AN OVERVIEW OF DISTRIBUTED GENERATION IN POWER SECTOR

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ABSTRACT

In present era, dependence of human life over technology has increased. Today we can't imagine human life without technology, because of the technological necessity in day to day life. Increase in demand of technology has also increased demand of electricity. Earlier, generation of electricity was mostly based upon central power generating unit and transmission was also over long transmission line to meet far away load demand. Transfer of power through long transmission line or network was resulting in transmission losses and reliability problems. For overcoming these issues a new technology has emerged called Distributed Generation. In this method the electricity is generated near to load demand with small generating units. Utilization of new energy sources in DG, for example utilization of environmental friendly renewable energy sources also helps to reduce transmission losses. The paper defines Distributed Generation and compares it with conventional power generation approach. It elaborates the concept behind the development of Distributed Generation; technologies used; its advantages and limitations. It also focuses on why it should be prefer and how it helps to minimize energy losses. This work analyzes Distributed Generation over central power generation and discusses the impact of technology in the coming future.

Keywords: Distributed Generation (DG), Transmission & Distribution, Transmission Network, Renewable Energy Sources

I. INTRODUCTION

Generation of electricity mostly depends upon centralised power generating facilities, for example coal, oil and gas powered, nuclear, large solar plants or hydro power plants. Centralised power generating units are located at distant places from load demand. Transmission of power from generating units to load demand causes transmission loss, quality of power and reliability problems. Facilities utilised by centralised power generating units for example coal, oil & gas adversely affect the environment. To overcome these issues power sectors are adopting a new technology called Distributed generation.

Electric power research institute defines DG system as a small-scale based modular energy conversion unit located near to load demand ranged between 1kw to 50MW [1]. In this technology generation units are located near to load demand with small scale generating capacities and directly connected to the distribution network to meet uncontrollable demand with more flexibility. It is interconnected to the same transmission grid as of central stations for the reason of reliability. Reliable power sources minimize interruption of power supply or power outages. DG also helps to enhance quality of power i.e. voltage levels, fluctuations and disturbances.

There are several technical and economical issues in the integration of these resources into a grid. It greatly reduces transmission loss and is a reliable power source. Technical problems arise in the areas of power quality, voltage stability, reliability, protection and control [2]. Behaviour of protective devices on the grid must be examined for all combinations of distribution and central station generation [3]. A large deployment of DG may affect grid-wide functions such as frequency control and allocation of reserves [4]. For this, there will be a need of good coordination control and better as well as bigger interconnections among them. DGs are expensive per watt electricity generation to central generators due to its high initial setup cost. But As per sources, the current initial costs of DG systems are decreasing gradually, as many countries are increasing their capacity [5].

In the last decade many countries have started the process of liberalization of their electrical systems, opening access to Transmission & Distribution grids. India is also liberalising its power sector and reforming electricity sector by increasing competition with flexibility of participation of private sector. Still With the liberalisation and participation of private sectors, India uses far less electricity per capita than developed countries, i.e. only about 900KWh per capita in India compared with 7,000KWh per capita in Europe and 14,000kwh in the US. As per sources, the electricity generation capacity will grow in India from about 225GW in 2013 to 700GW by 2032 to meet rising demand [6].

Today the DG is mostly based upon diesel engines that are used for back-up power (in the event of grid failure) and operate at very low load factors. Also the share of the energy generation from DG is marginal (about 2–3% of the total generation). Other than the diesel engines, the DG options that are being promoted in India are modern renewable energy based system [7]. Penetration of renewable energy sources play major role to enhance DG systems because of its small scale capacity and environment friendly nature.

In this research work, we have gone through various author's contribution over penetration of DG in electricity sector. We have discussed advantages of this new technology and compared with central power generation system. In our work we have emphasized on acceptance of this new technology along with its advantages and limitations.

Organization of the paper is as follows; section 2 explains Distributed Generation and comparison with central power generation. Use of DG, different types of DG Technologies and its applications are reviewed in sections 3 and 4. Benefits of DG and its Challenges of DG are discussed in section 5 and 6. The section 7 summarizes with Conclusions.

II.DISTRIBUTED GENERATION AND COMPARISON WITH CENTRAL POWER GENERATION

Different terms and definitions are used related to DG in different literature. For example, Anglo-American countries often use the term 'embedded generation', North-American countries use the term 'dispersed generation', and Europe and parts of Asia, uses the term 'decentralised generation'. Analysis of the relevant literature has shown the relevant definitions of DG which are derived in terms of capacities:

1. The electric power research Institute defined DG as generation from a few kilowatts up to 50MW [1],
2. According to the Gas Research Institute, DG is in between 25KW and 25MW [8],
3. Preston and Rastler defined as 'ranging the size from a few kilowatts to over 100 MW' [9],
4. Cardell defined DG as generation between 500KW and 1MW [10],
5. The international conference on Large High Voltage Electric Systems (CIGRE) defined DG as 'smaller than 50-100MW' [11],

"DG can be defined as effective and efficient fulfilment of load demand with small generating units ranging between 50KW to 50MW near to load demand". As per government regulations of different countries, the rating of each distributed power station varies. For example; In English and Welsh market, DG with a capacity of less than 100MW are not centrally dispatched and if the capacity is less than 50MW, the power output can't be traded via the wholesale market [12]. Therefore, in English and Welsh market DG predominantly used for power units with less than 100MW capacity. As per Swedish legislation DG is used for generation of electricity up to 1500KW [14]. On the other hand some of the proposed offshore wind farms for Sweden have a maximum capacity of up to 1000MWand this would still be considered DG as they plan to use 1500KW wind turbines [13].

Here we will see comparison of DG with central power generation. Comparison of Distributed Generation with central power generation on the basis of power flow from generating unit to load demand is given below:

Central Power Generation vs Distributed Generation

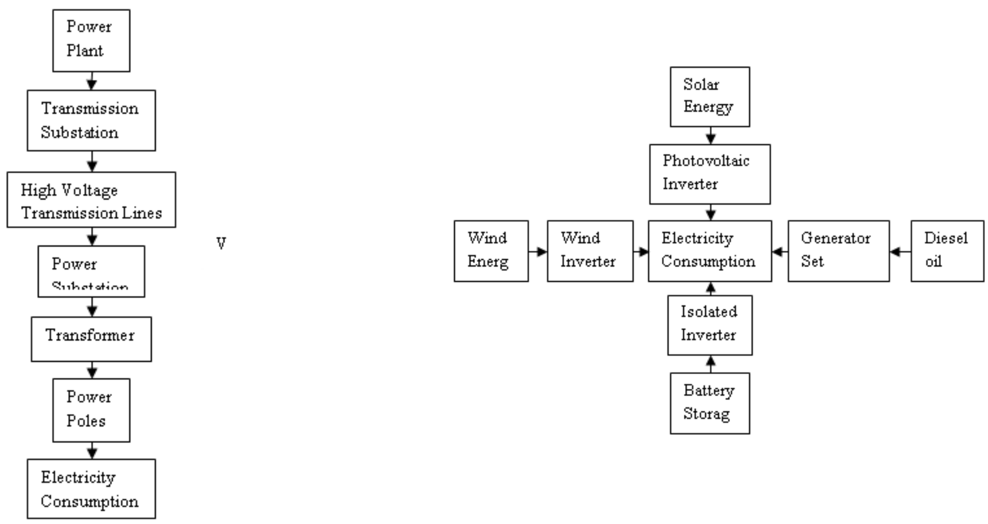

Fig.-1 Comparisons of DG with central generation approach

Multiple problems associated with central power generation, for example, are power losses through transmission, power theft, reliability and quality of power. Long distance power transmission also creates theft of power which is a big issue. Developing countries like India are mainly facing problems like lack of conventional energy resources, old technology, and power losses through transmission. In 2010, average electricity losses in India during Transmission & Distribution were about 24% of total loss, while losses because of consumer theft or billing deficiencies added another 10–15% [14]. If current average transmission & distribution losses remain same (32%), India will need to add about 135 GW of power generation capacity, before 2017, to satisfy the expected demand [15]. Local production has no electric transportation losses compared to long distance power lines or energy losses from the Joule effect in transformers where in general 8-15% of the energy gets lost [16].The developed countries like America and Europe have advantage of advanced technology which is the reason of their minimum transmission power losses and theft of power.

On other side, due to lack of coal reservoir, thermal power generating units suffers for consistent coal shortage conditions and works on high risk of unit shutdown. DG resources can play a big role to meet the huge and rising electricity demand and supply gap. Thermal power generating units pollutes the environment and increases global warming. China, world's major polluter, plans to reduce its CO2 emissions by 40% to 45% per unit GDP by 2020 from a 2005 baseline by implementing a carbon trading market that will penalise major polluters [17]. Ongoing 20 years of discussions and consultation about sustainable development, the world's climate and its biodiversity are still deteriorating [18]. With the help of DG system and renewable energy sources we can overcome all such issues. DG uses generating units sized between 1KW to 50MW near to load demand as compared to central power generating units sized between 100MW to 1GW at distant from load demand. Applications of different types of technology in DG have changed the way of operating electric power systems and utilization of renewable energy sources makes DG clean and environment friendly power generating system.

III. USE OF DG

In the past years, there have been good development of small scale generation technologies, but still they failed to push the "economy of scale" out of the system, because of its high initial setup cost. But other than this, other benefits make it desirable and thus its utilisation is increasing with each days passing. Also global warming and shortage of conventional energy resources make it necessary to look after clean and renewable energy sources. As compared to traditional diesel generator set, renewable energy is used for DG to reduce global warming. Now we will see use of DG due to market liberalisation and environmental concern [20]:

3.1 Market liberalisation

Now electricity suppliers are more concern with their interest in DG, because they see it as a tool that can help them to fill in niches in a liberalised market. In which, customers will look for the electricity service that will suit best for them. Weights assign to features of electricity supply and DG technologies from the different customers; can help electricity suppliers to supply the type of electricity service that they want. In changing market conditions, DG allows electricity suppliers in the electricity sector to respond in a flexible way. As compared to larger central power plants in many cases, DG provides this flexibility because of its small sizes and the short construction lead times. According to the IEA [19], the flexibility of this new technology can be understood when economic assessments of DG are made. We can get further knowledge from different areas which are discussed below:

3.1.1 Peak Load Shaving

Many DG technologies are indeed flexible in several respects: operation, size and expandability. Making use of DG gives flexibility of electricity price evolutions. DG then serves as a hedge against these price fluctuations. Europe increased their DG efficiency for heat applications with the help of renewable energy sources [20]. In 2013 India faced some black out conditions, which indicates lack of flexibility and reliability in electricity supply. For reliable and flexible power sources demand of DG in India has increased.

3.1.2 Power Quality

WE can have smaller voltage deviations, apart from large voltage drops to near zero. Voltage deviation shows level of power quality. Degree of power quality refers to the power characteristics align with the ideal sinusoidal voltage and current waveform, with current and voltage in balance [21]. Inadequate power quality may caused by (1) interruptions, voltage dips, and transients which occur due to switching operations and failures in the network, and (2) phase imbalance , flicker (fast voltage variations), and harmonics. The nature of these disturbances is related to the 'short-circuit capacity'. It is important for network operators to guarantee a specified minimum short-circuit capacity, to protect the system from degradation in power quality [22]. Ambiguity occurs when we go for find a relation between DG and power quality. There are many authors who stress over the healing effects of DG for power quality problems. DG can contribute voltage support in areas where it is difficult, as connecting DG generally leads to rise in voltage in the network [19]. Dondi et al. [20] also mentioned the potential positive effects of DG for voltage support and power factor corrections.

3.1.3 Reliability

Unreliable power source gives problem related to repetitive power interruptions, which are voltage drops to near zero in electricity supply. Due to liberalisation of energy markets, customers are more aware of the value of reliable electricity supply. In many European countries, the reliability level is very high, mainly because of high engineering standards.

In general, compared to voltage fluctuation, customers do not really care about supply interruptions because they do not feel it as a risk. Voltage instability can damage costly electrical and electronic equipment. Dependence of human life over technology demands continuous power supply. Now a day, customer demand has increased for reliable power sources. Continuous demand implies high investment and maintenance costs for the generation and network infrastructure. In industries like chemicals, petroleum, refining, paper, metal, and telecommunications having a reliable power supply is very important. Investors of these firms facing poor reliability level of power supply to invest in these industries. DG technology helps to increase reliability level of power supply to fulfil customer demand up to the desired level [20].

3.1.4. Alternative to expansion

DG could serve as a substitute for investments in Transmission & Distribution capacity (demand for DG from T&D companies). But, this is possible only to the extent that alternative primary fuels are also locally available in sufficient quantities so that it can give a better alternative power generation option.

According to the IEA [19], on-site production of electricity could result in 30% of cost savings during Transmission & Distribution. It directly impacts the increase demand of DG from the customer. Generally it is seen, if density of customer is less, the share of Transmission & Distribution costs in the overall price becomes large (above 40% for households) [19]. As per System operator's point of view, DG units can be a substitute for investments in Transmission & Distribution capacity. DG unit can be used as an alternative to connecting a customer to the grid in a 'stand alone' application. Well chosen DG locations like close to the load can also contribute to reduced grid losses. The IEA [19] reports average grid losses of 6.8% in the OECD countries. According to Dondi et al. [20], cost savings of 10–15% can be achieved using DG technology in this way.

3.2. Environmental Concerns

In present scenario, environmental policies or concerns are probably the major driving forces for the demand of DG, because of increased utilization of renewable energy sources. Environmental regulation force players in the electricity market are looking for cleaner energy- and cost-efficient solutions. By the use of DG we can optimise the energy consumption of firms that have a large demand for both heat and electricity [20]. Also, most government policies which have aimed to promote the use of renewable will also result in an increased impact of DG technologies, as renewable, except for large hydro, have a decentralised nature. More explanations related to environmental concern are given below:

3.2.1. Combined Generation of Heat and Electricity

It makes sense to consider the combined generation of heat and electricity on sites where there is a considerable and relatively constant demand for heat, instead of generating the heat in a separate boiler and buying electricity from the grid. This technology is called cogeneration technology and cogeneration units create a large segment of the DG market. Compared to separate fossil-fired generation of heat and electricity, CHP generation may result in a primary energy conservation, varying from 10% to 30%, depending on the size (and efficiency) of the cogeneration units [20, 23, and 24]. The avoided emissions are in a first approximation similar to the amount of energy saving, although the interaction with the global electricity generation system also plays a role.

3.2.2. Efficient Use of Cheap Fuel Opportunities

Installation of DG gives opportunity to use cheap fuel sources. For example, in the proximity of landfills, DG units used to burn landfill gases to generate electricity. But at local level biomass resources may also be envisaged. Currently the liberalisation of the electricity market and increased environmental concerns in developing countries both induce an increased interest in DG applications and thus also in innovations in the appropriate technologies. However, the technical, economic and environmental challenges will be to optimally integrate this increasing number of small generation units in an electricity system that up to now has been very centralised, integrated and planned [20].

3.2.3 Use of Renewable Energy Sources

Due to environmental benefits, developed and developing countries are moving towards use of renewable energy sources to generate electricity. It reduces green house gases and controls acidification. Small scale generation capacities of renewable energy sources are making this favourable for DG. Solar and wind energy are playing major role in DG, because of its availability. Various developed and developing countries are increasing use of renewable energy for generation of electricity [25].

IV. DIFFERENT TYPES OF DG TECHNOLOGIES AND ITS APPLICATIONS

DG shows a range of technologies for example fuel cells, reciprocating engines, small gas combustion turbines, micro-turbines, load reduction and other energy management technologies. In the table given below, we are discussing about different types of DG technologies and their fuel choices along with their benefits and drawbacks:

DG Technologies	Fuel Choices	Benefits	Drawbacks
Micro turbines Micro turbines are small combustion turbines that produce power ranged between 25 kW and 500 kW. Micro turbines were derived from turbocharger technologies found in large trucks or the turbines in aircraft auxiliary power units (APUs). Efficiency of this technology is 28% to 33%	Natural gas, propane, diesel, multi-fuel	• Thermal recovery improves efficiency • Thermal output for residential or small commercial applications • Operable as base, peaking, or back-up • Commercially available in limited quantities	• Insufficient thermal output for industrial applications
Small Gas Combustion Turbines	Natural gas, distillate,	• Highly efficient when	• Potentially onerous

For DG small gas combustion turbine generators typically range in size from about 500 kW up to 25 MW. Efficiency of this technology is 25% to 40%	methane, dual fuel	used with thermal recovery • Technology commercially available today—most likely candidate for on-site needs >3 MW in DG application • Can operate base load, back-up, or peaking load • Several manufacturers • Relatively low installed costs	siting and permitting requirements • Environmental issues—emissions and noise • Possible on-site fuel storage needs
Internal Combustion Engines Internal combustion engines converts the energy contained in a fuel into mechanical power. This mechanical power is used to rotate a shaft in the engine. A generator is attached to the IC engine to convert the rotational motion into power. They are available from small sizes 5 kW to large generators e.g., 7 MW. Efficiency of this technology is 28% to 37%	Diesel, natural gas, propane, bio-gas, other petroleum distillates	• Bulk power delivered when utility is unavailable • Fast start-up allows less sensitive processes to be served without need for UPSs (for use of emergency lighting, HVAC, elevators, some manufacturing processes) • Very mature, stable technology • Can be paralleled to grid or other generators with controls package • Can be very efficient when combined with heat recovery	• Capital is only being used when back-up generator is running • Marginal cost of production favours utility source in rare occasions • Environmental issues like carbon emissions and noise • Possible on-site fuel storage needs
Stirling Engines A Stirling engine is a heat engine that operates by cyclic compression and expansion of air or other gas at different temperatures. The Stirling engine is noted for high efficiency compared to steam engines, quiet operation, and its ability to use almost any heat sources. Stirling engines are cost competitive up to about 100 kW. Efficiency of this technology is ranging from 15% to 30%.	Air, Hydrogen, Helium	-Stirling engines can run directly on any available heat source - They require less lubricant and last longer than equivalents on other reciprocating engine types - No valves are needed, and the burner system can be relatively simple - They are extremely flexible~~.~~ and they can be used as CHP (combined heat and power) in the winter and as coolers in summer	- Stirling engine designs require heat exchangers for heat input and for heat output, and material requirements for this substantially increase the cost of the engine - Dissipation of waste heat is especially complicated because the coolant temperature is kept as low as possible to maximize thermal efficiency
Fuel Cells	Direct by hydrogen;	• Very high fuel efficiencies	• Few commercially

Fuel cell power systems are quiet, clean, highly efficient on-site electrical generators that use an electrochemical process—not combustion—to convert fuel into electricity. In addition to providing power, they can supply a thermal energy source for water and space heating, or absorption cooling. In demonstration projects, fuel cells have been shown to reduce facility energy service costs by 20% to 40% over conventional energy service. High temp: Efficiency is 45% to 55% Low temp: Efficiency is 30% to 40%	natural gas, propane, methanol, or other hydrogen-rich source through reformer	from hydrogen to electricity • Potential to operate base load with utility back-up • Possible residential application—a no-moving-parts energy appliance • Very high efficiencies when combined with heat recovery • Green technology—water and heat are only emissions from hydrogen fuel, low emissions from other fuels	available devices • Most research efforts are for automotive applications • Need for fuel reformer in almost all applications • Not a zero-emission technology—the effect of that may vary by state
Photovoltaic Photovoltaic (PV) cells, or solar cells, convert sunlight directly into electricity. PV cells are assembled into flat plate systems that can be mounted on rooftops or other sunny areas. They generate electricity with no moving parts, operate quietly with no emissions, and require little maintenance.	None	• No variable costs for fuel • No moving parts—inexpensive maintenance and long life • No emissions, no noise • Can be used for peak shaving • Highly reliable, mature technology	• Big foot print (600 ft^2/kW) • High installed costs • Not suited for base load • Not suited for back-up except when accompanied by storage • Variable energy output
Large Wind Turbines Wind turbines use the wind to produce electrical power. A turbine with fan blades is placed at the top of a tall tower. The tower is tall in order to harness the wind at a greater velocity, free of turbulence caused by interference from obstacles such as trees, hills, and buildings. As the turbine rotates in the wind, a generator produces electrical power. A single wind turbine can range in size from a few kW for residential applications to more than 5 MW.	None	• No variable costs for fuel • In utility implementation, zero emissions may allow green power price premium • Mature technology • Multiple manufacturers	• Need to meet siting requirements • Generation is intermittent with wind, and energy output can vary with wind speed squared or cubed over operation range. Not appropriate as backup or off-grid applications • Needs utility source for energy purchases and sales • Can require footprint up to $100ft^2/kW$

Table-1: Different Types of DG Technologies, Their Fuel Choices, Benefits and Drawbacks [26, 27]

Different DG technologies are implemented to fulfil the requirements of a wide range of applications and these applications and technologies differ according to the load requirements (thermal needs, stand-alone or grid-connected electrical power, requirements of power quantity and environmental issues in the site, etc). Some of these applications are:

- Grid connection to sell the electrical energy,
- Stand by sources to supply power for sensitive loads during grid outages,
- Peak-load shaving,
- Rural and remote applications,
- Used local fuel resources,
- Combined heat and power (CHP) with injection of power in to the network when the DG capacity is higher than its local load, and
- Utility-owned DGs, to provide part of the main required power and support the grid by enhancing the system voltage profile, reducing the power losses, and improving the system power quality as well as reliability.

V. BENEFITS OF DG

Countries like in India, many people are living in remote areas and they don't have access of electricity. Other side power deficiencies and Transmission & Distribution loss of power about 32% is in India [16]. Utilization of DG will lead to overcome of these issues. It provides more flexible and reliable power sources to consumers. It improves voltage instability connected with the power grid. There is more security provided by DG to the consumers due to setup of near to demand sites. We are considering economical, operational and environmental benefits of DG:

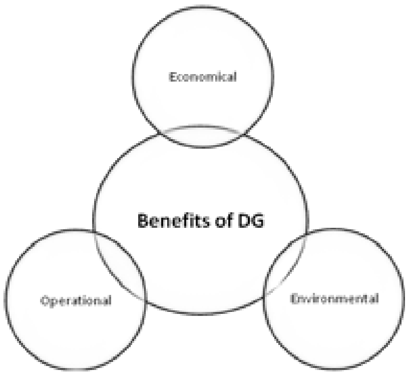

Fig.-2: Benefits of DG

5.1. Economical

DGs can generates required demand of electricity by increasing installation of units at certain locations near to load sites, so they can reduce or avoid the need for building new transmission & distribution lines and upgrade the existing power systems [24, 26, 27]. Investment point of view, it is easier to find sites for DGs as compared to a large central power plant and such units can be online in much less time. Unnecessary capital expenditure avoided and capital exposure and risk are reduced by matching capacity increase with local demand growth. DGs can be assembled easily anywhere as modules for power generation which have many advantages as [28]:

ü In a very short period they can be installed at any location. Each modular can't be affected by other modular operation failure and operated immediately and separately after its installation independent of other modules arrival.

ü The total capacity can be increased or decreased by adding or removing more modules, respectively.

Due to deregulation of electricity in many countries DGs will be of great importance in generating power locally especially if the location margin pricing (LMP) is applied for independent transmission operators (ISO's) and regional transmission organizations (RTO's). Location margin pricing (LMP) can give an indication of where DGs should be installed. Also by supplying power to the grid, DGs can reduce the wholesale price of power, which leads to reduction of the demand required [31]. DG can stimulate competition in supply; adjusting price via market forces. In a free market environment, DG operator can buy or sell power to the electricity grid, purchasing power at off-peak prices and exporting only at peak demand. DGs are decentralised power systems, so this has advantage to place at anywhere as per the demand. Flexibility of location for DG has a great effect on energy prices [29]. For the exact required customer load demand, DGs are well sized to be installed in small increments. However, renewable DGs technologies such as solar, wind, and hydro units require certain geographical and climatic conditions.

As the demand for more and better quality electric power increases, DG can provide alternatives for cost-effective, reliable, premium power for domestic use and for industrial use. When a power outage occurs at home or in the neighbourhood, restoring power in a short time, DG can provide customers with continuity and reliability of supply. By generating more power, CHP DGs can use their waste heat for improving their efficiency or heating and cooling, which is not applicable in the situation of centralized power generation alone [29]. For remote or stand-alone CHP DGs can be more economical [30]. DGs increase the system equipments and transformers lifetimes and provide fuel savings. According to different DGs technologies, the types of fuels and energy resources used are diversified. Therefore, there is no need for certain type of fuels or energy resources more than others [32]. Installation of DGs can reduce the construction schedules of developing plants. Hence, the system can track and follow the market's fluctuations and/or the peak-load demand growth [32]. All these technologies offer new market opportunities and enhanced industrial competitiveness.

5.2. Operational

DGs can reduce the distribution network power losses [30, 32, 36, and 38], distribution loads requirements by supplying some of the distribution load demand, reduce power flow inside the transmission network to fit certain constraints and improve its voltage profile [36]. DGs have a positive impact on the distribution system voltage profile [30, 32, 38] and power quality problems [30, 31]. This technology can help in "peak load shaving" and load management programs [34]. It can be used as on-site standby to supply electricity in case of emergency and system outages [36]. DGs maintain system stability, supply the spinning reserve required and they provide transmission capacity release [31]. It can be installed on medium and/or low voltage distribution network due to capacities vary from micro to large size which gives flexibility for sizing and site locating of DGs into the distribution network [37]. As there are many generation spots not only one centralized large generation so they can help in system continuity and reliability. When we are combined with DGs, there will be new customer classifications between high need for reliability with high service cost and others with less service cost and relatively lower reliability, especially in the case of end-user customers with low reliability [34].

From the mathematical point of view benefits of DG can be derived by figure-3 [19], which shows that the connection of a distributed generator to the power system, where R and X are the resistance and reactance of short-circuit, respectively, and P_g and Q_g are the active and reactive power generated. According to Thevenin equivalent of the power system E is the voltage of the ideal source. At the same point of common coupling (PCC), there is a load characterised by its demand curve (P_{load} + jQ_{load}).

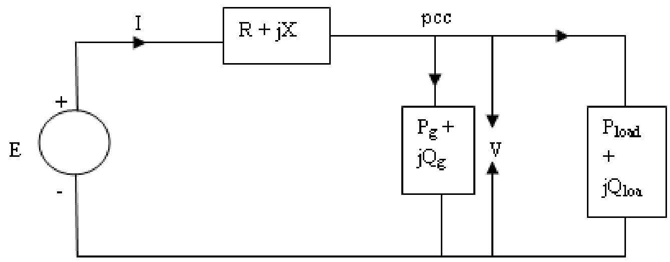

Fig.-3: Connection of DG and load at the point of common coupling

The variation of the voltage can be expressed as:

$$\Delta V = E - V = (R + jX)I = (R + jX)\frac{P - jQ}{V} = \frac{RP + XQ}{V} + j\frac{XP - RQ}{V}$$

Where P and Q are the total active and reactive power absorbed from the power system (load + generation), respectively. The variation of the voltage at the PCC of the wind farm to the grid can be calculated by solving the following equation:

$$V^4 + [(RP + XQ) - E^2]V^2 + [(XP - RQ)^2 + (XP + RQ)^2] = 0$$

From the above expressions, the voltage at the point of common coupling is the result of the combination of several parameters and variables such as the active and reactive powers, and the characteristics of the network. Positive values of K and L imply injected powers. The management of Q permits adjustment of voltage at the PCC to the required level.

5.3. Environmental

Development of highly efficient power generation (CHP production) and environmental friendly (renewable energy sources (RES)) has attracted significant attention around the world. With regard to, environment and society, renewable DGs eliminate or reduce the output process emission [39]. This is due to the increased awareness of the detrimental effects of the emissions from hydrocarbon based power stations on the environment, which has led to the commitment of many countries to comply with the Kyoto protocol [40] and reduce their green house gas (GHG) emissions. Power generation systems that use renewable resources like solar, wind, geothermal energy and organic matter have some advantages over traditional fossil –fuelled generation systems. For example, most renewable power technologies do not produces green house gases and emits far less pollution compared to burning oil, coal, or natural gas to generate electricity. It is widely recognised then the green house gas intensity in hydro-electrical systems is about 15g CO_2 / KWh on average, 20g CO_2 / KWh in the case of wind turbines and 100g CO_2 / KWh for photovoltaic. Where as in classical thermal systems burning natural gas it is around 577g CO_2 / KWh (combined cycle) or 750g CO_2 / KWh (open cycle) and in burning coal the values are greater than 860g CO_2 / KWh [28, 29].

The environmental load is also reduced due to the avoidance of additional energy required to compensate transmission losses. Studies report that reduction of losses by 1% in the UK system reduces emissions by 2 million tonnes of CO2 per year [41]. Moreover, in the UK, reduction by 1 GWh from hydrocarbon can reduce emissions up to 400,000 tonnes per year. In selected Portuguese networks of various types, ranging from rural LV networks to HV ones, 20% penetration of DG reduces CO2 emissions by 2.07–4.85% [42]. It is demonstrated that on European scale, 65 million tonnes of CO2 per annum can be saved by 50 million installations of domestic CHP units. A significant impact of increased efficiency in the domestic utilisation of gas and electricity on the reduction of CO2 emissions is claimed in Pudjianto [43]. Next to the potential environmental benefits of DG, their economic evaluation is critically influenced by the developing CO2 emissions trading markets [44], which also affect production costs of electricity generated by thermal (hydrocarbon) units [41].

VI. CHALLENGES OF DG

Today's power sectors are facing multiple challenges for example fuel shortage, environmental issues, power losses and government regulations. Like that, DGs are also having their own challenges. These challenges reduce overall performance of DG. Overcoming of these challenges will lead to optimal utilisation of DG. We considered four challenges of DG - commercial, technical, environmental, and regulatory. Inside this a technical challenge has three parts which are power quality, voltage rise effect and protection.

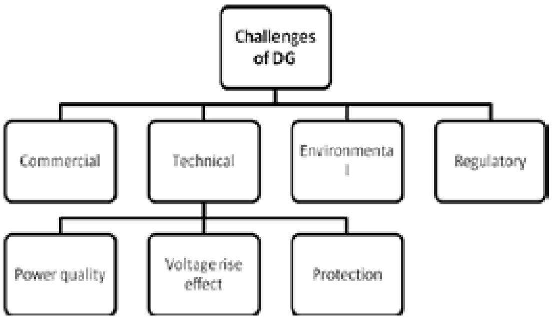

Fig.4: Challenges of DG

6.1. Commercial

At present, distribution companies which businesses of wires have no incentives to connect DG and offer active management services. New commercial arrangements need to be developed to support the development of active distribution networks and extract corresponding benefits associated with connecting increased amount of DG. In General, possible three approaches can be [45]:

- To establish a market mechanism outside government regulations for the development of active networks that would create a commercial environment. Distribution companies charge for providing active management services to the generators. Clearly, this could be used as a basis for bilateral negotiations between the local company and the generator whenever the net benefit from active management exists.
- To recover, cost of implementation of active management through the price controls mechanism (increasing the amount of recoverable capital and operating expenditure associated with active management). Recovery of cost could be achieved through increased charges for the use of the networks (distributed generators benefiting from either active management and/or demand customers).
- Establishing an incentive scheme that would reward companies for connecting DG, which one is recently developed in the UK [46]. With a suitable design of the scheme, we can achieve development of active distribution networks for such incentive scheme. These types of scheme could be funded from increased charges imposed on generators and/or demand customers.

6.2. Technical

There are some technical challenges of DG, among that power quality; voltage rise effect and protection are major challenges of DG. Further explanations of these issues are:

6.2.1. Power Quality

Power quality is an increasingly important issue especially in developing countries and generation of power is generally subject to the same regulations as loads. There are two aspects of power quality which are usually considered to be important [46]: (1) harmonic distortion of the network voltage and (2) transient voltage variations. DG plant can either increase or decrease the quality of the voltage received by other users of the distribution network which depends on the particular circumstances.

6.2.2. Voltage Rise Effect

The voltage rise effect is a key factor that limits the amount of additional DG capacity that can be connected to rural distribution networks. Connection or disconnection of DG in distribution network causes voltage rise effect. It produces instability of power supply and power variations. We can control this by using optimal power flow under voltage step constraints [47, 48].

6.2.3. Protection

There are different aspects of DG protection which can be identified: protection of the faulted distribution network from fault currents supplied by the DG; protection of the generation equipment from internal faults; anti-islanding or loss-of-mains protection (due to penetration of DG increases, islanded operation of DG will be possible in future) and impact of DG on existing distribution system protection. For the connection of DG to the distribution networks, these aspects are important and should be carefully addressed [46].

6.3. Environmental

After so many years of discussions and negotiations about sustainable development, the world's climate and its biodiversity are still deteriorating [18]. Environmental issues are prime concern for any countries due to increasing global warming and its negative impact over human being. Due to global warming our weather has changed and it becoming disaster for human life.

From the fuel utilisation point of view, smaller distributed generation plants generally are less efficient than larger central plants of the same type. Only when operating in a CHP mode, they may conserve primary energy compared to the separate generation of electricity and heat in best available technology (BAT)-electric-power plants and high-efficiency boilers. It is not easy to locate the environmental burden per unit of output (electricity or heat) in that the allocation of the emissions to the electricity or heat side is not straightforward. Based on direct or avoided emissions this allocation may be done energetically or exergetically. Although there are good thermodynamic reasons for argue over the most justified allocation which is based on the exergetic philosophy of avoided emissions, it is recommended to avoid the allocation and to compare CHP with separate generation. The primary power saving of CHP compared to separate generation is

$$PPS = \left(\frac{\alpha_E}{\eta_E} + \frac{\alpha_Q}{\eta_Q} - 1\right)F \qquad (1)$$

Where, α_E and α_Q are the electric and thermal efficiencies of the CHP, respectively, η_E and η_Q are electric and thermal efficiencies of the electric power plant and the boiler in the case of separate generation and F is the fuel input power in the CHP. With compression ignition (CI) the emission coefficient of the primary driver (gas turbine, engine, etc.) of the CHP per unit primary input i.e,

$$CI = \frac{amount\ emitted\ in\ (kg/s)}{primary\ fuel\ input\ in\ (J/s)} \quad (2)$$

Avoided emission of the CHP per unit of primary fuel input in the CHP compared to separate generation is

$$\text{Avoided emissions} = \left(\frac{\alpha_E}{\eta_E} + \frac{\alpha_Q}{\eta_Q} - 1\right)CI \quad (3)$$

This represents that the increased use of distributed generation is not always beneficial for the environment. For some cases or applications DG would be beneficial for environment, but in general it would not be. The outcome will crucially depend on the market share of the different DG technologies and on the mix of central generation that is replaced [20]. As far as renewable DG units are concerned, only indirect emissions have to be taken into account. Voorspools et al. [49] considered about indirect emission in their work.

6.4. Regulatory

On the treatment of DG, it is very unlikely that this type of generation is going to thrive in the absence of a clear policy and associated regulatory instruments. For this, the reasons are partly historical and related to the way distribution networks have been developed and operated as passive networks. In order to foster the required changes that support the integration of DG into distribution networks, there is a clear need to develop and articulate appropriate policies [46].

VII. CONCLUSIONS

The setback associated with central power generation has necessitated the development of DG. The area has attracted the attention of power generation and distribution sector. We discussed over the topic of DG in our work, and focused on how DG can be a better replacement of central power generation system. We have discussed about multidimensional benefits of DG along with their setbacks for better analysis. We have gone through different types of DG technology with their benefits and drawbacks. In this work, we focused over renewable energy sources and their increasing demand in DG. Further we elaborate advantage of renewable distributed generation to reduce carbon emission. Along with penetration of renewable energy sources in DG, we discussed over transmission and distribution losses minimization and flexibility of DG.

Adaptation of DG in power sector is still in its infancy state and is addressed along with challenges of DG in this paper. Further developments and more research work would be realized over the next few years to overcome these challenges. Having DG system that addresses the above research issues would accelerate the economical and environmental impact of DG in development of human life. Further research is required for finding optimal allocation and size of DG under load demand uncertainty and stochastically distributed solar and wind energy. Also there is need of research over DG to make this feasible for rural areas in developing countries.

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RESOURCE MANAGEMENT IN CLOUD COMPUTING ENVIRONMENT

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ABSTRACT

Cloud computing is the term for delivery of hosted services over the internet. It enables companies to consume resource based on their needs scale up and down. Most of the companies move to this technology due to reduction of cost Cloud computing delivery models are categorized as Iaas, Paas, Saas. Most of the cloud service provider gives the same service with different cost and speed. So the users can select the services based on their needs and cloud providers criteria like cost. In existing system is build upon future load prediction mechanism. Based on it, virtual machine allocation was done. In this paper Cloud Booster Algorithm is used, it provides the resource management. In this system uses virtualization technology to allocate resources dynamically based on the application demands.

Keywords: Cloud Computing, Virtualization, Virtual Machine, Resource Management.

I. INTRODUCTION

Cloud computing, as the name suggests, is a style of computing where dynamically scalable and often visualized resources are provided as a service over the internet. These services can be consumed by any user over a standard HTTP medium. The user doesn't need to have the knowledge, expertise, or control over the technology infrastructure in the "cloud" that supports them. The elasticity and the low cost of capital investment is offered by cloud computing to many businesses. Cloud computing platform guarantees service, scope, quality by service level agreement (SLA) to users. It allows users can scale up and down resource usage based on their resource needs. In cloud computing environment resources are shared, if they are not efficiently distributed then the result will be resource wastage The cloud is a next generation platform that provides dynamic resource pools, virtualization, and high availability. Today, we have the ability to utilize scalable, distributed computing environments within the confines of the Internet, a practice known as cloud computing. Cloud computing is the concept implemented to decipher the daily computing problems, likes of hardware software and resource availability unhurried by computer users. The cloud computing platform guarantees subscribers that it sticks to the service level agreement (SLA) by providing resources as service and by needs. The goal of cloud computing is to allow users to take benefit from all of these technologies, without the need for deep knowledge about or expertise with each one of them. The cloud aims to cut costs, and help the users focus on their core business instead of being impeded by IT obstacles. The main enabling technology for cloud computing is virtualization. Virtualization generalizes the physical infrastructure, which is the most rigid component, and makes it available as a soft component that is easy to use and manage. By doing so, virtualization provides the agility required to speed up IT operations, and reduces cost by increasing infrastructure utilization. On the other hand, autonomic computing automates the process through which the user can provision resources on-demand. By minimizing user involvement, automation speeds up the process and reduces the possibility of human errors.

Modern computers are sufficiently powerful to use virtualization to present the illusion of many smaller virtual machines (VMs), each running a separate operating system instance. This has led to a resurgence of interest in VM technology. "Virtualization, in computing, is the creation of a virtual (rather than actual) version of something, such as a hardware platform, operating system, a storage device or network resources" classification system.

Cloud can exist without Virtualization, although it will be difficult and inefficient. Cloud makes notion of "Pay for what you use", "infinite availability- use as much you want". These notions are practical only if we have.

- Lot of Flexibility
- Efficiency in the back-end.

This efficiency is readily available in Virtualized Environments and Machines. On a cloud computing platform, dynamic resources can be effectively managed using virtualization technology. Amazon EC2 provides virtualized server instances. Whereas some resources like CPU, memory, and instance storage are dedicated to a particular instance, other resources such as the network and the disk subsystem are shared among instances. If each instance on a physical host tries to use as much of one of these shared resources as possible, each receives an equal share of that resource. However, when a resource is under-utilized, you are often able to consume a higher share of that resource while it is available. The subscribers with more demanding SLA can be guaranteed by accommodating all the required services within a virtual machine image and then mapping it on a physical server. This helps to solve problem of heterogeneity of resources and platform irrelevance. Load balancing of the entire system can be handled dynamically by using virtualization technology where it becomes possible to remap virtual machines (VMs) and physical resources according to the change in load. Due to these advantages, virtualization technology is being comprehensively implemented in cloud computing. However, in order to achieve the best performance, the virtual machines have to fully utilize its services and resources by adapting to the cloud computing environment dynamically. The load balancing and proper allocation of resources must be guaranteed in order to improve resource utility. Thus, the important objectives of this research are to determine how to improve resource utility, how to schedule the resources and how to achieve effective load balance in a cloud computing environment. Virtualization technology allows sharing of servers and storage devices and increased utilization. Applications can be easily migrated from one physical server to another.

II. RELATED WORKS

In this section, I present a general review of project work on resource allocation and management on the cloud computing environment with respective algorithm. This paper completely deals with virtualization [1]. The key concept of cloud based solution is virtualization. The active resource allocation is performed by the virtual machine with the aid of virtual machine related features like flexible resource provisioning.In this report, we introduce a scheme that uses virtualization technology to allocate data center resources dynamically based on application needs and support green computing by optimizing the number of servers in use. We present the concept of "skewness" to measure the variability in the multidimensional resource utilization of a host. By minimizing skewness, we can mix different types of workloads nicely and better the overall utilization of host resources. In this paper, VM resource scheduling only considers the future resource need and ignores the current allocation & performance of the nodes. Grounded on this factor VM resource allocation is performed. During this allocation some nodes get more than it deserves and some other not get. During VM migration, there is no suitable criteria for unique identification and location of the VM, that means which VM is migrated and where to be migrated. The total migration cost becomes a problem when all the VM resources are migrated.

This report offers a parallel data processing framework exploiting dynamic resource allocation in Infrastructure-as-a-Service (Iaas) clouds [2]. This scheme fits well in a cloud for efficiently parallelizing incoming set of projects using large data. In this, a job initiates one virtual machine (VM) and on the go, based on this and complexity of subtasks, further VMs are allocated and de-allocated. It shows the architecture of this fabric. In parliamentary law to perform scheduling of tasks to VMs in a cost-effective way, they used a load balancing algorithm named Join-Idle-Queue algorithm. It brings in an idle queue between the Job Manager and the Task manager (VM). Whenever a VM becomes idle, it joins the queue. When a job approaches the Job manager, it fetches the first VM in the queue and allocates the task to it. This algorithm divides avoids the Job manager from inquiring every VM for its availability. Hence this method reduces communication overhead and thereby improves throughput of the information processing system. It comes after a centralized architecture and also ensures automatic adaptation to under and over-use of resources. Only this arrangement does not consider the heterogeneity aspects of resources in the swarm.

This report addresses a novel access for dynamic resource management in clouds [3]. Virtualization is a central concept in enabling the "computing-as-a-service" vision of cloud-based resolutions. Virtual machine related features such as flexible resource provisioning, and isolation and migration of machine state have improved efficiency of resource use and dynamic resource provisioning capabilities. Live virtual machine migration transfers "state" of a virtual car from one physical machine to another, and can mitigate overload conditions and enables uninterrupted maintenance activities. The focal point of this article is to give the details of virtual machine migration techniques and their usage toward dynamic resource management in virtualized environments. The migrations in a data center can be triggered periodically. For example, data centers in one part of the world may be heavily used in daytime (9 a.m. to 9 p.m.), whereas they may be under load during the night. Such "time of day" based migration of VMs ensures that VMs are "near" clients, and the communication delays and operating costs are minimized. Migrations can also be executed periodically to consolidate the reduced loads.

Virtual machines change their resource requirements dynamically. This dynamism leads to asymmetries in the resource usage levels of different PMs. Some PMs can get heavily loaded while others may be lightly loaded. In a data center, resource utilization levels of PMs are monitored continuously. If there is large discrepancy in the utilization levels of different PMs, load balancing is triggered. Load balancing involves migration of VMs from highly loaded PMs to low loaded ones. An overloaded PM is undesirable as it causes delays in service of user requests. Likewise, the PMs that are lightly loaded cause inefficient resource usage.

This report addresses the problem of resource management for large-scale cloud environments that hosted sites by contributing a key element called Gossip protocol [4]. Generally large-scale cloud environment includes the physical base and associated control functionality that enables the provisioning and management of cloud services. In addressing the problem of resource management, specific use case of a cloud service provider which hosts sites in a cloud environment is deployed. The cloud infrastructure includes many computational resources and storage resources in the machines within the swarm. The cloud service provider controls the cloud infrastructure which host sites in the cloud in the platform as a service concept. The required services will be offered by the site owners through the websites hosted on the swarm. The services can be made available to the end users through internet using a cloud tenant with host virtual machines in the cloud. The key contribution of this paper is a generic gossip protocol, which executes in the middleware and performs the resource allocation in the large cloud environment and achieves the objective fairness, adaptability and scalability. It owns the structure of a troll-based broadcast algorithm. Two nodes exchange state information, process this information and update their local status during a round. This algorithm is also subjected to constraints that allocated CPU and memory resources cannot larger than available resources. Each machine interacts with others by maintaining an Overlay network. A node which initiates protocol is called active server and the node which communicates with an active node for load distribution is called passive server. Active server compares the load with the passive server and if its load is higher than that of passive load, then the particular site request is handled by passive server otherwise that request is handled by active server itself.

This paper proposes to provide better and efficient VM scheduling for Cloud Data Centers with Minimum energy and VM migration [5]. This report is a contribution to the diminution of such excessive energy consumption using energy aware allocation. Our study offers an exact energy aware allocation algorithm. Modeling of energy aware allocation and consolidation to minimize overall energy consumption leads us to the compounding of an optimal allocation algorithm with a consolidation algorithm relying on migration of VMs at service departures. This paper aimed to achieve energy efficient VM placement consists of two steps. 1. Screening out the requested VMs in decreasing order of power use of goods and services. This builds somehow an ordered stack that is used in the second step for packing VMs in available servers. 2. The sorted VMs are handled starting from the top of the stack and attempting to place the most power consuming VMs on the server with the smallest remaining power consumption budget until a VM down the stack fits in this target server. The process repeats or continues until all VMs in the stack are set and carried as much every bit possible in the most occupied servers. This will tend to free servers for sleep mode or switching off. Merely it is ineffective to oversee energy efficiency under high load.

This report presents a precise VM placement algorithm that ensures energy efficiency and also prevents Service Level Agreement (SLA) violation [6]. The basic principle of VM placement is to allocate as many VMs on a physical server as possible, while satisfying various constraints specified as percentage of the scheme demands. In this newspaper, we design and deploy a distributed decision support system, which is deployed as a cloud-based solution. The road system is a cloud-based solution. Resource usage information from each VM and host is logged to a centralized cloud location. The information aggregation process can be performed by a hypervisor or third party software. Data analytic servers that employ the R framework as an engineer are pre-packaged Linux images that can run on VMs. The number of data analytic servers can be scaled up on demand since its cloud-based. A group of host machines is controlled by a Controller. The Controller has three duties. Firstly, it segments historical data to a specified distance for each VM or host; this segmented data will be utilized for building forecast models. Secondly, the Controller passes the address of data and the specific modeling algorithm to the roads. But in this scheme, there is no load balancing scheme.

In this report, we studied the problem of active resource allocation and power management in virtualized data centers [7]. Prior study in this area uses prediction based approaches for resource provisioning. In this study, we have utilized an alternate approach that makes usage of the queuing information available in the system to make online control decisions. This approach is adaptable to unpredictable changes in workload and does not require estimation and prediction of its statistics. We have been using the recently developed technique of Lyapunov Optimization to design an online admission control, routing, and resource allocation algorithm for a virtualized data center. This algorithm maximizes a joint service program of the average application throughput and energy costs of the information center.

III. SYSTEM ARCHITECTURE

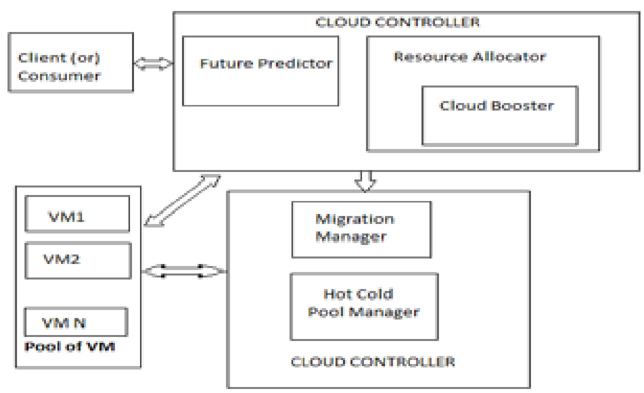

Fig No 3.1: System Architecture

Fig no3.1.shows the architecture of the systemCloud is a model for enabling convenient; on demand network access to shared pool of configurable computing resources. It allows business clients to scale upwards and down their resource use based on demands. The objective of this project is to create and implement Cloud booster algorithms for VM allocation which reduce hot spot nodes in the cloud and to design and implement the managing of the overloading process to Migrate VM from overloaded PM to overcome overloading.

- Cloud Node (Requestor) gets the job request from user to cloud controller.
- The cloud booster algorithm will calculate current allocation & Node capabilities.
- Future predictor will predict the future, loads based on the allocation details from the job allocator.
- Job allocator allocates the jobs based on the allocation sequence from the cloud buster.

- Hot cold pool manager gets the allocation details from the job allocator, and discoveries which all nodes are in hot and cold threshold.
- Based on the node load details of the Hot cold pool manager, the Migration manager overload detector will finds the victim job and remote node, where it can be able to migrate the victim job.
- PMs give the results back to user through the cloud controller.

IV. ALGORITHM

4.1Cloud Booster Algorithm

Resource Weight Calculation

- Collect resource information from various parallel nodes
- Calculate weight for each resource separately.
- Take the sum of all the resource's weights to determine the weight of a node.

Resource information

Here CPU Utilization and Memory usage are negative factors and the Available CPU and Memory are the positive elements. The CPU has greater impact on the performance of a machine comparing in memory or other factors. So it has a maximum weight constant. Weight for the above machine configuration is computed as follows:

Memory Utilization = (Total Memory – Used Memory) / Total Memory

CPU Utilization = Total CPU Usage of Processes / No. of Processes

Available CPU = Clock Speed * (1 – CPU Utilization) **37**

Resource	*Value (Example)*	*Weight constant*	*Weight of Each resource*
CPU Speed(MHZ)	2000	0.2	W_{cpu}= 2000*0.2=400
Cache memory(kb)	2500	0.2	W_{cache}=500
Main memory(kb)	1000000	0.15	W_{ram}=150000
CPU Usage (%)	20%	0.2	$W_{cpu\ usage}$=0.04
Memory usage (kb)	750000	0.15	W_{mem}=112500

Table No 4.1: Resource Table

Available Memory = Main memory * (1 – Memory Utilization)

For converting each parameter into same scale between 0 and 1, divide each value with the maximum value. Then weight for each resource is separately determined.

CPU Weight (WCPU) = Available CPU * Weight constant for CPU

Memory Weight (WMem) = Available Memory * Weight constant for Memory.

Weight for current load (WLoad) = Current load * Weight constant for load

Weight of Machine = WCPU + WMem – WLoad

In Load distribution phase selects the best parallel machine for job allocation. Here job Size is considered as load. Before job allocation, see the job percentage required by each machine. This is calculated by using the formula.

Required job percentage for a machine say X, PX = Wx / Σ WI*, here Σ WI *is the total weight of all the nodes.

After estimating Job volume for each machine PXsed on theWI node weiWItagethe total weightecution of task is started in parallel processing system and output is generated.

Weight of Each node $= W_{cpu} + W_{cache} + W_{ram} - W_{cpu\ usage} - W_{mem}$

b) Resource Allocation

- Represent all parallel nodes as a Connected Graph.
- Calculate mean deviation for each node in the path by taking the difference between current Job Weight and the weight of the node.
- Repeat this process for all nodes in the set.

4.2 Load Balancing Algorithm

This Algorithm mainly focused on dynamic load balancing or management. This dynamic load balancing algorithm based upon virtual machine migration in cloud computing environment. It proposes triggering strategy that was based on fractal method. It provide better performance, better resource usage and more balanced. The triggering strategy was based on the specific threshold that resulted into instantaneous peak load triggered then the virtual machine was migrated in the cloud computing environment. Here the migration decision was made on the basis of the history of the load indicators load information to get n load value. When k load values can be exceed the specified certain value, migration was triggered. Thus this strategy avoids the problem of instantaneous peak load triggering once the virtual machine is migrated.

- CPU load indicator is measured as

$$CPU=\sum_{K=1}^{n} Ak/n$$

Here n is the number of nodes, CPU utilization represented as Ak.

- Memory load indicator represented as

$$Memory=\sum_{K=1}^{n}(Memuse+MemSwap)/Tmem$$

Here memory load consists of memory usage and the swapped memory. Total memory is Tmem.

- Bandwidth load indicator represented as

$$Band=\sum_{K=1}^{n} BandK/TBand$$

V. CONCLUSION

Cloud is a model for enabling convenient, on demand network access to a shared pool of configurable computing resources. It allows business clients to scale upwards and down their resource use based on demands. Different organization provides the same service with different service charges and waiting time. Then clients can select services from these cloud providers according to their criteria like price and waiting time.

We have submitted the conception, execution, and evaluation of an efficient resource management scheme for cloud computing services. I use Cloud Booster Algorithm for determining the node's capabilities, Resource allocation and Load Balancing Algorithm for VM migration. My algorithm achieves both overload avoidance and energy saving for systems with multi-resource constraints. In a future enhancement will propose a new algorithm for resource scheduling and comparative with existing algorithms for reducing the number of migrations.

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EFFECTIVE LOCALISATION ERROR REDUCTION IN HOSTILE ENVIRONMENT USING FUZZY LOGIC IN WSN

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ABSTRACT

Placing a node and estimating a distance in a network plays a crucial role in wireless sensor network [WSN]. Now-a-days neural network [NN] scheme be used for estimating a distance between node and anchor nodes. By using NN scheme the localization error be increased and success rates should be reduced. Due to this problem the data send from the sink be loosed, and energy also is wasted. In the proposed scheme initially the node be placed randomly, then the energy should be assigned, each node transfers their energy to the anchor nodes. Then the anchor nodes communicate with the sink. Then sink collects all the data from the anchor nodes. Fuzzy logic is used for selecting an anchor node based on the rounds. Then the topology to be created and stored in the database with the help of the sink. In WSN the anchor node communicates with sink. The above process to be carried out repeatedly on comparing with old topology to new topology. When a new node is detected, by using the location of the new node to the nearest anchor node. The distance between the sink and new nodes is estimated accurately. Online training is carried out for training a topology in a database. By using these technique the accuracy and success rate be increased and the localization error be reduced. Efficiency increase due to fuzzy logic.

Index Terms: Neural Network,Fuzzy Logic, Anchor Nodes.

I. INTRODUCTION

Wireless sensor network is basically an interconnection of sensor nodes, it has an ability to senseand transmit data between node and sink. In WSN, node localization plays an important role in transferring the amount of data in a network. In a sensor node around the sink consumes relatively more energy and use up their energy first, this many to one WSN cause “energy hole problem”. It is due to the fact that that the sensor node must forward the relay traffic from the rest of the sensor nodes. Hence, how to effectively balance the consumption in a WSN and how to avoid an energy hole problem become an important issue. To this end, this paper introduces a Fuzzy logic based anchor node selection and localization. Localization scheme implemented in MATLAB 2013.MSACCESS 2007 be used for database connection with Matlab. The global positioning system (GPS) is a good, but expensive choice because is equipping all non-recyclable sensor nodes with GPS will cost heavily. To reduce the cost,

we tend to embed GPS in anchor nodes only and locate the other nodes by their estimated distances to the anchors. Popular artificial intelligent (AI) -based node localization approaches usually adopt renowned optimization techniques, such as neural networks (NNs) or particle swarm optimization (PSO), to enhance localization accuracy at a reasonable cost. The training of NN-based localization schemes can be offline or online. Among existing localization schemes, ‘Dana’ involves offline training, centralized localization calculation and received signal strength indication (RSSI) to estimate the inter-node distances but generates accumulated errors and low localization success rates in sparse topologies. The back propagation (‘BP’) scheme, which is also an offline training and centralized localization calculating approach, uses the estimated distances of hop counts (HCs) to train and produce a network model similar to that of the DV-hop but turns over large localization errors. The results show that, at reasonable cost, our new scheme constantly out performs others by yielding higher localization success rates and smaller localization errors.

II. RELATED WORK

To enhance both localization accuracy and localization success rates, a new neural network scheme is introduced by a author . The new scheme is distinct because it can make the trained network model completely relevant to the topology via online training and correlated topology-trained data and therefore attain more efficient application of the neural networks and more accurate inter-node distance estimation.the Received Signal Strength. Experimental evaluation is conducted to measure the performance of the proposed scheme and other artificial intelligence-based node localization schemes. The results show that, at reasonable cost, the new scheme constantly produces higher localization success rates and smaller localization errors than other schemes. This paper presents a new NN-based localization scheme to upgrade the performance of a WSN.

Using online training and correlated topology-trained data to make the trained network model completely relevant to the topology, our new scheme can achieve more efficient application of NNs and more accurate inter-node distance estimation. By employing both RSSI and HCs to estimate the inter-node distance, it is able to increase the distance estimation accuracy and localization accuracy at no additional cost. We can also estimate the distance by the HCs between the unknown node and an anchor node. The anchor node will first calculate its distance to the other anchors and get the average hop distance. The estimated distance between the anchor and the unknown node will be the average hop distance multiplied by the HC between the two nodes. Using HCs to estimate distances will cut down the cost, but accumulate more errors. This scheme works in a centralized sensor network where the sink will completely dominate the training of the model and the locating of unknown nodes. As the training data come from the complete topology which covers all situations, Narea × Narea training data are included.

In a random deployment, sensor nodes are scattered randomly in the sensing field. Hence, the coverage cannot be guaranteed. In contrast, the coverage of uniformly deployment is in general larger than the random deployment. However, the uniformly deployment strategy may cause the unbalanced traffic pattern in wireless sensor networks (WSNs). In this situation, larger load may be imposed to CHs (cluster heads) around the sink. Therefore, CHs close to the sink use up their energy earlier than those farther away from the sink.

To overcome this problem, we propose a novel node deployment strategy in the concentric model, namely, Region-based Intelligent Cluster-Head selection and node deployment strategy (called Rich). The coverage, energy consumption and data routing issues are well investigated and taken into consideration in the proposed Rich scheme. The simulation results show that the proposed Rich alleviates the unbalanced traffic pattern significantly, prolongs the network lifetime and achieves a satisfactory coverage ratio. A significant amount of research has studied the node deployment problem in terms of the network lifetime. The majority of the researches can be classified into the random deployment and the deterministic deployment. Random deployment is more applicable in many scenarios where the area of interest (AOI) is hostile, or the sensing area is enormous. Liu [9] addressed the deployment issue to prolong the network lifetime in a multihop WSN. Simulation results show that the proposed algorithm has an energy-efficient clustering and gradient-based routing algorithm. Maleki and Pedram [10] determined the densities of sensor nodes at the beginning. They also provide a continuous space model in the random deployment that can be used to provide the minimum required energy depletion. Xin et al. [11] first studied the biased energy consumption rate (BECR) phenomenon in a multihop WSN. They consider the joint problem of relay node deployment and transmission power control in order to prolong the network lifetime. Deterministic deployment can be applied in the conditions where the AOI is human accessible. The consumed energy for transmitting m data unit over a distance d is m × (Eelec + Eamp×dα), where else is the energy consumed in a sensor node for transmitting 1 bit of sense data, amp is the amplified energy (multi-path model), d indicates the transmission distance and α denotes the path loss exponent.

Generating fuzzy rules from training data is the most vital assignment in design of fuzzy classification system. In this paper, we present an approach to deal with the classification problem where fuzzy logic is used. We intend to show that fuzzy logic introduces new elements in the identification process, to manage imprecise information. A method to generate set of definitive fuzzy rules from initial training data is introduced. A triangular membership function is used for generating fuzzy rules from training data as they are simpler and more human understandable with high interpretability. Fuzzy rules are simply IF-THEN rules, used for knowledge representation with high interpretability. For a pattern classification problem, Fuzzy IF–THEN rules include two clauses viz. Antecedent and consequent. Antecedent clause includes conditions for the occurrence of the event; while consequent contain consequence of antecedent clause. For generating fuzzy rules we need to draw membership function for corresponding input data.

The length of membership function is obtained using the difference between maximum and minimum value of the attribute. Membership function recycled each input attribute to unit interval [0, 1] by using linear transformation that preserves the distribution of training patterns. Then, partitioning the pattern into fuzzy subspaces took place where each subspace is identified by a fuzzy rule. By assigning linguistic values of each input attribute we can do partitioning. Generally, triangular membership functions are used for this purpose, as they are simpler and more human understandable with high interpretability.

The fuzzy classification system is one of the important applications of fuzzy set theory [11]. We proposed a procedure for generating fuzzy rules from input dataset and then to construct a set of definitive rules that are generalizations of initial rules. Fuzzy rules are used for knowledge representation. Two methodologies to get hold of fuzzy rules for fuzzy classification systems. One is given directly by experts; and the other is produced through an automatic learning process. The main purpose of this paper is to obtain an automatic procedure able to get the structure of a fuzzy rule from a given input data set. Fuzzy rules generated must contain fewer components in the antecedent clause of the rule and identifying simultaneously the largest number of examples in given input data set.

III. SYSTEM ARCHITECHTURE

Initially the node be placed randomly, then the energy should be assigned, each node transfers their energy to the anchor nodes.Then the anchor nodes communicate with the sink. Then sink collects all the data from the anchor nodes. Fuzzy logic is used for selecting an another anchor node based on the rounds. Then the topology to be created and stored in the database with the help of the sink. In WSN the anchor node communicates with sink.

The above process to be carried out repeatedly on comparing with old topology to new topology.When a new node is detected, by using the location of the new node to the nearest anchor node. The distance between the sink and new nodes is estimated accurately.

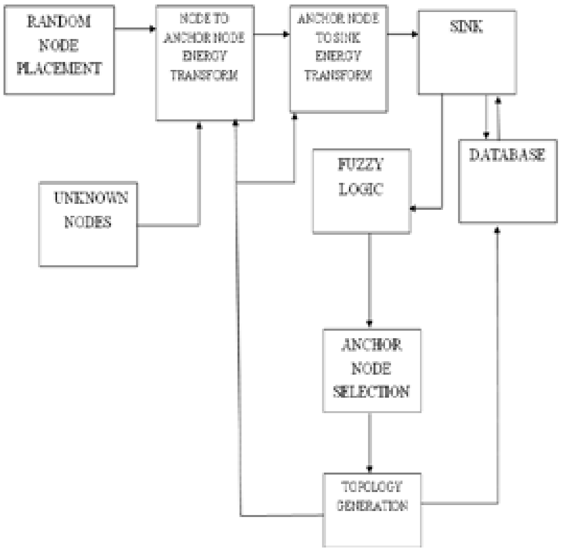

Fig3.1 Architecture diagram

IV. IMPLEMENTATION AND RESULTS

To implement the project the following assumptions are made with regard to the cloud computing, physical machine, virtual machine, resource management. The following section lists the implementation with the results.

4.1 Tool Descriptionmatlab

A wireless sensor network consists of spatially distributed autonomous sensors to cooperatively monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants. The development of wireless sensor networks was motivated by military applications such as battlefield surveillance. They are now used in many industrial and civilian application areas, including industrial process monitoring and control, machine health monitoring, environment and habitat monitoring, healthcare applications, home automation, and traffic control [1-2].

A smart sensor node is a combination of sensing, processing and communication technologies. The basic architectural components of a sensor node. The sensing unit senses the change of parameters, signal conditioning circuitry prepares the electrical signals to convert to the digital domain, the sensed analog signal is converted and is used as the input to the application algorithms or processing unit, the memory helps processing of tasks and the transceiver is used for communicating with other sensors or the base stations or sinks in WSN.

Sensors can monitor temperature, pressure, humidity, soil makeup, vehicular movement, noise levels, lighting conditions, the presence or absence of certain kinds of objects or substances, mechanical stress levels on attached objects, and other properties. Their mechanism may be seismic, magnetic, thermal, visual, infrared, acoustic, or radar. A smart sensor is also capable of self-identification and self-diagnosis. The mechanisms of smart sensors work in one of three ways: by a line of sight to the target (such as visual sensors), by proximity to target (such as seismic sensors), and by propagation like a wave with possible Simulating A Simple Wsn In Simulink MATLAB

V. MODULES

Implementation takes place by the means of the following modules

- Node Placement
- Anchor node selection
- Topology generation
- Node location in database
- New node placement
- Updated topology in the database
- Estimating the distance

5.1 Module 1: Node Placement

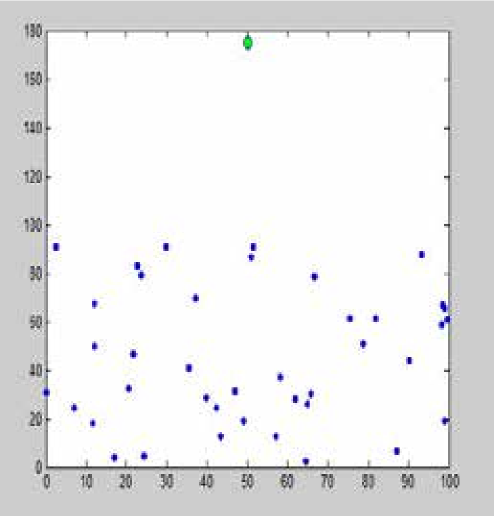

Fig 5.1 Node placement

Nodes are deployed randomly in the simulation environment. Totally fifty nodes are deployed for implementing the concept. Each node has individual initial energy. The energy is assigned initially Next data transfer between the sensor nodes and the anchor nodes, the sink be placed at the middle of the environment.

5.2 Module 2: Anchor Node Selection

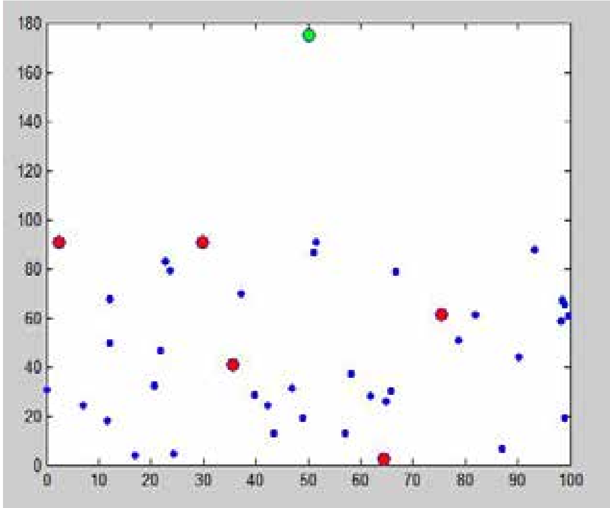

Fig 5.2 Flow modeling

Based on the node having higher energy is selected as the Anchor nodes after completing the rounds of Energy Transmission between the nodes. The Fuzzy logic is used for selecting an anchor node in the environment. Then the anchor nodes collects all the hop-counts and RSSI from the nearby nodes.The anchor nodes tabulate the location of the nodes based on the RSSI received from the nodes. Now the anchor node is ready to communicate with SINK.

5.3 Module3: Topology Generation

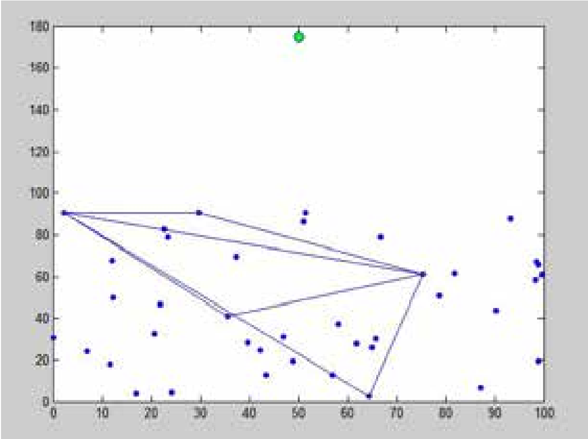

Fig 5.3 Topology Generation

The sink collects all the data from the Anchor nodes and place the co-ordinates in the region based on the signal strength and energy. Sinks connects the anchor nodes to form the topology.Then the location of the anchor nodes is stored in the database.Finally the topology is generated and stored in the database for future comparison.

5.4 Module 4: Node Location In Database

When the topology is stored in the database the location of the anchor node can be viewed in the database

VI. CONCLUSION

Using of the LEACH algorithm for energy efficient and using the fuzzy logic for anchor node selection reduces the localization error and increases the high success rates. The distance between the new node to sink is estimated accurately by the comparison of topology in the database. In future works a part of my work I completed the first four modules and as a part of my future work in phase II, I am going to implement that the location of the new node entered in topology and the accurate distance calculation from node to sink.

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IMAGE RETRIEVAL AND OBJECT CATEGORIZATION USING COLOR INTEREST POINT

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ABSTRACT

The main aim of this paper is to detect color interest points which is used for image matching. This paper deals with interest point detection from which local image descriptors are computed for image matching. In general, interest points are based on luminance & the use of color increases the distinctiveness of interest points. The use of color may therefore provide selective search reducing the total number of interest points used for image matching. This paper proposes color interest points for sparse image representation. Color statistics based on occurrence probability lead to color boosted points. For color boosted points, the aim is to exploit color statistics derived from the occurrence probability of colors. This way, color boosted points are obtained through saliency-based feature selection.

Keywords* : *Color Interest Point ,Color Invariance, Image Retrieval, Local Features, Object Categorization.

I. INTRODUCTION

Interest point detection is an important research area in the field of image processing and computer vision. In particular, image retrieval and object categorization heavily rely on interest point detection from which local image descriptors are computed for image and object matching [1]. The majority of interest point extraction algorithms are purely intensity based [2]-[4]. However, it was shown that the distinctiveness of color-based interest points is larger and therefore, color is important when matching images [5]. Furthermore, color plays an important role in the preattentive stage in which features are detected [6].

Salient points, also referred to as *interest points*, are important in current solutions to computer vision challenges. In general, the current trend is toward increasing the number of points [7], applying several detectors or combining them [8,9], or making the salient point distribution as dense as possible [10,11]. Therefore, computational methods are proposed to compute salient points, designed to allow a reduction in the number of salient points while maintaining state of the art performance in image retrieval . The ability to choose the most discriminative points in an image is gained through including color information in the salient point determination process.

Our aim is to exploit state-of-the-art object classification and to focus on the extraction of distinctive and robust interest points. In fact, the goal is to reduce the number of interest points extracted while still obtaining state-of-the-art image retrieval or object recognition results. Recent work has aimed to find distinctive features, i.e., by performing an evaluation of all features within the data set or per image [12]. Therefore, in this paper, we propose color interest points to obtain a sparse image representation. To reduce the sensitivity to imaging conditions, color boosted points are proposed. For color boosted points, the aim is to exploit color statistics derived from the occurrence probability of colors. This way, color boosted points are obtained through saliency-based feature selection.

II. SYSTEM STRUCTURE

2.1 Overall block diagram

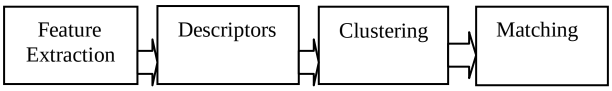

Fig. 1. Basic block diagram

Fig.1 shows system architecture. The whole systean be divided into four parts. The first part concerned with extraction of local features. **Feature extraction** is carried out with either global or local features. In general, global features lack robustness against occlusions and provide a fast and efficient way of image representation. Local features are either intensity- or color-based interest points. The second part represents **descriptors** which gives the local image information around the interest points. They can be categorized into three classes: They describe the distribution of certain local properties of the image [e.g., scale-invariant feature transform (SIFT)], spatial frequency (e.g., wavelets), or other differentials (e.g., local jets)[13]. For every feature extracted, a local descriptor is computed.

The third part is **Clustering** for signature generation, feature generalization or vocabulary estimation assigns the descriptors into a subset of categories. The result of image segmentation(clustering) is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Groups of pixels in each region are similar with respect to some characteristic or computed property, such as color, intensity or texture. Adjacent regions are significantly different with respect to the same characteristic(s).

The last part concerned with **Matching** summarizes the classification of images. Image descriptors are compared with previously learnt and stored models. Classification approaches need feature selection to discard irrelevant and redundant information [14]–[15]. The search for images similar to a query image'q' results in finding the 'k' nearestneighbors of 'q'. In the case of threshold-based matching, two regions are matched if the distance between their descriptors is below a threshold.

III. REATED WORK

First, 'interest points' are selected at distinctive locations in the image, such as corners, blobs, and T-junctions. The most valuable property of an interest point detector is its repeatability, i.e. whether it reliably finds the same interest points under different viewing conditions. Next, the neighbourhood of every interest point is represented by a feature vector. This descriptor has to be distinctive and, at the same time, robust to noise, detection errors, and geometric and photometric deformations. Finally, the descriptor vectors are matched between different images. The matching is often based on a distance between the vectors i.e SURF Algorithm

3.1 SURF (Speeded Up Robust Features) Algorithm:

It is composed of three consecutive steps

3.1.1Interest point detection

In the detection step, the *local maxima* of the *Hessian determinant* operator applied to the scale-space are computed to select interest point candidates. These candidates are then validated if the response is above a given threshold. Both scale and location of these candidates are then refined using an iterated procedure to fit a quadratic function. Typically, a few hundred interest points are detected in a digital image of 1 Mega-pixels.

3.1. 2 Interest point description

The purpose of the second step is to build a descriptor that is invariant to view-point changes of the local neighborhood of the point of interest. Recall that the location of this point in the scale-space provides invariance to scale and translation changes. To achieve rotation invariance, a dominant orientation is defined by considering the local gradient orientation distribution, estimated with Haar wavelets. Making use of a spatial localization grid, a 64-dimensional descriptor is then built, corresponding to a local histogram of the Haar wavelet responses.

3.1.3 Image matching

Finally, the third step matches the descriptors of both images. Exhaustive comparisons are performed here by computing vector distance between all potential matching pairs. Using the similarity metrics defined for color,the similarity distances between the query image and every image in the database are calculated and then are sorted in ascending order. The first *N* similar target images (with smallest distance value to the query) are retrieved and shown to the user, where *N* is the number of the retrieved images required by the user.

3.2 Object Categarization

We evaluate the color salient points on the dataset. This dataset contains many images of different object categories, e.g. rose, ball,bulb, car, chair, hibiscus and scooty. The data set is divided into a predefined train set and test set.

Over this data set, repeatable experiments have been defined. The experiments decompose automatic category recognition into a number of components, for which they provide a standard implementation. This provides an environment to analyze which components affect the performance most.

The average precision is taken as the performance metric for determining the accuracy of ranked category recognition results. The average precision is a single-valued measure that is proportional to the area under a precision-recall curve. This value is the average of the precision over all images judged to be relevant. Hence, it combines both precision and recall into a single performance value.

When performing experiments over multiple object and scene categories, the average precisions of the individual categories are aggregated. This aggregation, mean average precision, is calculated by taking the mean of the average precisions. As average precision depends on the number of correct object and scene categories present in the test set, the mean average precision depends on the data set used.

IV. RESULTS

Fig 1. Query Image

a) Image 1 b) Image 2 c) Image 3

Fig2. Images in data set

4.1 Color interest points between two images

Fig 3. Color interest points between Query Image & Image 1.

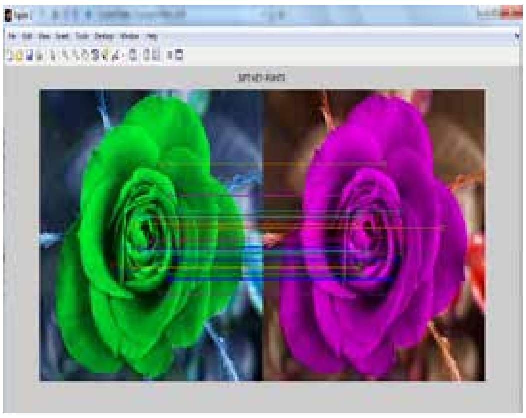

Fig 4. Color interest points between Query Image & Image 2.

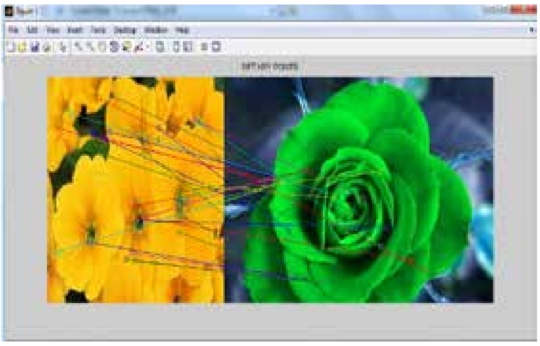

Fig 5. Color interest points between Query Image & Image 3.

4.2 Image Retrieval & Object Categarization

Fig 6 Matching Image & Object Categarization of Query Image & Image1

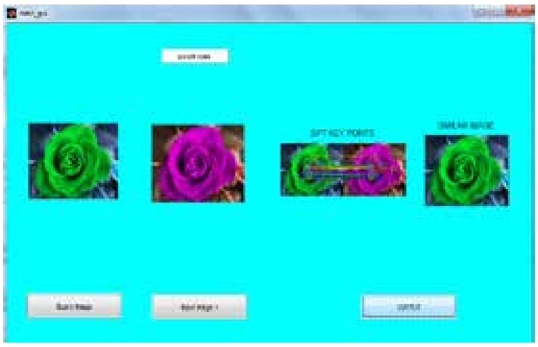

Fig 7 Matching Image & Object Categarization of Query Image & Image2

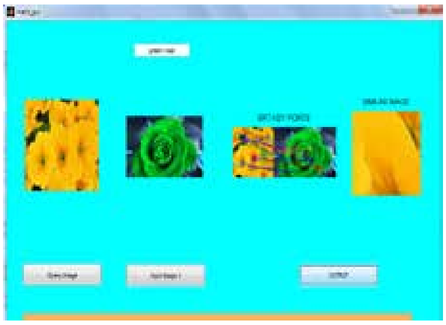

Fig 8 Matching Image & Object Categarization of Query Image & Image3

V. CONCLUSION

Computational methods have been introduced to allow the usage of fewer but more distinctive salient points for Image retrieval and Object categorization. These distinctive points are obtained by making use of color information. Extensive experimental results show that a sparser but equally informative representation, obtained by making use of color information, can be directly passed to current and successful image retrieval and object categorization frameworks, which then obtain state of the art results while processing significantly less data.

It has been shown that the proposed color interest point detector has higher repeatability than luminance-based one. Furthermore, a reduced number of color features increase the performance in image retrieval.Whereas object categorization using only a subset of the features used for matching, reducing the computing time considerably.

VI. ACKNOWLEDGEMENT

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A STUDY OF CRITICAL COMPARATIVE ANALYSIS OF ANCIENT INDIAN EDUCATION AND PRESENT EDUCATION SYSTEM

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ABSTRACT

This paper presents comparison between the present and the ancient education system. It highlights the basic structure of ancient education which contributed quality manpower imbibing moral, social and civic values to the society. The present education system is plagued by several reasons as a result of which the outcome is becoming self centric. This calls for several reforms in present education sector which can be implemented from ancient education for overall development of students as a human being. The quality of education greatly influences the quality of manpower for the societal benefits.

Keywords- Ancient Education, Ethical Education, Gurukul, Knowledge, Veda.

I. INTRODUCTION

Gurukul system of education existed during ancient times where students used to reside at guru's place and learn everything which can be later implemented to find solutions to real life problems [1]. An emotional bond between a guru and shishya was must before practicing teaching learning process. The guru imparted the knowledge of everything such as religion, sanskrit, scriptures, medicine, philosophy, literature, warfare, statecraft, astrology, history and many more. The learning was not only to read books but correlating it with the nature and life. It was not memorizing certain facts and figures and writing the answers in examinations [2]. The education was based on vedas, rules of sacrifice, grammar and derivation, understanding secrets of nature, logical reasoning, science and skills necessary for an occupation. The ancient education system in India had explicitly recognized that the supreme goal of life is self realization and hence it claimed to be unique in the world in several aspects like the society did not in any way interfered with the curriculum of studies or regulating the payment of fees or hours of instruction [3]. The other aim of ancient Indian education included preservation and enrichment of culture, character and personality development and cultivation of noble idea. It being completely residential hence student had to live in the guru's house and learn from him not only what was taught but also observe how his teacher responded in different situations arising in daily life and learn from it [4]. Education was absolutely free. Each student used to meet the teacher separately and learn from him through separate instructions and guidance. Even student aiming highest philosophical knowledge was duty bound to do some manual labour daily such as collecting fuel, tending cattle etc. The quality of education was unparalleled i.e. the students from all over the world had their first preference to India for higher education.

II. BASIS OF ANCIENT EDUCATION

2.1 Personality Development

The foremost aim of ancient education system was to develop the overall personality and character. The moral strengths were induced that helped the society to be together. This was because the education started and ended with religious rituals with the sense of whole heartedly devotion for the cause of learning. The formal and informal education were given due importance. The pursuit of knowledge was pursuit of religious values. The personality traits such as self esteem and self confidence were tried to inculcate in pupils through education.

2.2 Perfect Teaching Learning Atmosphere

The classes were held in either open space on the bank of a river or in a jungle in quiet, calm and peaceful environment. Temple colleges were known for all the amenities such as hostels, classrooms, laboratories and residential quarters for teachers.

2.3 Personal Attention to Every Student

The gurus were spiritual father. They used to nurse, feed and clothe. The students were taught based on his learning ability. Teachers never assumed themselves in the position of authority but were very gentle and sweet while dealing with the students. Teachers commanded full respect in society and honored even by kings.

2.4 Discipline

The gurukul contained students from rich to poor families. Every student used to lead a very simple life in ashrama. The discipline, rules and regulations were rooted in morality and religion. Any violation of rules was treated as a sin and subject to punishment.

2.5 Low Student Teacher Ratio

Due to low student teacher ratio, the individual attention could be given. The number of students on roll was limited. In the extreme situation, when it was not possible on the part of guru to impart learning, the assistance from senior pupils was taken. In the absence of guru, senior pupils played the role of gurus [6].

2.6 Free Education

The education was absolutely free. The pupils from well to do families such as princes used to pay Guru Dakshina. It had perfect autonomy. There was no involvement of external beneficiaries. Access to good education was independent of wealth but the emphasis was on the learnability. Shishyas were never compelled to offer a field, cow, horse or vegetables to his guru. Thus financial position was never a barrier to get the best education. It enhanced originality of thinking among them. The varna was based on karma. One could choose his profession and accordingly, his varna was determined

2.7 Development of Civic Responsibilities and Social Values

The inculcation of civic virtues and social values was equally important objective of education in India. The Brahmachari after his education in the gurukulas went back to the society to serve the rich and the poor, to relieve the diseased and the distressed. He was required to be hospitable to the guests and charitable to the needy. Everyone had a responsibility to preserve the national culture and act as a transmission medium to spread the knowledge.

2.8 Convocation Address

The duration of education was not uniform and used to last more than 12 years for slow learners. After receiving education, teacher used to give few pieces of advices for happy and smooth running of their life. The teacher used to make the students feel how to lead life of a grihastha, how to take care of society and nation and how to serve the humanity as a whole. This ceremony was known as samavartan.

III. NEED FOR CHANGE IN MODERN EDUCATION

The best practices of ancient education system can be implemented in modern education system. Though we feel proud of our civilization but we still believe in our culture, religion, god and desire less deeds. The aim of modern education is also building character, spiritualism and philosophy rather than wealth and leads a simple life. However, the cordial relationship between a teacher and student is missing due to numerous problems that educational environment has encountered. The study of Sanskrit language needs to be given due care to preserve it because it is enriched by the sense of peace, humanity, brotherhood. There has been a tremendous improvement in quality of life with the advances in technology. The young generation must realize how to use this technology for spreading knowledge and culture. The education should be imparted in peaceful, clean and natural environment far away from towns and villages. The Indian constitution has recently adopted the principle of equality in the field of education. The present education prepares the students for their future career as it used to be in ancient times. The vocational subjects have to be included in curriculum but much is needed to be done to achieve the desired aim. After independence, government stressed upon providing free education to all children up to age of 14 and many programmes have been started but the desired objective is yet to be achieved. In the race of completing the curriculum, the practical aspects are missed many a times. The modern education system is plagued and blamed for several reasons [4]. Rabindranath Tagore had assessed it long back that the Indian education system needs to change. We live in a society where child spends his parent's earnings and still not getting the standard education and struggling to get the desired employment. The increased competition in education sector sometimes crushes the creativity of millions of students and drives them to commit suicide. Education is treated as a means of achieving wealth. There is a need to redefine our education system. Some of the initiatives have been listed below.

3.1 Skill Based Education

The modern education system is tested on the basis of examinations conducted by boards and universities. The method of teaching is mostly one way but it has to be ensured "Are they learning?" If not, which method of teaching suits an individual has to be focused upon? This requires identification of skills in individual and moulds them into their direction of interest. It is same as "Give a man a fish and you feed him one day, teach him how to catch fishes and you feed him for a lifetime." Similarly, if you teach a skill, you enable him for a lifetime.

3.2 Encourage Research and Innovation

The testing and marking system needs to be built to recognize originality, creativity, problem solving approach and valuable original research and innovation. India lacks high quality research, weak ecosystem for research and low level of industry engagement.

3.3 Recruitment of Competent Teachers

Teaching is an honorable profession and hence it has to be preserved. Few teachers blame students for their performance but hardly introspect what and where is it going wrong? They feel it as a safe, well paid, low pressure and unaffected by recession. It is time to recruit competent and superstar teachers. The teaching community needs leaders, self motivated and entrepreneurs in teaching position.

3.4 Interactive Classroom

An interactive classroom intellectually engages the students as active participant with teacher as an engagement trigger that captures and maintain students' attention. The teacher allows the students to apply what they have learnt and give them a context for upcoming lecture material. The teacher feels enriched with students' participation and thinks upon the blend of interactive techniques for next class.

3.5 Time Management

The syllabus coverage is given the utmost importance in most of the schools and universities. This needs time bound completion of several academic activities. Lecturing is a time honored activity which can be effectively accomplished using Socratic lecture model to deliver large content within optimum time frame.

3.6 Teacher is not Devil's Advocate

"If you affirm it, I deny it. If you deny it, I affirm it." The teacher is not an opponent in an argument. The teacher plays more than a teachers' role such as friend, guide, philosopher, facilitator, guardian and role model. In fully residential schools/ universities, the teacher has many other roles to play. He asks questions not only to test the students but helps him/ her to arrive at meaningful answer [2].

3.7 Students' Participation

The teachers are encouraged not to teach the content but to teach the students how to learn. Because learning is a process of actively exploring information and validating with previously acquired knowledge and experience and creating new knowledge or re-evaluating existing knowledge. Socratic method substitutes self directed learning opportunities instead of classical lecturing practices.

3.8 Feed Students with Endless Content

Sometimes, deep questioning drives the thought underneath the surface of things force students to deal with complexity. The questions on interpretation help to examine and organize meaningful information while the questions on assumptions help to examine what is taken for granted. The questions on implications examine the orientation of discussion.

3.9 Provide Essential Tools

The conventional lecturing is very common teaching tool to use for all classroom situations. If on the other hand, if you have several tools in your toolbox, you will have the opportunity to pick up the most appropriate tool for the task at hand. The well crafted questions act as tool to generate a more sophisticated and self directed learning. The students are trained to become independent of the teacher, who models how to ask appropriate questions. An effective teacher gives students the tools requisite to formulate their own ideas and thoughts. Teachers are supposed to inspire their students, giving them academic wings.

3.10 Focus on Moral Education

A good teacher forms strong relationship with his/ her students and show that he/ she cares about students as individual. The substance of socratic enquiry is the belief and values the participants. The Professor is a participant in dialogue and is always open to learn something new and does not seek difference to his/ her authority.

3.11 Redefine the Purpose of Education

Our education system is still a colonial education system geared towards generating babus and pen-pushers under the newly acquired skin of modernity. We may have the most number of graduates in the world, but that certainly has not translated into much innovation here. Rather, we are busy running the call centers of rest of the world – that is where our graduate skills end. The goal of our new education system should be to create entrepreneurs, innovators, artists, scientists, thinkers and writers who can establish the foundation of knowledge based economy rather than the low-quality service provider nation that we are turning into [4].

3.12 Deregulation in Education Sector

Until today, an institute of higher education in India must be operating on a not-for profit basis. This is discouraging for entrepreneurs and innovators who could have worked in these spaces. On the other hand, many people are using education institutions to hide their black money, and often earning a hefty income from education business through clever structuring and therefore bypassing the rule with respect to not earning profit from recognized educational institutions. As a matter of fact, private equity companies have been investing in some education service provider companies which in turn provide services to not-for-profit educational institutions and earn enviable profits. Sometimes these institutes are so costly that they are outside the rich of most Indian students. There is an urgent need for effective de-regulation of Indian education sector so that there is infusion of sufficient capital and those who provide or create extraordinary educational products or services are adequately rewarded.

3.13 Personalized Education

Teaching is often considered to be delivering lectures for 60 minutes, perhaps ask few questions that are answered by few assertive students in the front rows. This kind of teaching enables the students to take notes in less time and more time testing their understanding of content. Such a teaching strategy does not guarantee that students learnt everything during lecture or learning at home. The teaching philosophy that may work in one situation may not work for all and therefore it is individual and site specific. If however, we can effectively decentralize education, and if the government did not obsessively control what would be the syllabus and what will be the method of instruction, there could be an explosion of new and innovative courses geared towards serving various niches of learners. Central regulation kills choice, and stifles innovations too. As far as education is concerned, availability of choices, de-regulation, profitability, entrepreneurship and emergence of niche courses are all inter-connected.

IV. CONCLUSION

The level of education is one of the major indicators of welfare, prosperity and security of people in any society. Education is a process by which individuals are equipped with the skills of everyday life. More than a mere system of imparting and acquiring knowledge, education is regarded as an attempt to transmit the cultural norms of the group to its younger members. Thus, it ensured the continuing of social traditions and customs. Education can be a powerful instrument for shaping and modernizing the society. It is a mechanism by which the quality of manpower is determined, which in turn, leads to qualitative transformations of society as a whole [8].

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PREDICTING RELATIVE RISK FOR DIABETESMELLITUS USING ASSOCIATION RULE SUMMARIZATION TECHNIQUES

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ABSTRACT

The detection of diabetes mellitus at the earlier stages is difficult in clinical management.In an existing system, apriori algorithm is used to find the item sets for association rules .But it is not efficient in finding item sets and it uses only four association rules. In this paper we aim to maintain a EMR (Electronic Medical Record) and apply association rule mining to discover sets of risk factors and their corresponding subpopulations. We reviewed four association rule summarization techniques and conducted comparative evaluation based on their advantages and disadvantages.These foursummarization methods having its fair strength but the BUS (Bottom Up Summarization) algorithm developed the best acceptable summary.

Index Terms: Data Mining, Association Rules, Survival Analysis, Association Rule Summarization Techniques

I INTRODUCTION

Diabetes mellitus, commonly referred to as diabetes is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period. It affects 25.8 million people in the U.S. Approximately 7 million of the people do not know they have the disease. Serious health complications such as stroke and may occur if not controlled properly. Diabetes is the major reason for heart diseases.

As of 2014, totally 387 million people have diabetes worldwide. This is equal to 8.3% of the adult population. In the years 2012 to 2014, diabetes is appraisal to have resulted in 1.5 to 4.9 million deaths per year. Diabetes doubles the risk of death. The number of people with diabetes is anticipated to rise to 592 million by 2035.

There are three main types of diabetes mellitus. Type 1 diabetes mellitus results from the body failure to produce enough insulin. Type 2 diabetes mellitus begins with insulin resistance, a condition in which cell fail to produce insulin properly. This may result in lack of insulin. The primary cause of this type of diabetes is excessive body weight and not enough exercise. Gestational diabetes is the third form of diabetes which occurs when pregnant women develop a high blood glucose level.

Association rules are implications that associate a set of potentially interacting conditions (e.g. high BMI and the presence of hypertension diagnosis) with elevated risk. The association rules is important in order to quantify the diabetes risks which also provide the physician with a "justification", namely the associated set of conditions. This set of conditions can be used to provide treatment towards a more personalized and targeted preventive care or diabetes management.

II EXISTING SYSTEM

In an existing system, the patient records are recorded manually. Because of this the full information of the patient cannot be obtained. This method is called as**Censoring.** If a patient drops out of the study, we may not know if hegets diabetes at the end of the study. The ability to use partial information is the key characteristics of survival analysis making it a mainstay technique in clinical research.

III PROPOSED ALGORITHM

The original rule set available in the Electronic Medical Record(EMR) are compressed using the four rule set summarization techniques namely APRX-COLLECTION, RPGlobal, TopK,BUS to predict the Relative Risk of Diabetics Mellitus of patients. The applicability and strength of the Association rule set summarization techniques have been proposed .But it cannot provide the exact results. The four summarization techniques enables the practitioners in choosing the most suitable one. Between TopK and BUS, we found that BUS retained slightly more redundancy than TopK,. Top K has better ability and patient coverage. Thus BUS has been made the best suited algorithm for these purposes.

IV ASSOCIATION RULE MINING

Association rule mining, one of the most important and well researched techniques of data mining. It aspires to extract interesting correlations, frequent patterns and associations among sets of items in the transaction databases. Let an item be a binary indicator signifying whether a patient possesses the corresponding risk factor. E.g. The item htn indicates whether the patient has been diagnosed with hypertension. Let X denote the item matrix, which is a binary covariate matrix with rows representing patients and the columns representing items. An item set is a set of items: it indicates whether the corresponding risk factors are all present in the patient. If they are, the patient is said to be covered by the item set (or the item set applies to a patient).An association rule is of form $I \rightarrow J$, where I and J are both item sets. The rule represents an implication that if J is likely to apply to a patient given that I apply. The item set I is the antecedent and J is the consequent of the rule. The strength and “significance” of the association is traditionally quantified through the support and confidence measures.

V DISTRIBUTIONAL ASSOCIATION RULE

A Distributional association rule is defined by an itemset I and is an implication that for a continuous outcome y, its distribution between the affected and the unaffected subpopulations is statistically significantly different. For example, the rule {htn, fibra} indicates that the patients both presenting hypertension (high blood pressure) and taking statins (cholesterol drugs) have a significantly higher chance of progression to diabetes than the patients who are either not hypertensive or do not have statins prescribed. The distributional association rules are characterized by the following statistics. For rule R, let OR denote the observed number of diabetes incidents in the subpopulation DR covered by R. Let ER denote the expected number of diabetes incidents in the subpopulation covered by R.

ER = OR −i∈DRyi,.

Whereyi is the martingale residual for patient i.

The relative risk of a set of risk factors that define R is RR =OR/ER.

Input: Set *I* of item sets, number *k* of summary rules

Output: Set *A* of item sets, s.t.*A* minimizes the criterion *L*

Generate an extended set *E* of item sets based on *I*

A = $

while|*A*| <*k* **do**

A = argmin*E*∈*E L(E)*

Add *A* to *A*

Remove the effect of *A*

end while

VI METHOD

Many of these rules are slight variants of each other leading to the obfuscation of the clinical patterns underlying the ruleset. One remedy to this problem, which constitutes the main focus of this work, is to summarize the ruleset into a smaller set that is easier to overview. We first review the existing rule set and database summarization methods, then propose a generic framework that these methods fit into and finally, we extend these methods so that they can take a continuous outcome variable.

6.1 Rule Set and Database Summarization

The goal of rule set summarization is to represent a set I of rules with a smaller set A of rules such that I can be recovered from A with minimal loss of information. Since a rule is defined by a single itemset, we will use itemset‟ in place of „rule‟ meaning the „itemset that defines the rule‟.

VII SUMMARIZATION TECHNIQUES AND SUMMARIZED RULE SET

Summarization is a key data mining concept which involves techniques for finding a compact description of a dataset. Simple summarization methods such as tabulating the mean and standard deviations are often applied for analysis of data, visualization of data and automated report generation.Four summarization techniques are used. we present the rule sets generated by the extended summarization algorithms. For each one algorithm, it provided the best suitable outcome because we used the parameter settings. For APRXCOLLECTION, we used $\alpha = .1$, $\lambda = 1$; for RPGlobal, we used $\delta = .5$, $\sigma = .2$, $\lambda = .98$; for Top-K, we used $\lambda = .2$; and for BUS, we used $\lambda= 1$. Note that λ notably varies from 1 single for Top-K, which previously takes the risk of diabetes into relation in the usual loss condition.

VIII SUMMARIZARTION TECHNIQUES

8.1 APRX-Collection

The APRX-COLLECTION algorithm finds supersets of the conditions (risk factors) in the rule such that most subsets of the summary rule will be valid rules in the original (unsummarized) set and these subset rules imply similar risk of diabetes.

Rule Set Summarized by APPRX-COLLECTION Described by the Number r of Original Rules Covered, Relative Risk of the Subpopulations Covered RR, the Expected E_R and Observed O_R of Diabetes Incidents in the Covered Subpopulation

r	RR	E_R	O_R	Rule
1	1.96	36.24	71	*fibra*
20	1.34	271.71	363	bmi trigl *acearb statin aspirin* **htn**
15	1.31	348.92	457	bmi trigl *statin aspirin* **ihd**
16	1.19	426.78	506	hdl trigl *acearb aspirin* **htn**
20	1.35	273.00	368	bmi sbp trigl *acearb diuret* **htn**
16	1.35	417.38	562	bmi trigl *bb diuret* **htn**
11	1.18	761.13	895	bmi trigl *acearb statin*
11	1.02	797.64	813	hdl trigl *diuret aspirin*
11	1.25	550.12	688	bmi *acearb* **htn ihd**
10	1.23	534.58	660	bmi sbp *ccb* **htn**

8.2 RP Global

APRX-COLLECTION has some major limitations such as redundancy and intensity of risk. The RP Global mainly uses the rule expression. It also has two main drawbacks such as taking the exposure of patients into relation and creating summary from rules.

Top 10 Rules of the Summarized Rule Set Created by RPGlobal in Terms of Relative Risk RR, Expected E_R and Observed O_R Counts of Diabetes Incidents

RR	E_R	O_R	Rule
1.32	38	51	*acearb bb statin aspirin* **htn ihd**
1.69	32	55	bmi trigl *acearb diuret* **htn**
1.52	35	54	bmi *bb statin aspirin* **ihd**
1.93	35	68	trigl *acearb statin aspirin* **htn**
1.23	52	65	*acearb bb diuret aspirin* **htn**
1.29	42	55	sbp tchol *acearb diuret* **htn**
2.20	25	57	hdl trigl *acearb aspirin* **htn**
2.10	25	54	hdl trigl *diuret aspirin* **htn**
1.86	34	65	bmi *acearb statin aspirin* **htn**
1.28	42	54	bmi tchol hdl trigl **tobacco**

8.3 TOP-K

The Redundancy-Aware Top K (TopK) algorithm further reduces the redundancy in the rule set which was possible throughoperating on patients rather than the expressions of the rules. TopK still achieves high compression rate.

Top 10 Summarized Rule Created by the Top-K Algorithm

RR	E_R	O_R	Rule
2.40	21.70	52	*fibra* **htn**
2.34	24.33	57	bmi trigl *acearb statin* **htn**
2.06	25.78	53	bmi sbp *ccb* **htn**
2.10	25.74	54	hdl trigl *diuret aspirin* **htn**
1.58	37.97	60	bmi hdl **ihd**
1.47	45.52	67	sbp **htn tobacco**
1.71	43.28	74	bmi sbp trigl *aspirin*
1.46	317.03	464	bmi **htn**
1.35	36.93	50	tchol *acearb bb diuret* **htn**
1.62	32.16	52	sbp tchol trigl *statin* **htn**

8.4 BUS

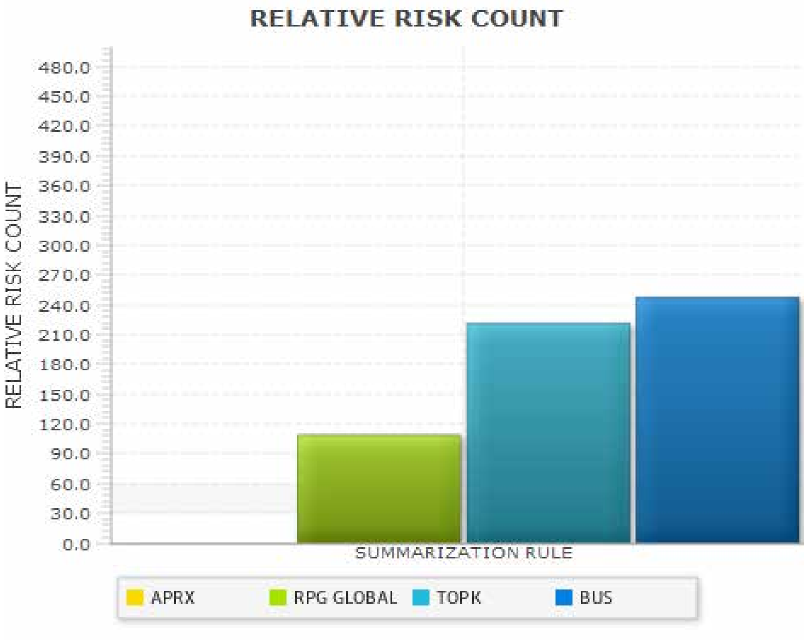
BUS (as opposed to TopK) operates on the patients and not on the rules. Therefore, redundancy in terms of rule expression can occur. However, BUS explicitly controls the redundancy in the patient space through the parameter mandating the minimum number of new (previously uncovered) cases (patients with diabetes incident) that need to be covered by each rule. Thus the reduced variability in the rule expression does not translate into increased redundancy.

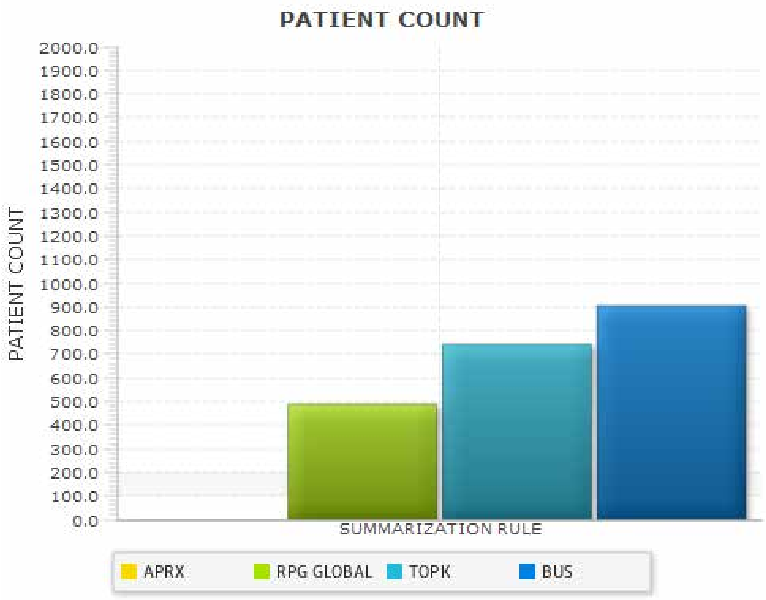
Top 10 Summarized Rule Created by BUS

RR	E_R	O_R	Rule
2.40	21	52	*fibra* **htn**
2.34	24	57	bmi trigl *acearb statin* **htn**
2.15	29	64	bmi trigl *aspirin* **ihd**
2.10	25	54	hdl trigl *diuret aspirin* **htn**
1.91	56	107	bmi trigl *statin* **htn**
2.00	47	94	bmi hdl *aspirin* **htn**
1.63	55	91	bmi *statin* **ihd**
1.54	78	121	bmi trigl **tobacco**
1.36	48	66	*bb diuret statin aspirin* **htn**
1.37	39	54	dbp *diuret* **htn**

IX RESULTS

Our proposed technique aims to predict the risk of diabetes mellitus. In this we use four association rule summarization techniques such as APRX-COLLECTION, RP Global, Top K and BUS. All these techniques have its own strength but BUS algorithm is the most efficient one.





X CONCLUSION

Association rule mining to identify sets of risk factors and the corresponding patient subpopulations that are at significantly increased risk of progressing to diabetes. An excessive number of associationrules were discovered impeding the clinical interpretation results. For this method, the number of rules is used for clinical interpretation is make feasible.

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A REVIEW ON ENERGY OPTIMIZATION RELAY SELECTION SCHEME FOR WIRELESS SENSOR NETWORKS

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ABSTRACT

Author considered a wireless sensor network (WSN) with identically distributed nodes, and a two phase cooperative protocol where the source transmits and is overheard by multiple relays which in turn transmit to the destination or fusion center (FC). The Author introduces a selection scheme that will pick a subset of the relays that overhear the message and transmit to the FC. This scheme will aim at making the least number of relays active while minimizing the outage probability and sending the least amount of information enough to reconstruct the message at the FC. The reduced amount of information being transmitted through the network along with an even distribution of active relays leads to a more energy efficient system. The use of cooperative diversity, where neighboring stations may act as relay nodes to transfer the source data to the desired destination node through an independent relay channel, has shown to provide diversity gain and consequently improve the achievable bit rate. The network performance under the proposed settings is modeled using continuous Markov chains. The steady-state transmission blocking probability and the average network throughput are obtained by analyzing the derived Markov model. Author's scheme first selects the best relay from a set of available relays and then uses this "best" relay for cooperation between the source and the destination. The outage probabilities of selection relaying protocols are analyzed and compared for cooperative wireless networks. These multiple relay selection schemes require the same amount of feedback bits from the receiver as single relay selection schemes.

Keywords: Wireless Sensor Network (WSN), Burst Erasure Channel (Buec), Cooperative Communications, Channel State Information (CSI), Fusion Center (FC), Sensors (Relays), Outage Probability, Expected Number Of Bits, Transition Probability.

I. INTRODUCTION

Nowadays wireless sensor networks (WSNs) are widely used in many applications. They are employed in field trials and performance monitoring of solar panels, in target detection through digital cameras, and even in the petrochemical industry field. The main challenge for WSNs is the energy constraint on the network, the sensors are powered by batteries and replacing these batteries is extremely difficult if not impossible in most cases. Much research is conducted on low power dissipation communication protocols that can improve the network throughput and lifetime while achieving minimum symbol error at the destination (e.g., [16]) In [3]-[11] relay selection protocols are introduced that pick a single relay to transmit to the destination. In [3] the selection is based on geographical information; in [4] amplify-and-forward (AF) coded cooperative system is proposed and investigated under relay selection. In [6], [7] a "best" relay is chosen based on the source-relay and relay-destination channels where both source and relay transmit without any power consideration. In [8], [9], [10], [12] a best relay is again chosen to transmit along with the source but transmission power is divided between the two in a way that optimizes transmission performance. Having a single node to relay the message saves on bandwidth and energy but the tradeoff comes at the expense of the symbol error rate at the destination. It is shown in [11] that multiple relay selection schemes perform much better than their corresponding single relay selection schemes. The question then arises how many relays should transmit and how to select them considering the energy constraints on the sensors. A variety of schemes have been introduced based on different perspectives [13]-[24]; some take advantage of the static topology of the network, others attempt to maximize the signal-to-noise ratio (SNR) and some use amplify-and-forward to send the data. In [14], a source coding technique is proposed to compress the source information using incremental compression using turbo coding technique to ensure lossless compression. Different from [14], the authors in [15] proposed a new signal processing scheme referred to as decode-compress-and-forward where turbo coding is applied at both source and relay nodes. In [15], coding is used to correct errors in transmissions and plays an important role in relay selection. In this paper, we introduce a relay selection scheme that saves on energy and at the same time guarantees message delivery to the destination based on the channel state information (CSI) provided by the relays to the fusion center (FC). Author shows that selecting a subset of two relays that have the complete source message will offer the best result considering power consumption and complexity at the receiver. In section II, we provide a description of the network model, the motivation behind our work and proposed relay selection scheme. In section III, author analyse the performance of the proposed relay selection schemes in-terms of the outage probability and the expected number of bits transmitted for subsets of any number of relays. Author’s follow up in section IV by presenting simulation results along with the analytical ones. In section V, author present results for a more realistic channel model and show that they are comparable to the results under his earlier assumptions for the network model. Author concludes with some final remarks and potential for future work in section VI. In cooperative networks, a node at any given time can act as a sender, destination or relay depending on the network traffic and topology. Neighboring stations to the transmitter and/or receiver can act as relay nodes to transfer the source data to the desired destination node through an independent relay channel, that is, independent from the source–destination channel [6]. The function of the relay node can be as simple as to amplify and forward the received source data or to decode and regenerate an estimate of this data. Wireless sensor networks (WSNs) consist of a large amount of sensor nodes deployed over a certain wide area, where the sensor nodes are required to be low-cost and low-power devices for long lifetime requirements. One very challenging task in WSNs due to the limited resources is to develop efficient and scalable protocols meeting the demands for different network functions, such as transmission, routing, and scheduling protocols. Employing multiple relays may substantially provide high-order cooperative diversity, but it leads to more waste of bandwidth while increasing difficulty in time and carrier synchronization among nodes. To avoid these drawbacks, many recent studies focus on the issue of relay selection [4], i.e., choosing the best relay among the available relays when it has the best channel condition. The authors suggested the relay is the one closest to the destination, depending on its geographic position. Relay selection technique is recognized as a promising solution to realize the benefits of multiple-relay cooperation with a low implementation complexity. Sensor networks play a major role in many aspects of society including home automation, consumer electronics, military application [1, 2], agriculture, environmental monitoring, health monitoring and geophysical measurement. Usually sensor devices are small and inexpensive, so they can be produced and deployed in large numbers. Their resources of energy, memory, computational speed and bandwidth are severely constrained [5]. Therefore, it is important to design sensor networks aiming to maximize their life expectancy.

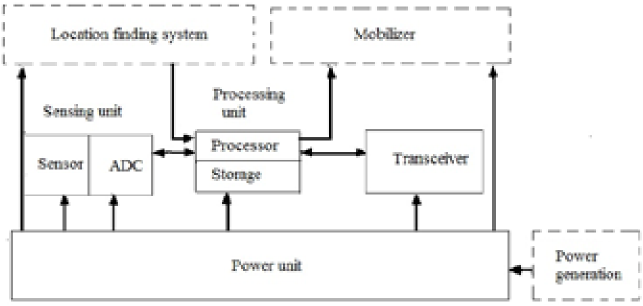

Fig.1 The Components of A Sensor Node.

II. NETWORK MODEL AND PROPOSED SCHEME

The Author considers a two phase wireless sensor network with no direct source-destination link, and communication can only be done through aid of relays. The source broadcasts its message on the channel and the relays overhear a noisy version of the message. Upon receiving the message, the relays encode their channel state information (CSI) by a run length code then transmit to the destination. Figure 2 show a network model with i relays overhearing the message transmission from the source.

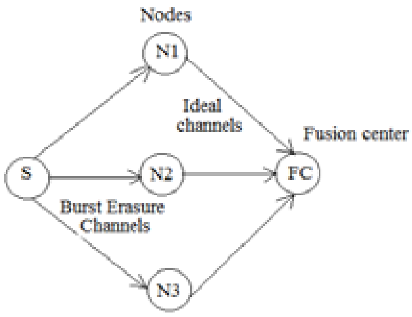

Fig. 2 Network Model with 3 Overhearing Relay

Based on the selection scheme being used, the fusion center selects the relays that will transmit and send feedback bits to the network that will dictate whether each relay will transmit or not. The channels between the source and the relays are modeled as independent burst erasure channels (BuEC) shown in Figure 2. The author assumes that the channels between the relays and the fusion center are ideal.

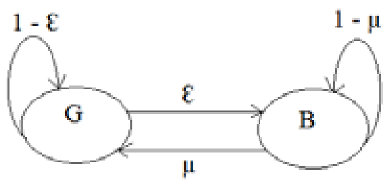

Fig. 3 Burst Erasure Channel Model

The simplest model for wireless fading channels is the two state Gilbert-Elliott model. In this model, there exists a good channel state, for which the channel SNR is large, and a bad channel state, for which the SNR is low. The Gillbert Elliot channel model is a simple model for fading channels; It has a good state when the signal-to-noise ratio (SNR) in the channel is very high and a bad state when the SNR is very low. Let the probability of going from good state (G) to bad state (B) be Ɛ and the probability of going from bad state to good state be μ. The BuEC is a special case of this model where we assume that the SNR is high in good state and therefore the bit is always received correctly and low in bad state therefore the bit is flagged as erasure. Upon receiving the CSI from the relays, the FC will have the task of selecting a subset of these relays to transmit. Here we introduce a general selection scheme that the FC can use to determine which of these relays will be active and give a specific example to illustrate the results. We define the outage probability as the probability that none of the subsets of relays/sensors in the network has enough information to reconstruct the message error free at the fusion center. In this case, we assume that the FC checks whether the aggregate information of all sensors is sufficient to decode the message. If this is the case, the FC prompts all sensors to transmit together. Authors also define the expected number of bits transmitted as the number of bits transmitted by all active sensors. The sensors (relays) in the WSN that send their CSI to the FC are divided into subsets of x relays; for example if six relays overhear the transmission and x = 2, one can group relays 1-2, relays 3-4 and relays 5-6; if x = 3 (subsets with three relays), author can group relays 1-2-3 and 4-5-6. The FC selects the subset that has enough information to reconstruct the message and has the least number of bits to transmit. If no subset is able to provide all the information necessary to reconstruct the message, then all relays transmit. Consider the network model in which relay selection is applied in the cluster-based cooperative wireless sensor network. The transmission procedures that a sensor transmits its data to the fusion center can be described as follows: First, a sensor shares the data to its cluster head. Next, the cluster head selects an optimum cooperating sensor within its cluster to collaboratively transmit the data to the neighboring cluster head. Finally, the cluster-based multihop transmission is completed by concatenating this single-hop scheme, and the fusion center is the final destination. A simplified cooperative communication model is one with a source, a relay and a destination. Various cooperative protocols proposed in [2]–[5] consist of two phases. In Phase 1, the source broadcasts its information received by both the destination and the relay. Then, in Phase 2, the relay simply forwards the received signal to the destination. We consider a single-relay scenario, consisting of three nodes; source (S), relay (R) and destination (D). Assume that the source intends to transmit a message consisting of *K* binary unbiased i.i.d. bits to the destination, with possible collaboration from the relay. For this, the source encodes the message by a turbo code, punctures a defined number of parity bits to achieve a target code rate, and starts broadcasting the generated codeword. Authors assume here that the turbo code consists of two parallel concatenated convolutional codes, separated by a code interleaver.

III. RELAY SELECTION SCHEMES

Relay selection schemes conserve energy and increase the lifetime of the network and reducing the amount of data being transmitted from the sensor nodes. Relay selection scheme aims at minimizing the outage probability and reducing the number of bits transmitted from the sensor nodes. Upon receiving the channel state information (CSI) from the nodes, the fusion center (FC) will have the task of selecting a subset of these nodes to transmit. Author introduced three selection schemes that the FC can use to determine which of these nodes will be active.
Author defines the outage probability that none of the subsets of sensors in the network has enough information to reconstruct the message error free at the FC. In this case, the FC checks whether the aggregate information of all sensors is sufficient to decode the message and if yes then FC prompts all the nodes to transmit.Author defines expected number of bits transmitted as the number of bits transmitted by all the active sensors.

Scheme 1: Fixed pairs

The nodes that send their CSI to the FC are divided into clusters of two. For example, if 6 nodes are there, they can be grouped as nodes 1-2, nodes 3-4, and nodes 5-6. The FC selects the cluster that has enough information to reconstruct the message and has the least amount of bits to transmit. If no cluster is able to provide all the information necessary to reconstruct the message then all nodes transmit. In a network with six nodes, they can be grouped as nodes 1-2-3 and 4-5-6.

Scheme 2: All pair combinations

In this scheme, the FC looks at all pair combinations of nodes. The FC again selects the pair with the least amount of bits to send but enough to reconstruct the message at the destination. As in the previous scheme if no pair has the necessary information to reconstruct the message at the FC, then all nodes will transmit.

Scheme 3: Singles, pairs or triplets

The FC in this scheme looks first for nodes that have received the entire message error free. If one is found then it will be selected by the FC to transmit. If none are found then the FC looks for any pair of sensors to transmit (scheme 2). If no pairs are found the FC looks for any cluster of three nodes that has the full information to send. Again if no single node, pair or triplet of nodes has the full message to deliver to the FC then all nodes transmit.

IV. ANALYTICAL RESULTS

4.1 Outage Probability

Outage probability is defined as the probability that none of the subsets of relays/sensors in the network has enough information to reconstruct the message error free at the fusion center. In this case, author assumes that the FC checks whether the aggregate information of all sensors is sufficient to decode the message. If this is the case, the FC prompts all sensors to transmit together.

The marginal probability of being in good and bad states assuming that we are in steady state is:

$$\begin{aligned}
P_G &= p\left(G \to G \mid G\right) \times P_G + p\left(B \to G \mid B\right) \times P_B \\
&= p\left(G \to G \mid G\right) \times P_G + p\left(B \to G \mid B\right) \times \left(1 - P_G\right) \\
&= \frac{p\left(B \to G \mid B\right)}{1 + p\left(B \to G \mid G\right) - p\left(G \to G \mid G\right)} \\
&= \frac{\mu}{1+\mu-(1-\nu)} \\
&= \frac{\mu}{\nu+\mu}
\end{aligned}$$

$$\begin{aligned}
P_B &= 1 - P_B \\
&= 1 - \frac{\mu}{\nu+\mu} \\
&= \frac{\nu}{\nu+\mu}
\end{aligned}$$

$$P_G + P_B = 1$$

Given the channels are independent, one can now easily find the probability of the states that describe two source-node channels

$$\begin{aligned}
P_{GG} &= P_G \times P_G = \frac{\mu^2}{(\nu+\mu)^2} \\
P_{GB} &= P_G \times P_B = \frac{\mu\nu}{(\nu+\mu)^2} \\
P_{BG} &= P_B \times P_G = \frac{\nu\mu}{(\nu+\mu)^2} \\
P_{BB} &= P_B \times P_B = \frac{\nu^2}{(\nu+\mu)^2}
\end{aligned}$$

Assuming uncoded communication between source and relays, if the state with all bits in error is visited at least once then the subset will not have enough aggregate information to reconstruct the entire message. Given this, we define a new state OUT which is an absorbing state that when entered cannot be left; we go to state OUT once we enter the state with all x bits in error for the first time (for fixed pairs it is once state BB is visited). Figure 4b shows the new state diagram for x = 2. To calculate the outage probability we first find the transition matrix Q of the state diagram shown in Figure 4b. Note that element Q_{ij} represents the transition probability from state i to state j. Table 1 shows the states and their corresponding labels for fixed pairs where x = 2 and the number of states is $2^x = 4$.

Table1: State Labeling For Transition Matrix.

Label	State
1	GGG
2	GGB
3	GBG
4	GBB
5	BGG
6	BGB
7	BBG
8	BBB(OUT)

4.2 Clusters with 3 Or More Nodes

In this section author present some guidelines on how to evaluate the outage probability and expected number of transmitted bits for the proposed relay selection scheme in cases with three or more nodes. Author illustrate it by presenting the results for clusters of $x = 3$ nodes.

Author start by forming a state diagram of the Markov process that jointly describes channel realizations for x independent source-node channels. The state diagram will have 2^x states (author will have 8 states for $x = 3$). As defined earlier "G" is an error free bit and "B" is a bit received as erasure. If the state with all the bits as erasure is visited at least once then the cluster will not have enough aggregate information to reconstruct the whole message. We enter the absorbing state "Out" when all x bits are received as erasure at once for the first time (for $x = 3$ it is once state "BBB" is visited).

The transition matrix Q for clusters with x nodes will have $2^x \times 2^x$ dimensions (for $x = 3$, Q will be an 8×8 matrix). Element Q_{ij} represents the transition probability from state i to state j. Below is the transition matrix for $x = 3$.

$$Q = \begin{bmatrix}
(1-\epsilon)^3 & \epsilon(1-\epsilon)^2 & \epsilon(1-\epsilon)^2 & \epsilon(1-\epsilon)^2 & \epsilon^2(1-\epsilon) & \epsilon^2(1-\epsilon) & \epsilon^2(1-\epsilon) & \epsilon^3 \\
\mu(1-\epsilon)^2 & (1-\mu)(1-\epsilon)^2 & \epsilon\mu(1-\epsilon) & \epsilon\mu(1-\epsilon) & \epsilon(1-\epsilon)(1-\mu) & \epsilon(1-\epsilon)(1-\mu) & \mu\epsilon^2 & (1-\mu)\epsilon^2 \\
\mu(1-\epsilon)^2 & \epsilon\mu(1-\epsilon) & (1-\mu)(1-\epsilon)^2 & \epsilon\mu(1-\epsilon) & \epsilon(1-\epsilon)(1-\mu) & \mu\epsilon^2 & \epsilon(1-\epsilon)(1-\mu) & (1-\mu)\epsilon^2 \\
\mu(1-\epsilon)^2 & \epsilon\mu(1-\epsilon) & \epsilon\mu(1-\epsilon) & (1-\mu)(1-\epsilon)^2 & \mu\epsilon^2 & \epsilon(1-\epsilon)(1-\mu) & \epsilon(1-\epsilon)(1-\mu) & (1-\mu)\epsilon^2 \\
(1-\epsilon)\mu^2 & \mu(1-\epsilon)(1-\mu) & \mu(1-\epsilon)(1-\mu) & \epsilon\mu^2 & (1-\epsilon)(1-\mu)^2 & \epsilon\mu(1-\mu) & \epsilon\mu(1-\mu) & \epsilon(1-\mu)^2 \\
(1-\epsilon)\mu^2 & \mu(1-\epsilon)(1-\mu) & \epsilon\mu^2 & \mu(1-\epsilon)(1-\mu) & \epsilon\mu(1-\mu) & (1-\epsilon)(1-\mu)^2 & \epsilon\mu(1-\mu) & \epsilon(1-\mu)^2 \\
(1-\epsilon)\mu^2 & \epsilon\mu^2 & \mu(1-\epsilon)(1-\mu) & \mu(1-\epsilon)(1-\mu) & \epsilon\mu(1-\mu) & \epsilon\mu(1-\mu) & (1-\epsilon)(1-\mu)^2 & \epsilon(1-\mu)^2 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 1
\end{bmatrix}.$$

The outage probability for a given message size K, is the probability that we end up in state "Out" after K transitions

$$P_{out}(K,x) = \left(AQ^{k}\right)_{2^x}$$

where *A* in (3.11) is the vector of marginal state probabilities with dimensions $1{\times}2^x$. And Q^k is the matrix of transition probabilities after *k* transitions (It is proven that element *ij* of $Q^k$is the probability that we end up in state j after k transitions).by Multiplying Q^k by the initial probabilities for each state *A* gives the probability that we reach any of the states after k transitions. The $(2^x)^{th}$ element of AQ^k gives the probability that we reach state "Out" after *k* transitions which is why we added the subscript 2^x to $(AQ^k)_{2^x}$. For the case of $x = 3$ nodes per cluster we have$P_{out}(k, 3) = (AQ^k)_8$. Where *A* is the vector of marginal state probabilities, derived the same way we did for pairs from (3.1) and (3.2).

$$A = \left[\begin{array}{cccccccc} \frac{\mu^3}{(\epsilon+\mu)^3} & \frac{\epsilon\mu^2}{(\epsilon+\mu)^3} & \frac{\epsilon\mu^2}{(\epsilon+\mu)^3} & \frac{\epsilon\mu^2}{(\epsilon+\mu)^3} & \frac{\mu\epsilon^2}{(\epsilon+\mu)^3} & \frac{\mu\epsilon^2}{(\epsilon+\mu)^3} & \frac{\mu\epsilon^2}{(\epsilon+\mu)^3} & \frac{\epsilon^3}{(\epsilon+\mu)^3} \end{array} \right]$$

The 3 in $P_{Out}(k, 2)$ indicates that this is the outage probability for a cluster of 3 nodes. The outage probability for a network with *n* clusters will be $(P_{Out}(k, x))^n$. Using (3.12) Author calculate the outage probability for $x = 3$ nodes per cluster. We run simulations where 6 nodes overhear a message of size $K = 10000$ bits and for bursterasure channel parameters $\epsilon = 5 \times 10^{-4}$ and vary μ. We compare the results to those from the clusters with 2 nodes (Figure 3.11).

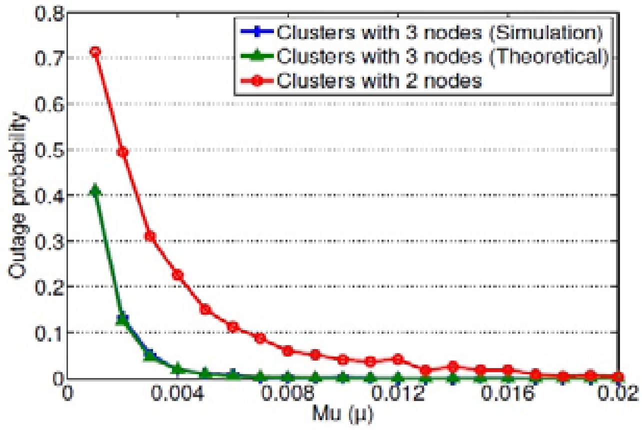

Figure 3.11: Simulation Vs Theoretical Outage Probability

Author can see from Figure 3.11 that the simulation and theoretical results match. Author also notice that the outage probability for clusters with 3 nodes is lower than that of clusters with 2 nodes. The total outage probability for a network with *n* clusters and *x* nodes per cluster ($x \times n$ total nodes) is $(P_{Out}(k, x))^n$. The marginal probability of being in the good state (receiving an error free bit) is $\frac{\mu}{\mu \times \varepsilon}$ (3.1). Hence the expected number of bits received correctly through each burst erasure channel is $\frac{\mu}{\mu ' \varepsilon} ' K$

Therefore we can write that for a cluster of *x* nodes

$$E(B_C) = \frac{x\mu}{\mu + \varepsilon} K$$

where *E* (*Bc*) is the expected number of bits received correctly by a single cluster. The total expected number of bits transmitted by the nodes is given by

$$E(B) = (1 - P^n_{out}(K, x))\, E(B_c) + P^n_{out}(K, x) \times nE(B_c)\,. \qquad (3.14)$$

For the case of $x = 3$ nodes and $n = 2$ clusters, we have

$$E(B_C) = \frac{3\mu}{\mu + \varepsilon} K$$

and

$$E(B) = \left(1 - P_{out}^{2}(K,3)\right) E(B_c) + P_{out}^{2}(K,3) \times 2E(B_c), \qquad (3.16)$$

where the first term is the probability that at least one of the clusters is not in outage multiplied by the expected number of bits transmitted by a cluster. And the second term in (3.16) is the probability that all clusters are in outage multiplied by theexpected number of bits when all nodes transmit (all n clusters).

Author consider the same configuration as before, 6 nodes and x = 3 nodes per cluster (n = 2 clusters) that overhear a message of size K = 10000 bits. We consider burst erasure channel parameters $\epsilon = 5 \times 10^{-4}$ and vary μ. We have shown in the previous subsection how to calculate P_{Out} (k, 3) from (3.12). Using (3.15) and (3.16), Author cannow calculate the expected number of bits transmitted by all nodes. We compare the results to those Author obtained from the simulations and to the results from the clusters with 2 nodes (Figure 3.12). Author also show the average number of active nodes per transmission for clusters with 2 and 3 nodes (Figure 3.13).

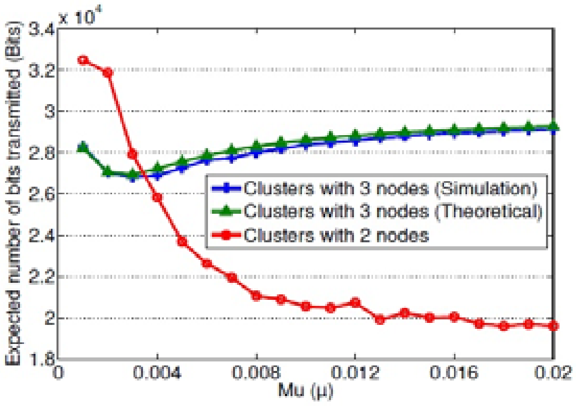

Figure 3.12: Simulation Vs Theoretical Expected Number of Bits Transmitted.

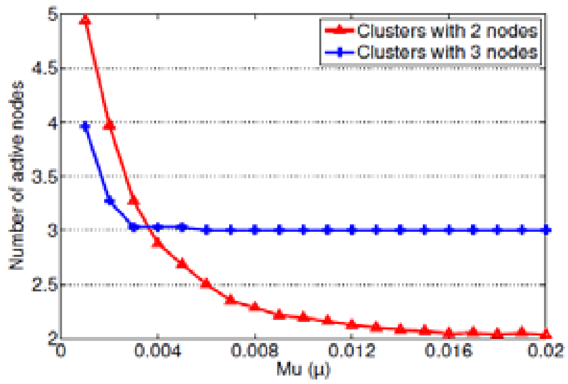

Figure 3.13: Node Activity For Clusters With 2 and 3 Nodes.

Again we can see that the theoretical and simulation results in Figure 3.12 coincide. We also notice from Figures 3.12 and 3.13 that for bad channels (smaller values of μ) the number of bits transmitted and the number of active nodes is higher in theclusters with 2 nodes than in the clusters of 3. For better channels (larger values of μ) the clusters with 3 nodes transmit more bits and more nodes are active. We can extrapolate by saying that for good channels smaller clusters of nodes will have enough information to send the full message. Therefore we will have less active nodes and less bits transmitted compared to larger clusters of nodes. On the other hand, for poor channels the smaller clusters will have a higher outage probability and more often than not all the nodes will have to be active. Larger clusters will have a larger likelihood of having the entire message to relay hence the smaller outage probability and expected number of bits transmitted for poor channels.

4.3 Expected Number of Bits Transmitted

- Since we are sending a message with K bits, the expected number of bits received correctly through each burst erasure channel is

$$\frac{\mu}{\mu \times \varepsilon} \times K$$

- So we can write for a subset of x relays,

$$E\left(B_S\right) = \frac{x\mu}{\mu + \varepsilon} K$$

Where E (B_s) is the expected number of bits received correctly per subset.

- The total expected number of bits transmitted by the relays is given by:

$$E(B) = \left[1 - P_{out}^{n}(K, x)\right] E(B_s) + P_{out}^{n}(K, x) \times n\,E(B_s)$$

For x=2 we get;

$$E(B_i) = \frac{2\mu}{\mu + \varepsilon} K \quad \text{……………………………………………………......................} \quad (2)$$

$$E(B) = \left[1 - P_{out}^{n}(K, 2)\right] E(B_s) + P_{out}^{n}(K, 2) \times n\,E(B_s) \quad \text{…………………………….} \quad (3)$$

The first term is the probability that at least one of the subsets is not in outage multiplied by the expected number of bits transmitted by a subset. The second term is the probability that all subsets are in outage multiplied by the expected number of bits when all relays transmit (all n subsets). Author consider the same configuration as before, 6 relays and x = 2 relays per subset (n = 3 subsets) that overhear a message of block length K = 10000 bits and burst erasure channel parameters $\varepsilon = 5 \times 10^{-4}$ and varying μ. Using (2) and (3) we can calculate the expected number of bits transmitted by all relays. The energy (E) consumed by a sensor for transmitting a message is a linear function of the size of the message

E = m × size + b,

Where b is a constant dependent on device state and channel acquisition overhead, and m × size is an incremental component proportional to the size of the message. For large messages, b is negligible and we can assume that the energy consumed by a sensor to relay a message is directly proportional to the size of the message. When a relay is not transmitting it is idle and its power consumption is negligible.

Table: Analytical values for Fig. 3.11

S No.	Cluster	Mu (μ)	Outage probability
1	Clusters with 3 nodes (simulation)	0.001	0.40
		0.002	0.13
		0.004	0.20
		0.020	0.00
2	Cluster with 3 nodes (theoretical)	0.001	0.41
		0.002	0.13
		0.004	0.02
		0.020	0.00
3	Cluster with 2 nodes	0.001	0.71
		0.002	0.50
		0.004	0.22
		0.008	0.08
		0.012	0.05
		0.016	0.02
		0.020	0.00

Table: Analytical Values for Fig3.12

S No.	Cluster	Mu (µ)	Expected number of bits transmitted
1	Clusters with 3 nodes (simulation)	0.001	2.82×10^4
		0.002	2.70×10^4
		0.004	2.76×10^4
		0.008	2.80×10^4
		0.012	2.86×10^4
		0.016	2.90×10^4
		0.020	2.94×10^4
2	Cluster with 3 nodes (theoretical)	0.001	2.84×10^4
		0.002	2.70×10^4
		0.004	2.74×10^4
		0.008	2.83×10^4
		0.012	2.89×10^4
		0.016	2.90×10^4
		0.020	2.93×10^4
3	Cluster with 2 nodes	0.001	3.26×10^4
		0.002	3.20×10^4
		0.004	2.60×10^4
		0.008	2.10×10^4
		0.012	2.09×10^4
		0.016	2.00×10^4
		0.02	1.98×10^4

V. CONCLUSION

Author introduced three selection schemes that aim at decreasing the number of active nodes in a wireless sensor network and send less information through the network while maintaining a certain level of performance. Author saw how the reduced number of bits transmitted leads to energy saving for the sensor nodes in the network. Author also showed that even without the initial assumptions of perfect node-FC channels author is still able to gain a significant improvement on the lifetime of the sensors when using his proposed schemes. From the above data author analyse that Scheme 3 (Singles, pairs or Triplets) is the best for relay selections because outage probability is minimum for different values of Mu (µ) and that is we want and the outage probability for all schemes should decrease as the source node channel quality becomes better. So the author analyse that Scheme 3 (Singles, pairs or Triplets) is the best for relay selections because expected number of bits transmitted is minimum for different values of Mu (µ) and that is we want. We expect that expected number of bits transmitted for all schemes should decrease as the source node channel quality becomes better.

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HIGH SPEED AND INDEPENDENT CARRY CHAIN CARRY LOOK AHEAD ADDER (CLA) IMPLEMENTATION USING CADENCE-EDA

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ABSTRACT

In this paper focuses on carry -look ahead adders have done research on the design of high-speed, low-area, or low-power adders. Addition is the fundamental operation for any VLSI processors or digital signal processing. The main objective of this paper is to reduce the propagation delay and gate count of the Carry look-Ahead Adder (CLA).Which will also reflect in the reduction of area and power of the adder module. Experimental results reveal that the proposed adders achieve delay, power and area reductions for Multi bit addition. We know that in adder circuits propagation delay is the main drawback. To overcome this drawback the independent carry technique is introduced. Here in this paper 4, 8, 16-bit adders are been designed and the gate count, power and delay are measured using CADENCE EDA, and then compared with the conventional adder.

Index Terms: Carry look-ahead (CLA) adder, VLSI, CADENCE EDA.

I. INTRODUCTION

Addition is the most commonly used arithmetic operation and also the speed-limiting element to make faster VLSI processors. As the demand for higher performance processors grows, there is a continuing need to improve the performanceof arithmetic units and to increase their functionality. High-speed adder architectures include the carry look-ahead (CLA) adders, carry-skip adders, carry-select adders, Conditional sum adders and combinations of these High-speed adders based on the CLA principle remain dominant, since the carry delay can be improved by calculating each stage in parallel.

The CLA algorithm was first introduced in 1958, and several variants have been developed. The Manchester carry chain (MCC) is the most common dynamic (domino) CLA adder architecture with a regular, fast, and simple structure adequate for implementation in VLSI. The recursive properties of the carries in MCC have enabled the development of multioutput domino gates, which have shown area–speed improvements with respect to single-output gates.

In this brief, the carry will be generated independently without the use of previous carries. In previous work of this paper the carry chain has been split into even and odd carry chains. The even and odd carries of this adder are computed in parallel by two independent 4-bit carry chains. And in this paper the delay for 4 and 8-bit will be higher when compared to the conventional adder but for 16-bit and more than that delay will be reduced drastically.

This paper is organized as follows. In Section II, preliminary concepts of the double carry chain MCC adders are given. In Section III, the proposed independent carry adder is presented. In Section IV, comparisons among the proposed design and conventional MCC topologies in the open literature are given. Finally, in Section V, the conclusions are drawn.

II.PRELIMINARY CONCEPTS OF DOUBLE CARRY CHAIN MCC ADDERS

MCC adders can efficiently be designed in CMOS logic. As mentioned previously, due to technological constraints, the length of their carry chains is limited to 4 bits. However, these4-bit adder blocks are used extensively in the literature [2] and 12] in the design of wider adders.

In the following, we propose the design of an 8-bit adder module which is composed of two independent carry chains. These chains have the same length (measured as the maximum number of series-connected transistors) as the 4-bit MCCadders. According to our simulation results, the use of the proposed 8-bit adder as the basic block, instead of the 4-bitMCC adder, can lead to high-speed adder implementations.

The derived here carry equations are similar to those for the Ling carries proposed in [4]. The derived carry equationsallow the even carries to be computed separately of the oddones. This separation allows the implementation of the carriesby two independent 4-bit carry chains; one chain computes theeven carries, while the other chain computes the odd carries. Inthe following, the design of the proposed 8-bit MCC adder isanalytically presented.

2.1. Even Carry Computation

For $i = 0$ and $z0 = t0$, from relation (1), we get that $c0 = g0 + t0 \cdot c{-1}$. Since the relation $gi= gi \cdot ti$holds, we get that $c0 = t0 \cdot (g0 + c{-1}) = t0 \cdot h0$, where $h0 = g0 + c{-1}$ is the new carry. From relation (2), for $i = 2$ and $zi= pi$, we get that

$c2 = g2 + p2g1 + p2p1g0 + p2p1p0c{-1}$.

Since $gi+ pi \cdot gi{-1} = gi+ ti \cdot gi{-1}$ and $pi = pi \cdot ti$, we have

$c2 =t2(g2 + g1 + p2p1g0 + p2p1p0c{-1}) =t2 (g2 + g1 + p2p1t0(g0 + c{-1})) = t2 \cdot h2$

where

$h2 = g2 + g1 + p2p1t0(g0 + c{-1})$ is the new carry.

In the same way, the new carries for $i = 4, 6$ are computed as

$h4 =g4 + g3 + p4p3t2 (g2 + g1 + p2p1t0(g0 + c{-1}))$

$h6 =g6 + g5 + p6p5t4 \times (g4 + g3 + p4p3t2 (g2 + g1 + p2p1t0(g0 + c{-1})))$.

Then, the following equations are derived for the new

carries for even values of *i*:

$h2 = G2 + P2G0$

$h4 = G4 + P4G2 + P4P2G0$

$h6 = G6 + P6G4 + P6P4G2 + P6P4P2G0$

2.2. Odd Carry Computation

The new carries for the odd values of i are computed according to the aforementioned methodology proposed for the even carries as follows:

h1 =g1 + g0 + p1p0c−1

h3 =g3 + g2 + p3p2t1 (g1 + g0 + p1p0c−1)

h5 =g5+g4+p5p4t3 (g3 + g2 + p3p2t1 (g1 + g0+p1p0c−1))

h7 =g7 + g6 + p7p6t4

× (g5 + g4 + p5p4t3

×(g3 + g2 + p3p2t1(g1 + g0 + p1p0c−1))) .

While for odd values of *i*, the equations for the new carries are rewritten as follows:

$h1 = G1 + P1c-1$

$h3 = G3 + P3G1 + P3P1c-1$

$h5 = G5 + P5G3 + P5P3G1 + P5P3P1c-1$

$h7 = G7 + P7G5 + P7P5G3 + P7P5P3G1 + P7P5P3P1c-1.$

From the aforementioned equations, it is evident that the groups of even and odd new carries can be computed in parallel by different carry chains in multioutput domino CMOS logic. The new generate and propagate signals *Gi*and *Pi* can be easily proven to be mutually exclusive, avoiding false node discharges. Between the new and the conventional carries, $ci-1 = ti-1 \cdot hi-1$ holds; therefore, the sum bits are computed as $si = pi \oplus (ti-1 \cdot hi-1)$. According to [4], the computation of the sum bits can be performed as follows:

$si = hi-1 \cdot pi + hi-1 \cdot (pi \oplus ti-1)$

for$i>0$, while $s0 = p0 \oplus c-1$.

The above Relation can be implemented using a 2 → 1 multiplexer that selects either *pi* or $pi \oplus ti-1$ according to the value of *hi*−1. Taking into account that an XOR gate introduces equal delay with a 2 → 1 multiplexer and both terms *pi* and $pi \oplus ti-1$ are computed faster than *hi*, then no extra delay is introduced by the use of the proposed carries for the computation of the sum
bits according to above equation.

For the implementation of the sum signals, the domino chain is terminated, and static CMOS technology is used for the $pi \oplus ti-1$ gate and the final 2 → 1 multiplexer. An efficient static CMOS implementation of the 2→1 multiplexer is used for Sum bit implementation.

2.3. MCC Design Issues

To evaluate the speed performance of the proposed (PROP) design over the conventional (CONV) one, 8-, 16-, 32-, and 64-bit adders have been designed according to the even and odd carry chain principle respectively, and simulated using SPECTRE in a standard 90-nm CMOS technology (*V*DD = 1 V). The conventional 8-, 16-, 32-, and 64-bit MCC adders are designed by cascading two, four, eight, and sixteen 4-bit MCC adder modules, respectively. The proposed 16-, 32-, and 64-bit MCC adders are designed by cascading two, four, and eight of the proposed 8-bit MCC adder modules, respectively.

III. PROPOSED WORK

In this work i have proposed the new independent carry technique which will not require the previous carry bit to generate the current carry. While it will generate all the carry bits parallel. The proposed Carry Equations for 4-bit are

- C(0) = e(0) AND p(0);
- C(1) = (e(1) AND p(1) ORp(1) AND g(0) or k(1);
- C(2) =(e(2) AND p(2)OR p(2) AND g(1)) or k(2);
- C(3) = (e(3) AND p(3) ORp(3) AND g(2) or k(3);

INTERMEDIATE TERMS

- e(i) = a(i) XNOR b(i);
- k(i) = p(i) and …….. p(0);

PROPAGATE AND GENERATE TERMS

- p(i) = a(i) OR b(i);
- g(i) = a(i) AND b(i);

SUM BIT IMPLEMENTATION

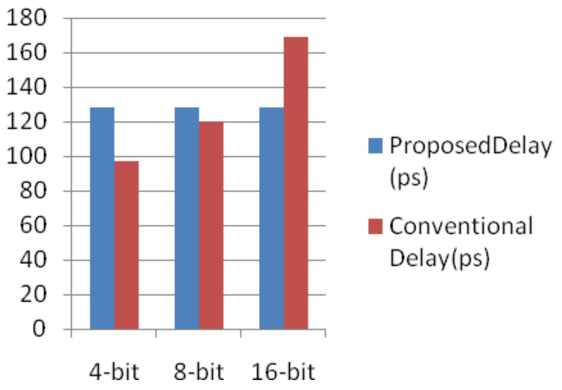
- S(i)= a(i) xor b(i) xor c(i-1);

IV. RESULTS AND COMPARISION.

TABLE I

CLA PARAMETRIC COMPARISION

	Proposed			Conventional		
n-bit	**Delay (ps)**	**Power (nW)**	**Area (μm^2)**	**Delay (ps)**	**Power (nW)**	**Area (μm^2)**
4-bit	128.25	540.47	32	97.3	663.41	38
8-bit	128.25	1125.4	64	120.21	1533.2	77
16-bit	128.25	2635.1	144	168.57	3765.5	175



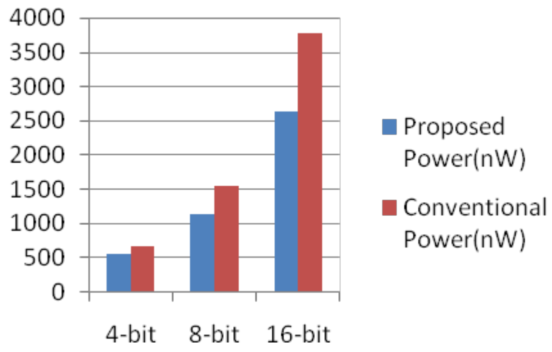


FIGURE 1(a). Delay Comparison ChartFIGURE 1(b). Power Comparison Chart

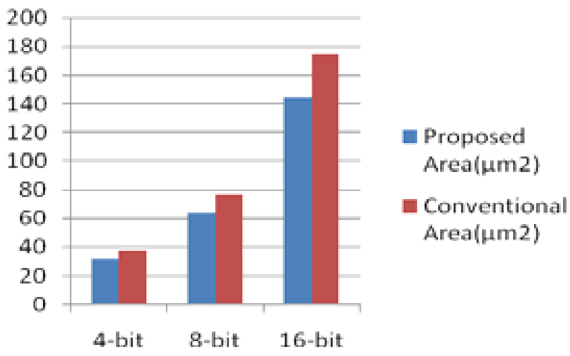


FIGURE 1(c). Area Comparison Chart

TABLE II

Percentage Comparison of Proposed and Conventional Adder Parameters

n-bit	Delay(%)	Power(%)	Area(%)
4-bit	-32.8	18.5	15.78
8-bit	-6.68	26.59	16.88
16-bit	23.91	30.01	17.71

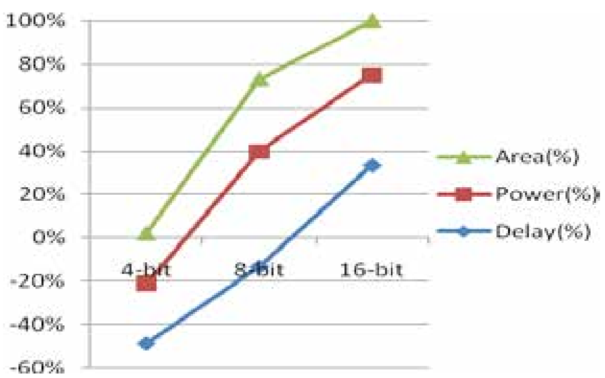


FIGURE 2. Percentage Improvement of Proposed Technique Over Conventional

V. CONCLUSION

The Independent Carry technique is an efficient approach to construct Fast CLA adders. In this work, I have presented a new independent carry technique, which does not need to wait for the previous carry to be calculated. In this way the delay has been reduced for the higher bit addition. Here the small drawback is the delay reduction will be efficient for 16-bit and larger than 16-bit additionand for some combinations of input carry will not propagate properly. And the proposed work will also reduce area and power of the adder.

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ACOUSTIC ECHO CANCELLATION BY SINGLE AND DOUBLE TALK CASE IN TODAY'S TELECOMMUNICATION SYSTEM

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ABSTRACT

In this paper we, present a new approach to acoustic echo cancellation for single and double talk case for a teleconferencing system. This approach is general but by using it we can differentiate new approach with conventional approach in the terms of the computational complexity and convergence rate, so this is suitable candidate for real world application.

Keywords: Acoustic Echo Cancellation, Adaptive Filtering, Double Talk Detection, White Gaussian Noise, Loudspeaker.

I. INTRODUCTION

Acoustic echo cancellation is one of the most popular applications of adaptive filter [1]. The role of the adaptive filter is to identify the acoustic echo path between the terminals loudspeaker and microphone.
Even though many interesting adaptive filtering algorithm have been developed and are applicable for acoustic echo cancellation [2], an application with limited precision and processing power, the least means-square (NLMS) algorithm [3] (e.g., frequency domain or subband versions [1]) are usually applied.
The standard least means square (LMS) algorithm is considered to be one of the simplest algorithms for adaptive filtering, but it is sensitive to the scaling of its input when choosing a step-size parameter to guarantee stability [2],[3].

The NLMS algorithms solve this problem by normalizing with the power of the input. For both algorithms, the parameter of step-size governs the convergence speed and the steady-state excess mean-square error. To better tradeoff the conflicting requirement of fast convergence rate and low misadjustment, various schemes for adjusting the step-size have been reported [4], [5], [6], [7],. To meet these conflicting requirements, the step size needs to be controlled. Thus, a number of variable step size NLMS (VSS-NLMS) algorithms have been proposed [8], [9] and references therein. In [5], elaborated and distribution free VSS-NLMS (DFVSS-NLMS) is proposed. This algorithm is gives the good performance in the context of acoustic echo cancelation [AEC].

(a) BASIC CONCEPTS OF ECHO CANCELLATION In acoustic echo cancelation, the estimates of the near-end echo path response is computed which is used to generate an estimate of echo. The estimate of echo is subtracted from the near-end microphone output to subtract the actual echo.

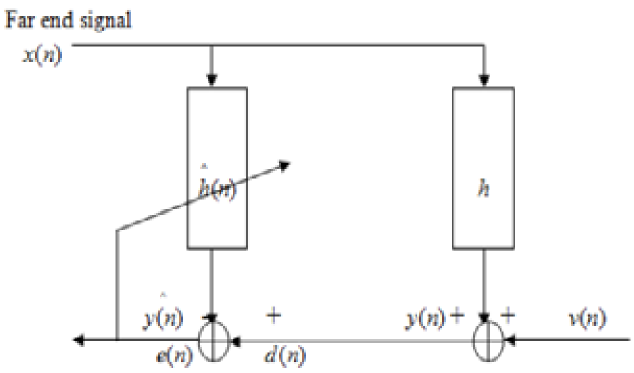


Fig1. Block Diagram of the Echo Canceller

Where,

x (n) Far-end signal

v (n) Near-end signal

d(n) Echo or desired signal

The problem then reduces to similar to the room echo path response h by an impulse response $\hat{h}(n)$ of the adaptive filter. So that feeding a same input to the adaptive filter the estimate of actual echo, $\hat{y}(n)$ is obtained. The use of adaptive filter in the echo cancellation is necessary because the path of echo's are highly time varying, so that the use of fixed filter is not suitable.

II BASIC PROBLEM

In hand free telephony, the objective is to permit two or more people, sitting in two different rooms, two converge with each other. In simple configuration, there are two separate rooms one is far end room and another is near end room. Each room contains a microphone and a loudspeaker pair which is used by one speaker to converge with other..

The far-end signal broadcast to the near end signal x(n) is broadcast to the near end room. The near end room has a microphone which is for the use of near end speaker but this

near end speaker also receives a delayed and distorted version of the far end signal x(n) as an echo d(n) due to the room.

System Identification

System identification refers to the ability of an adaptive system to find the FIR filter that best reproduces the response of another system, whose frequency response is apriori unknown. System identification is mostly used in divergence application, setup is given below Fig2.

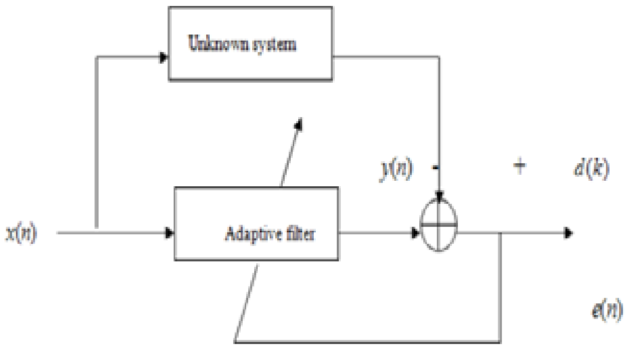


Fig2. System Identification

The FIR filter reproduces the behavior of the 'unknown system'. This works perfectly when the system to be identified has got a frequency response that matches with that of a certain FIR filter.

But if the unknown system is an all-pole filter, then the FIR filter will try its best. It will never be able to give zero output but it may reduce it by converging to an optimum weights vector. The frequency response of the FIR filter will not be exactly equal to that of the 'unknown system' but it will certainly be the best approximation to it.

Let us consider that the unknown filter is a time invariant, which indicate that the coefficient of the impulse response are constant and of finite extent (FIR). Therefore,

$$d(n) = \sum_{k=0}^{N-1} h_k x(n-k)$$

The output of the adaptive filter with the same number of the coefficient N, is given by,

$$y(n) = \sum_{k=0}^{N-1} w_k x(n-k)$$

These two systems to be equal, the difference between e(n) = d(n) - y(n) must be equal to zero. Under these conditions, the two set of the coefficients are also equal. It is the method of adaptive filtering that will enable us to produce an error, e(n) approximately equal to zero and therefore will identify that. $w_k \approx h_k$.

III DESCRIPTION OF PROPOSED ALGORITHM

Acoustic echo cancellation is one of the most popular application of adaptive filter [1]. The role of the adaptive filter is to identify the acoustic echo path between the terminals loudspeaker and microphone.

Even though many interesting adaptive filtering algorithm have been developed and are applicable for acoustic echo cancellation [2], an application with limited precision and processing power, the least means-square (NLMS) algorithm [3] (e.g., frequency domain or subband versions [1]) are usually applied.

Setup shown in fig 3. The main purpose of this setup is that the near end speech signal $v(t)$ is to be picked up by the microphone M and propagated to the far-end room while far-end speech is to be emitted by the loudspeaker L in to the near – end room. During single talk, which are the cases only when the far-end or speech signal present means $v(t) = 0$.

$$y(t) = h^{T} x(t) + w(t) \qquad (1)$$

During doubletalk, which is the case when both near-end and far-end speech is present, the near-end speech in the microphone signal $y(t)$ is corrupted by the echo of the far-end speech signal $x(t)$ that is propagated in the near-end room from the loudspeaker L to the microphone M .

Therefore, during doubletalk, the resulting microphone signal $y(t)$ consists of near-end speech mixed with far-end speech

filtered by the near-end room impulse response h from the loudspeaker to the microphone

$$y(t) = h^{T} x(t) + v(t) + w(t) \qquad (2)$$

Where n is the order of the room impulse response modeled as FIR filter.

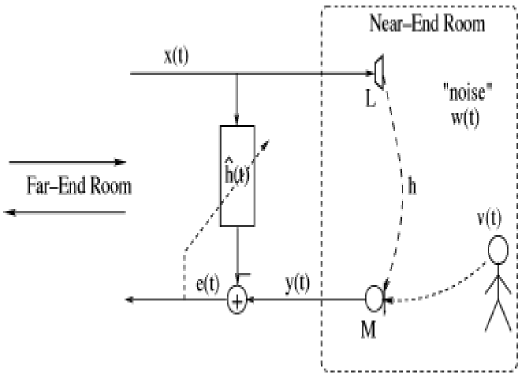


Fig.3. AEC setup

$$h = [h_0 h_1 .... h_{n-1}]^{T} \qquad (3)$$

The room impulse response is varying with time since movements (e.g., people moving around) may occur in the room. Thus, usually in order to remove the undesired echo an adaptive filter estimate $\hat{h}(t)$ of h is used to predict the far-end speech contribution $h^{T} x(t)$ and subtract it from the microphone signal $y(t)$. Thereby, we get the error signal,

$$e(t) = y(t) - \hat{h}^{T}(t) x(t)$$

$$e(t) = v(t) + h^{T} x(t) - \hat{h}^{T}(t) x(t) + w(t) \quad (4)$$

$E\{.\}$ is mathematical expectation and $\sigma_v^2 = E\{v^2(n)\}$ is the power of system noise. Using approximation $x^{T}(n) x(n) = L\sigma_x^2 = LE\{x^2(n)\}$, for $L \gg 1$, where σ_x^2 is power of input signal and we also known that $\mu(n)$ is deterministic nature.

$$E\left\{\varepsilon^2(n)\right\} = \left[1-\mu(n)L\sigma_x^2\right]\sigma_e^2(n) = \sigma_v^2$$

where $E\left\{\varepsilon^2(n)\right\} = E\left\{e^2(n)\right\}$ is power of error signal from (33) obtained a quadratic equation,

$$\mu^2(n) - \frac{2}{L\sigma_x^2}\mu(n) + \frac{1}{(L\sigma_x^2)^2}\left[1-\frac{\sigma_v^2}{\sigma_e^2(n)}\right] = 0$$

The step size parameter of a proposed nonparametric VSS-NLMS algorithm is given by:

$$\mu_{NPVSS}(n) = \frac{1}{x^T(n)x(n)}\left[1-\frac{\sigma_v}{\sigma_e(n)}\right] = \mu_{NLMS}(n)\alpha(n)$$

Where $\alpha(n)$ is normalized step size, range is given $0 \le \alpha(n) \le 1$. The NPVSS-NLMS algorithm is,

$$\hat{h}(n) = \hat{h}(n-1) + \mu_{NPVSS}(n)x(n)e(n)$$

We conclude that if $\sigma_e(n) \gg \sigma_v$ then the $\mu_{NPVSS}(n) \approx \mu_{NLMS}(n)$. When the algorithm starts to converge to true value, $\sigma_e(n) \approx \sigma_v$ and $\mu_{NPVSS}(n) \approx 0$. This exactly what we desired to have good convergence and low misadjustment.

NPVSS-NLMS algorithm written in terms of misalignment,

$$m(n) = m(n-1) - \mu_{NPVSS}(n)x(n)e(n)$$

It is understandable that $\sigma_e(n) \ge \sigma_v \mu_{NPVSS}(n)$, which imply that $\mu_{NPVSS}(n) \ge 0$. The quantity $\sigma_e^2(n)$ is estimated as follows:

$$\hat{\sigma}_e^2(n) = \lambda\hat{\sigma}_e^2(n-1) + (1-\lambda)e^2(n)$$

Where λ is an exponential window.This estimation could result in a lower magnitude than σ_v^2, which would make $\mu_{NPVSS}(n)$ negative. To overcome this problem, when its occurs is to set $\mu_{NPVSS}(n) = 0$.

Table- DP VSS-NLMS ALGORITHM

Initialization:	$\hat{h}(0)=0$ $\hat{\sigma}_e^2(0)=0$
Parameters:	$\lambda=1-\frac{1}{KL}$, exponentialwindow with $K\geq 2$ σ_v^2, noise power known or estimated $\delta=$ constant. σ_x^2, regularizatio $\varepsilon>0$, very small nuber to avoid division by zero
Error	$e(n)=y(n)-\hat{h}(n-1)x(n)$
Update:	$\hat{\sigma}_e^2(n)=\lambda\hat{\sigma}_e^2(n-1)+(1-\lambda)e^2(n)$ $\beta(n)=\left[\delta+x^T(n)x(n)\right]^{-1}\left[1-\frac{\sigma_v}{\varepsilon+\hat{\sigma}_e(n)}\right]$ $\mu_{NPVSS}(n)=\begin{cases} \text{if} & \hat{\sigma}_e(n)\geq\sigma_v \\ 0 & \text{otherwise}\end{cases}$ $\hat{h}(n)=\hat{h}(n-1)+\mu_{NPVSS}(n)x(n)e(n)$

IV SIMULATION

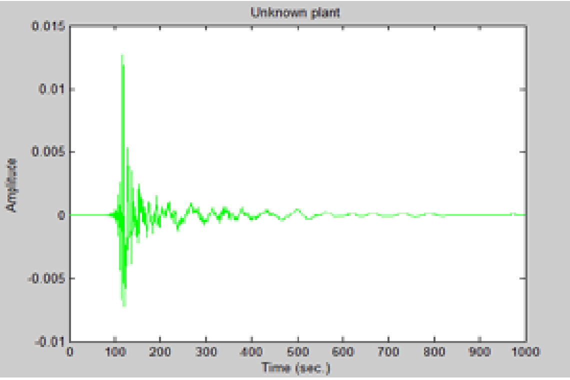
The input signal applied to the unknown system is either a white Gaussian noise or speech signal. The output of the plant is mixed with noise such that the signal to noise ratio remain 20-dB. This signal is a desired signal for adaptive filter. The error vector obtained as the difference of desired and output vector is used to update output of adaptive filter. The initial weights of are initially set to zero. The simulation study has been carried out for NLMS, NPVSS-NLMS

I. (a) NLMS and DFVSS-NLM

II.

The acoustic coupling between microphone and microphone in hand free telephones generates echoes .To remove this echo, we need to identify impulse response of unknown system. Simulation results, input signal are consider as white Gaussian signal or speech signal. An independent white Gaussian noise signal is added to the output of unknown system at 30-dB. We also assume that power of noise signal is known. Parameters setting for simulations are $\hat{\sigma}_e^2(0)=0$, $\delta=20\sigma_x^2$ and $\lambda=1-\frac{1}{KL}$ and $K=2$ for white Gaussian noise signal. The performance of algorithm measured in terms of the normalized misalignment in

(dB). $$Misalignment\left(\hat{h}(t)\right)=20\log\left(\frac{\left\|\hat{h}(t)-h\right\|}{\left\|h\right\|^2}\right)$$



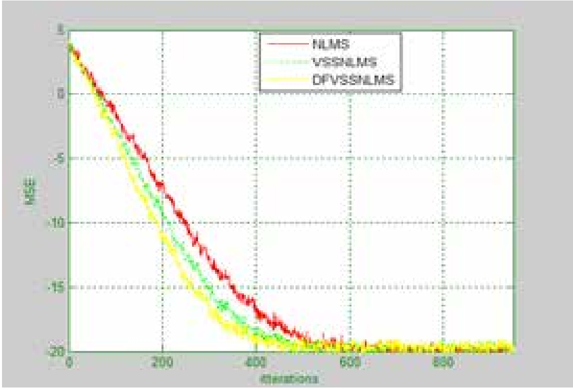


Fig4. Unknown plant **Fig.5.**

Fig.5. Misalignment of the NLMS algorithm at $\left[\delta + X^{T}(n)X(n)\right]^{-1}$, **and the NPVSS-NLMS and DFVSS-NLMS Algorithm.**

The input signal is white Gaussian noise, $L = 500$, $\lambda = 1 - \frac{1}{1-(2L)}$, and SNR = 20 dB.

The simulation results show that NPVSS algorithm is better than NLMS and DFVSS-NLMS algorithm. We have compared NPVSS and NLMS and DF-VSS-NLMS. The plot has been taken between numbers of iterations and corresponding MSE. The iteration range varied from 0 to 950 where as MSE value varies from 0 dB to 5 dB. It is clear from the above plot, fig.5 that proposed algorithm converges in 20 dB signal to noise ratio, which is lesser than NLMS algorithm.

Tracking is a very important issue in adaptive algorithms. In applications like acoustic echo cancellation, it is essential that an adaptive filter tracks fast since impulse responses are not very stationary. Fig. shows that, when the impulse response has changed NLMS algorithm provides more erroneous results than the previous one, where as DFVSS-NLMS algorithm shows the same results with more efficiency compare to NLMS and NPVSS algorithm.

V SIMULATION

In AEC, the acoustic echo paths are extremely long. The main property of the algorithm doesn't require any priori information about acoustic environment. It can be deduced from above figures that distribution free variable step size normalized least means square adaptive algorithm perform better than the other two algorithms, NLMS and NPVSS in the context of echo cancellation. In NLMS algorithm, we need to find a compromise between fast convergence and low final misadjustment. In many applications, this compromise may not be satisfactory so a DFVSS-NLMS algorithm is required. It should be noted that the idea of proposed algorithm can be used in coincidence with other NLMS-based algorithms This improves the convergence rate and reduced the computational complexity. So it is suitable for real world application.

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RELIABILITY EVOLUTION IN DISTRIBUTION SYSTEM USING EVOLUTIONARY TECHNIQUES

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ABSTRACT

The purpose of this paper is to examine issues re-lated to the distribution system reliability improvement using nature inspired technologies like PSO (Particle swarm optimisation),GA (Genetic algorithm),Ant Colony Optimisation, Diffusion Algorithm, Artificial Bee Colony, Intelligent Water Drop, Hybrid Particle Swarm Optimization, Max-Min Particle Swarm Optimization etc.In this paper the main focus is on the improvement of reliability by taking inspiration from the collective behaviours of social insects and other animal societies. Distributed Generation (DG) is a promising solution to many power system problems such as voltage regulation, power loss, etc so the main purpose of this paper is to reduce the losses and improve the system reliability. In this paper the reliability is improve by calculating reliability indices like SAIFI, SAIDI etc.

Keywords: Distribution System, Evolutionary Techniques, Genetic Algorithm, Particle Swarm Optimization, Reliability, Reliability Indices.

I. INTRODUCTION

Reliability is associated with unexpected failures of products or services and understanding why these failures occur. This is the main purpose to improving reliability [1]. The main reasons why failures occur include:

The product is not fit for purpose or more specifically the design is inherently incapable, the item may be overstressed in some way and Failures can be caused by wear-out etc. Reliability in distribution system is the ability of system to full fill the requirement of costumer related to electricity [2].

1.1 Why Is Reliability Important?

Reliability is important because if any system is unreliable then number of unfortunate consequences and therefore for many products and services is a serious threat [3]. For example poor reliability can have implications for: Safety, Competitiveness, Profit margins, Cost of repair and maintenance, Delays further up supply chain Reputation, Good will.

1.1.1 Key Points

- Reliability is a measurement of uncertainty and therefore estimating reliability means using statistics and probability theory.
- Reliability is quality over time.

- Reliability must be designed into a product or service
- Most important aspect of reliability is to identify cause of failure and eliminate in design if possible otherwise identify ways of accommodation.
- Reliability is defined as the ability of an item to perform a required function without failure under stated conditions for a stated period of time [4].

1.2 Distribution System Reliability

Power system reliability has two aspects: system adequacy and system security [5]. The present work is concerned only with system adequacy. The three functional zones: generation, transmission and distribution are combined to give three hierarchical levels: HL-I, HL-II and HL-III for reliability evaluation of power systems. HL-I includes only the generation facilities. HL-II includes both generation and transmission facilities. HL-III includes all three functional zones. Reliability analysis of HL-III is most complex because it includes all three functional zones of power system. For this reason the distribution functional zone is analyzed as separate entity. The objective of the HL-III study is to obtain suitable reliability indices at consumer load point [6].

1.3 Distributed Generation

Distributed generation plays an important role in improving the reliability of distribution system. Many definitions and terms are used to define distributed generation. In Anglo- Saxon countries, it is termed as "Embedded Generation ", in North America it is termed as "Dispersed Generation" and in Europe and other parts of Asia it is termed as "Decentralized Generation" [7]. The term "Embedded Generation" is used to mean the concept of generation embedded in the distribution network. The International Energy Agency (IEA) has defined the distributed generation as a generating plant serving a customer on-site or providing support to a distribution network, connected to the grid at distribution level voltage. It includes small (and micro) turbines, fuel cells and photovoltaic cells etc [8].

1.4 Review of Literature

In the research of Dr. Robert P. Broad water, Dr. Ira Jacob the evolution of power system reliability Analysis improvements with distributed generators while satisfying Equipment power handling constraints. In this research, a computer Algorithm involving pointers and linked list is developed to analyze the power system reliability. This algorithm needs to converge rapidly as it is to be used for systems containing thousands of components. So an efficient "object-oriented" computer software design and implementation is investigated [9].
In the research of MARK RAWSON The California Public Utilities Commission (CPUC) has identified the costs and benefits of distributed generation (DG) as a priority issue for their new rulemaking, To understand the qualitative and quantitative nature of DG costs and benefits, the California Energy Commission (Energy Commission) has been conducting research to gain a better analytical understanding of how to calculate the costs and benefits of DG. Based on the analysis presented in this white paper, collaborative staff concludes that the following benefits and costs be addressed in this proceeding: This white paper discusses issues Energy Commission and CPUC staff, henceforth referred to as collaborative staff, has uncovered regarding the costs and benefits of DG. These issues are presented to support the CPUC's scoping memo. It should be noted that collaborative staff is not recommending a specific methodology(s) or model(s) in this paper [10].

In the research of M. Abbagana , G. A. Bakare , I. Mustapha 1,B.U.Musa -Distributed and disperse generation of electricity have been used to address economical and environmental challenges associated with centralized generation of electricity. This paper aims to minimize the power losses and improve the voltage profile of power distribution system by determining the optimal location and size of two Distributed Generation (DG) units. Differential Evolution (DE) technique is used for optimizing the formulated problem. Performance of the technique is tested on IEEE 33 bus radial distribution system consisting of 32 sections and six different scenarios were created by varying the DE parameters. MATPOWER and MATLAB software were used for the simulation. The results show that proper placement and size of DG units can have a significant impact on system loss reduction and voltage profile improvement. On the other hand, improper choice of size would lead to higher losses [11].

In the research of M.PADMA LALITHA-Distributed Generation (DG) is a promising solution to many power system problems such as voltage regulation, power loss, etc. This paper presents a new methodology using a new population based meta heuristic approach namely Artificial Bee Colony algorithm(ABC) for the placement of Distributed Generators(DG) in the radial distribution systems to reduce the real power losses and to improve the voltage profile. A two-stage methodology is used for the optimal DG placement. In the first stage, single DG placement method is used to find the optimal DG locations and in the second stage, ABC algorithm is used to find the sizes of the DGs corresponding to maximum loss reduction. The proposed method is tested on standard IEEE 33-bus test system and the results are presented and compared with different approaches available in the literature. The proposed method has outperformed the other methods in terms of the quality of solution and computational efficiency. Keywords: DG placement, Meta heuristic methods, ABC Algorithm, loss reduction, radial distribution [12].

II. TECHNIQUES USED

In the reliability improvement there are various types of techniques used. All techniques are described one by one:

2.1 Swarm Intelligence

Swarm intelligence is a computational intelligence technique to solve complex real-world problems. It involves the study of collective behaviour of individuals in a population who interact locally with one another and with their environment in a decentralised control system. Swarm intelligence is the collective behaviour of a group of animals, social insects such as ants, bees, and termites that are each following very basic rules. An artificial-intelligence approach to problem solving using algorithms based on the self-organized collective behaviour of social insects. Swarm intelligence is the discipline that deals with natural and artificial systems composed of many individuals that coordinate using decentralized control and self-organization. In particular, the discipline focuses on the collective behaviours that result from the local interactions of the individuals with each other and with their environment [13].

2.2 Particle Swarm Optimization

Main Goal of Optimization Find values of the variables that minimize or maximize the objective function while satisfying the constraints. Particle Swarm Optimization based on the collective behaviour of decentralized, self-organized systems. The expression was introduced by Gerardo Beni and Jing Wang in 1989, in the context of cellular robotic systems. Natural examples of SI include ant colonies, bird flocking, animal herding, bacterial growth, and fish schooling. Particle Swarm Optimization works- PSO is initialized with a group of random particles (solutions) and then searches for optimal by updating generations. Particles move through the solution space, and are evaluated according to some fitness criterion after each time step. In every iteration, each particle is updated by following two "best" values. The first one is the Pbest and second one is Gbest [14].

2.3 Genetic Algorithm

Genetic Algorithms (GAs) are adaptive heuristic search algorithm based on the evolutionary ideas of natural selection and genetics. As such they represent an intelligent exploitation of a random search used to solve optimization problems. The basic techniques of the GAs are designed to simulate processes in natural systems necessary for evolution; especially those follow the principles first laid down by Charles Darwin of "survival of the fittest." Since in nature, competition among individuals for scanty resources results in the fittest individuals dominating over the weaker ones better than conventional Algorithm in that it is more robust. Unlike older AI systems, they do not break easily even if the inputs changed slightly, or in the presence of reasonable noise. Also, in searching a large state-space, multi-modal state-space, or n-dimensional surface, a genetic algorithm may offer significant benefits over more typical search of optimization techniques [15].

2.4 Differential Evolution

Global optimisation is necessary in fields such as engineering, statistics and finance. But many practical problems have objective functions that are non-differentiable, non-continuous, non-linear, noisy, flat, multi-dimensional or have many local minima, constraints or stochasticity Such problems are difficult if not impossible to solve analytically DE can be used to find approximate solutions to such problem. DE is used for multidimensional real-valued functions but does not use the gradient of the problem being optimized, which means DE does not require for the optimization problem to be differentiable as is required by classic optimization methods such as gradient descent and quasi-Newton methods. DE can therefore also be used on optimization problems that are not even continuous, are noisy, change over time, etc [16].

2.5 Cultural Algorithms

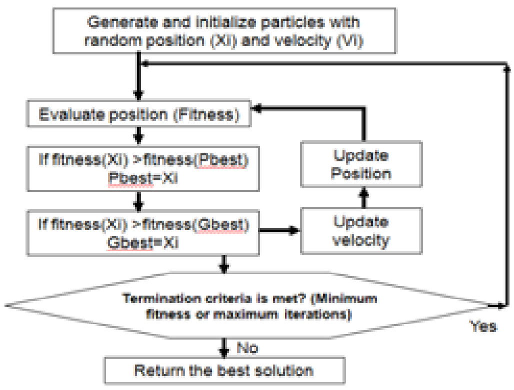
The Cultural Algorithm is an extension to the field of Evolutionary Computation and may be considered a Meta-Evolutionary Algorithm. It more broadly belongs to the field of Computational Intelligence and Met heuristic. It is related to other high-order extensions of Evolutionary Computation such as the Mimetic Algorithm. The focus of the algorithm is the Knowledgebase data structure that records different knowledge types based on the nature of the problem. For example, the structure may be used to record the best candidate solution found as well as generalized information about areas of the search space that are expected to payoff (result in good candidate solutions). This cultural knowledge is discovered by the population-based evolutionary search, and is in turn used to influence subsequent generations. The acceptance function constrains the communication of knowledge from the population to the knowledge base [17].

2.6 Ant Colony Optimization

Ant colony optimization (ACO) is a Swarm Intelligence technique which is inspired from the foraging behaviour of real ant colonies [18]. The ants deposit pheromone on the ground in order to mark the route from the nest to food that is followed by other members of the colony. ACO exploits an optimization mechanism for solving discrete optimization problems in various engineering domain. The ACO differs from the classical ant system in the sense that here the pheromone trails are updated in two ways. Firstly, when ants construct a tour they locally change the amount of pheromone on the visited edges by a local updating role. Secondly, after all the ants have built their individual tours, a global updating rule is applied to modify the pheromone level on the edges that belong to the best ant tour found so far. An artificial Ant Colony System (ACS) is an agent-based system, which simulates the natural behaviour of ants and develops mechanisms of cooperation and learning. ACS was proposed by Dorigo et al. in 1997 as a new heuristic technique to solve combinatorial optimization problems. It is found to be both robust and versatile in handling a wide range of combinatorial optimization problems [19][20].

2.7 Artificial Bee Colony

Artificial Bee Colony (ABC) technique is a swarm based metaheuristic technique. It was introduced by Karaboga in 2005 [21]. It simulates the foraging behaviour of honey bees. The technique has three phases namely employee bee, onlooker bee and scout bee. In the employed bee and the onlooker bee phases, bees exploit the sources by local searchers in the neighbourhood of the solutions selected based on deterministic selection. Scout bee phase is an analogy of abandoning exhausted food sources in the foraging process, solutions that are not beneficial anymore for search progress are abandoned and new solutions are inserted instead of them to explore new regions in the search space. The technique has a well-balanced exploration and exploitation ability [22].



Basic PSO flow chart

III. RELIABILITY INDICES

Performance indices are the record of past data. Because on the basis of past we plan for our present. the reliability are of two types qualitative reliability and quantitative reliability Quantitative reliability evaluation of a distribution system can be divided into two basic segments; measuring of the past performance and predicting the future performance [23]. Some of the basic indices that have been used to assess the past performance are;

•System Average Interruption Frequency Index (SAIFI)

•System Average Interruption Duration Index (SAIDI)

•Customer Average Interruption Duration Index (CAIDI)

•The Average Service Availability Index {Unavailability} (ASAI) {ASUI}

•Energy not supplied (ENS)

Past performance statistics provide valuable reliability profile of the existing system. However, distribution planning involves the analysis of future systems and evaluation of system reliability when there are changes in; configuration, operation conditions or in protection schemes. This estimates the future performance of the system based on system topology and failure data of the components. Due to stochastic nature of failure occurrence and outage duration, it is generally based on probabilistic models. The basic indices associated with system load points are failure rate, average outage duration and annual unavailability. SAIFI indicates how often an average customer is subjected to sustained interruption over a predefine time interval where as SAIDI indicates the total duration of interruption an average customer is subjected for a predefined time interval. CAIDI indicates the average time 8required to restore the service. ASAI specifies the fraction of time that a customer has received the power during the predefine interval of time and is vice versa for ASUI. ENS specifies the average energy the customer has not received in the predefined time [24].

3.1 Customer Based Indices

The Utilities commonly use the following two reliability indices for frequency and duration to quantify the performance of their systems [25].

(i) System Average Interruption Frequency Index (SAIFI) is designed to give Information about the average frequency of sustained interruptions per customer over a predefined area.

$$\text{SAIFI} = \frac{\text{Total number of custumer interruption}}{\text{Total number of custumer served}}$$

(ii) System Average Interruption Duration Index, (SAIDI) is commonly referred to as Customer minutes of interruption or customer hours, and is designed to provide Information about the average time that the customers are interrupted-

$$\text{SAIDI}= \frac{\text{Sum of customer interruption duration}}{\text{Total number of custumer served}}$$

(iii) Customer Average Interruption Duration Index (CAIDI) is the average time needed to restore service to the average customer per sustained interruption-

$$\text{CAIDI}= \frac{\text{Sum of customer interruption duration}}{\text{Total number of custumer interruptions}}$$

(iv) Customer Average Interruption Frequency Index (CAIFI) is designed to show trends in customers interrupted and helps to show the number of customers Affected out of whole customer base-

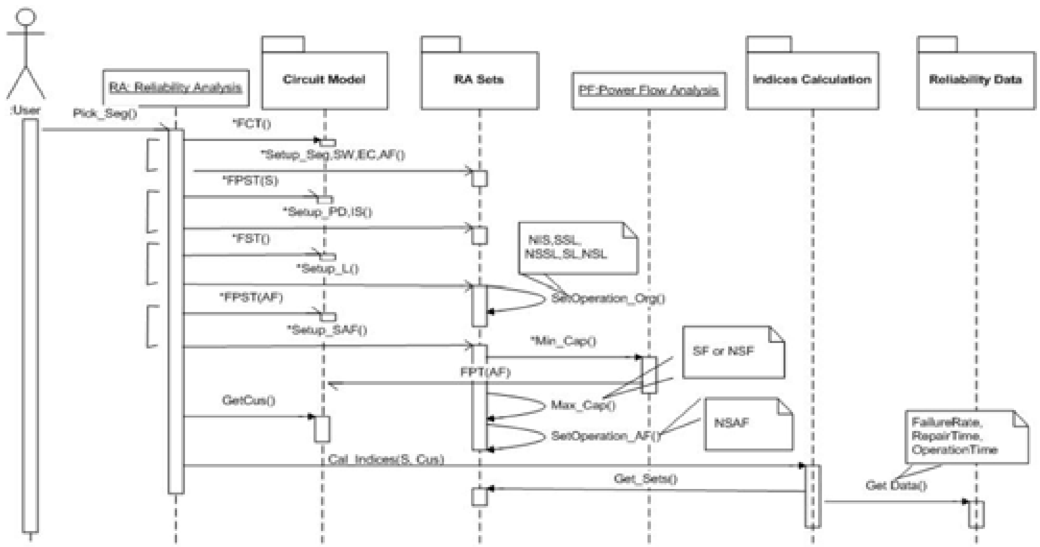
$$\text{CAIFI} = \frac{\textit{Total number of costumer interrupted}}{\textit{Number of custumer affacted}}$$

(v) Average Service Availability Index (ASAI)-

$$\text{ASAI} = \frac{\textit{Custumer hours of available service}}{\textit{custumer hours demanded}}$$

IV. FIGURE

Reliability Analysis Algorithm Sequence diagram-



V.TABLE-COMPARATIVE ANALYSES OF VARIOUS EVOLUTIONARY TECHNIQUES

Comparative analyses of evolutionary techniques of are summarized in Table. In particular, advantages, limitations, issues etc are analyzed and compared to the other techniques. Here we discuss mainly 5 techniques.

S.No.	Technique	Issues	Advantages	Limitation
1.	GENETIC ALGORIHM (GA)	Window size, Two point cross over, Evolution Period, Max stale period	Minimizes execution time & communication cost &maximizes average processor utilization & system throughput	Incur extra storage and processing requirement at the scheduling node The saving may out weight the extra overhead considering the ever decreasing cost of storage and processing power[26][27]
2.	PARTICLE SWARM OPTIMIZATION (PSO)	Makespan,cost, Deadline		

			It is very simple , have no overlapping and mutation calculation, it adopts the real no. code and it is decided directly by the solution[28]	It suffers from the problem of premature convergence, particularly in case of multimodal optimization problems[29]
3.	ARTIFICIAL BEE COLONY (ABC)	Colony size, maximum cycle number and limit	It produces better results on multimodal and Multidimensional optimization problems. It is as simple and flexible as PSO and also employs less control parameters	It is found effective only in solving small to medium sized generalization assignment problems not for large and complex problem[30]
4.	ANT COLONY OPTIMIZATION (ACO	Execution time, Maximum execution time, idle time.	Inherent parallelism; Positive feedback accounts for rapid discovery of good solution; Efficient for TSP.	Theoretical analysis is difficult; Sequences of random decision decisions; Probability on distribution changes by iteration;
5.	DIFFUSION ALGORITHM (DA)	It performs better in terms of time taken to balance the load, Minimizing the load variance among the nodes and maximizing the throughput.	Reducing communication overhead	It is difficult to provide clean general solution to this problem.

VI. CONCLUSION

This paper is the review paper of my thesis topic, in this review paper, we have presented a reliability analysis with the help of evolutionary techniques. In this paper we worked on improvement of reliability. in this paper we improve the reliability by calculating reliability indices, this section is also presented here. for reliability improvement there are various techniques which are used by many authors in there research papers like-genetic algorithm, Particle Swarm Optimization, Ant Colony Optimization, Diffusion Algorithm, Tabu Search, Intelligent Water Drop, Artificial Bee Colony etc.but the main work of my topic is depend on the two techniques, Particle swarm optimization, Genetic Algorithm .In this paper the comparison between many intelligent techniques is also presented. The main work of reliability improvement in distribution system is based on Particle swarm optimization and Genetic algorithm because these techniques are based on social-psychological principles and provides insights into social behaviour as well as contributing to engineering applications.

Genetic Algorithm is used because of following advantages-

1) These techniques minimizes execution time and communication cost.
2) Maximizes average processor utilization and system through output.

Particle swarm optimization Algorithm is used because of following advantages-

1) It is very simple, have no overlapping and mutation calculation.
2) It adopts the real number code and it is decided directly by the solution.

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