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NOCTURNAL FRONTAL LOBE EPILEPSY (NFLE): MEDICAL SLEEP DISORDER

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ABSTRACT

This paper contains the details of sleep disorder, types of sleep disorder, mainly sleep disorder is categorised as dyssomnias and parasomnias. The diseases under these categories are discussed in brief. This paper mainly comprises the details of Nocturnal frontal lobe epilepsy that comes under the parasomnias. It contains the information like what NFLE is? What are its symptoms, causes, detection etc.? So, Nocturnal frontal lobe is a kind of seizure that comprises violent behaviour, only or mainly during sleep. During a NFLE seizure, patients often exhibit behaviours that resemble sleep terrors. Sudden, explosive arousal from non-REM sleep, often within 30 minutes of falling asleep Vocalizations, including screaming or laughing, Arm and leg movements, such as one arm extended while the other flexes; kicking or bicycle-pedalling motions of legs; rocking; or stiffening of the limbs and finally returning to sleep immediately after the seizure. It can be caused by abnormalities such as tumours, stroke, infection etc. Nocturnal frontal lobe can be treated by Anti-seizure drugs are provided and in case of failure ,surgery is another option that is removing the focal point, dividing the focal point inspiring the vagus nerve.

Keywords: Nocturnal Frontal Lobe Epilepsy, Dyssomnias, Parasomnias, Polysomnograms, Electroencephalogram.

Abbreviations: REM=Rapid eye movement; NFLE=Nocturnal frontal lobe epilepsy; EEG=electroencephalogram; FLE=frontal lobe epilepsy; TLE=Temporal lobe epilepsy

I. INTRODUCTION

Sleep is associated with an urge to lie down for several hours . The nature of consciousness is changed during sleep.We experience some dreaming during sleep.We may recall very little of the mental activity that occurred during sleep.

There are two main types of sleep:

- *Non-Rapid Eye Movement (NREM)* :
  - Stage1: Our eyes are closed, but it is easy to wake us up and the brain produces high amplitude theta waves, which are very slow brain waves. This period of sleep lasts only a brief time (around 5-10 minutes). .
  - Stage2: In this stage, we are in light sleep. Our heart rate slows and body temperature drops .At this time, our body is getting ready to sleep. Body temperature starts to decrease and heart rate begins to slow.
  - Stage3: This is the deep sleep stage. It's harder to rouse us during this stage, and if someone wakes us up, we would feel disoriented for a few minutes. Delta waves occur during this stage.
- *REM*: This stands for rapid eye movement. REM sleep happens 90 minutes after you fall asleep. The first period of REM typically lasts 10 minutes. Our heart rate and breathing quickens. We can have

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intense dreams during REM sleep, since our brain is more active. Babies can spend up to 50% of their sleep in the REM stage, while 20%.

II. SLEEP DISORDERS

Sleep disorders are problems with sleeping, like trouble in having sleep or staying asleep, falling asleep at the wrong times, too much sleep, or doing unusual activity during sleep. It is a medical disorder and also called somnipathy.

III. TYPES OF SLEEP DISORDER

Dyssomnias: This kind sleep disorder is caused by three major factors, first one is arising from within the body, second one is related to environmental conditions, and last one by disorders of daily rhythm.

- Insomnia: Insomnia is a sleep disorder in which there is an inability to fall asleep or to stay asleep as long as desired due to emotional stress, anxiety, depression etc.
- Narcolepsy: Narcolepsy is a neurological disorder that occurs when brain becomes unable to control sleep or wakefulness.
- Sleep disorder breathing: SDB comprises of sleep-related breathing abnormalities. It includes following disorders:
  - Sleep apnea: It is characterized by pauses in breathing or unusual breathing during sleep. Each pause in breathing, called an apnea, can last for several seconds to several minutes.
  - Snoring: Snoring is noisy breathing during sleep. It is the shaking of respiratory organs and this produces sound.
  - Upper Airway Resistance Syndrome : It is a sleep disorder, categorised by air route resistance to breathing during sleep
- Periodic limb movement disorder: It is a sleep disorder where patients move their legs involuntarily during sleep, and shows problem related to movement.
- Circadian rhythm sleep disorders: Daily rhythm sleep disorders all involve a problem in the timing of when a person sleeps and is awake.

Ø *Parasomnias:* This kind of sleep disorder involves abnormal and unnatural movements, behaviours, emotions, observations, and dreams in connection with sleep.

- *Sleep walking:* The person suffering from sleep walking arises from the slow wave sleep stage in a state of low consciousness and perform activities that are usually performed during a state of full consciousness, like walking, cleaning etc.
- *Bruxism*: Bruxism is the unnecessary grinding of the teeth and/or excessive. There are two main types of bruxism- one that occurs during sleep (sleep bruxism) and one that occurs during wakefulness (awake bruxism).
- *Bedwetting*: Bedwetting refers to the unintentional passage of urine during sleep.
- *Nocturnal frontal lobe epilepsy:* Frontal lobe epilepsy is characterized by recurrent seizures arising from the frontal lobes like screaming, reciting prayers, singing etc. during sleep.

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IV. NOCTURNAL FRONTAL LOBE EPILEPSY

NFLE stands for Nocturnal frontal lobe epilepsy. NFLE originates from certain words like nocturnal means something that happens at night, frontal means front part of anything, lobe means a fairly round flat part of ear, and lastly epilepsy refers to c disorder in which a person have regular seizures. Nocturnal frontal lobe epilepsy is a condition which occurs only during sleep and arising from the frontal lobes. Autosomal dominant nocturnal frontal lobe epilepsy (ADNFLE) is an uncommon form of epilepsy that are found in families. This disorder causes seizures that usually occur at night while an affected person is sleeping. Some people have mild seizures that simply cause them to wake up from sleep. Others have more simple incidents that can include sudden, regular movements such as motions of the arms and bicycling movements of the legs. The person may get out of bed and stroll around, which can be mistaken for sleepwalking. The person may also cry, sing songs, produce different kind of voices or groaning sounds. This diseases are sometimes misunderstood as nightmares, night terrors.

The most common symptoms associated with an aura in people with ADNFLE are touchy, shivering, a sense of fear and a feeling of falling or being pushed. Some affected people have also reported a feeling of breathlessness, fast breathing or choking. It is unclear what brings on seizures in people with ADNFLE.NFLE seizures dominate in males (7:3)

4.1 Symptoms of Nfle

- Sudden, awakening from non-REM sleep, often within 30 minutes of falling asleep.
- Produces different types of voices, emotions ,like screaming, laughing, singing patriotic or reciting religious songs etc.
- Arm and leg movements, like , one arm is extended while the other bends, kicking or bicycle-pedalling, motions of legs, or boost hardening of the limbs.
- Returning to sleep immediately after the seizure

4.2 Causes of Nfle

- Frontal lobe seizures can result from abnormalities — such as tumours, stroke, infection, or shocking injuries — in the brain's frontal lobes
- An abnormal gene causes a uncommon genetic disorder called autosomal dominant nocturnal frontal lobe epilepsy.
- If one of the parents has this form of frontal lobe epilepsy, you have a 50 percent chance of inheriting the gene and developing the disease yourself.
- In most cases, however, the cause of frontal lobe epilepsy remains unknown.

V. DIAGNOSIS OF NFLE

Frontal lobe epilepsy can be difficult to diagnose because its symptoms are similar from psychiatric problems or sleep disorders, such as night terrors.

It can be diagnosed by three methods-

- Brain Scan: Frontal lobe seizures can be caused by tumours, abnormal blood vessels or injuries. Brain imaging, usually magnetic resonance imaging is used to diagnose. MRI uses radio waves and a powerful magnetic field to produce very detailed images brain.
- Electroencephalogram (EEG): An EEG shows the electrical activity in our brain by putting a series of electrodes attached to our scalp. EEGs are often helpful in diagnosing some types of epilepsy, but results may be normal in frontal lobe epilepsy.
- Video EEG: Video EEG is usually performed during an overnight stay. Both a video camera and an EEG monitor works together all night. Doctors then matches what physically occurs when we have a seizure with what appears on the EEG at the same time.

VI. TREATMENT OF NFLE

Earlier there were not many treatment option, but now there are many new anti seizure medication.

We have two ways of treating NFLE, first one is drug and other one is surgery.

- Medication*:*

  All anti-seizure drugs seem to work equally for frontal lobe epilepsy.

  Many drugs are in use now like: Carbamazepine (Tegretol), Phenytoin (DilantinKapseals), Gabapentin (Neurontin) etc.
- Surgery*:*

  If our seizures can't be controlled with medications, surgery is another option. Surgery involves treating of the infected area of brain that is where seizures occur.

  In general, surgery for seizures that aren't well controlled by medication may be quite successful.

  Surgery may involve:
  - Removing the focal point: If seizure occurs at a particular spot then tissue of that small part is removed.
  - Isolating the focal point:

    surgeon may make a series of cuts to isolate that section of the brain that has seizure.
  - Stimulating the vagus nerve:

    An artificial device is implanted to stimulate vagus nerve.
  - Responding to a seizure: A responsive neuro stimulator (RNS) is a implanted device and gets activated at the time seizure and stops it.

VII. CONCLUSION

Nocturnal seizures are important subset of epilepsy. when seizures continue to occur, even if only during sleep, they can still result in illness due to disruption of normal sleep structure. Occurrence of seizures in relation to the sleep-wake has important diagnostic inferences in several syndromes.

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THE POCKET DOCTOR

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ABSTRACT

In this paper we are proposing a health application that provides an efficient way to keep a track on health. In the age of Smart phones and technology where one can have applications on every aspect of our lives, having an application that addresses health issues is a must and 'The Pocket Doctor' , an android application provides an efficient and time saving method for the users to track and manage the most important aspect of their lives. The application will help the users to keep a track of their health. Patients who use our app can store the prescription details of themselves. So our aim is to develop an application that addresses the health issues and provides optimal solutions to the users.

Keywords: Smart Phones, BMI (Body Mass Index), Prescription, Android

I. INTRODUCTION

In recent times health care concepts of people have undergone a tremendous change which has led to higher expectations and an increased demand for high quality medical care and facilities. The Pocket Doctor app provides an efficient and time saving method for the users to track and manage their health. The application also addresses the weight related issues. The users can check whether they are overweight or underweight or normal using Body Mass Index (BMI) calculator, a feature that is incorporated in our application.

The users can post their health queries on this application and they will be provided with immediate solutions for their queries. Patients who use this app can also store the prescription details of the themselves. It helps the patient to view their medication anytime, anywhere through their phone. A substantial number of patients, particularly the handicapped and the elderly do not follow instructions in taking medication. This can result in patient failing to take medication, taking the wrong medication, taking an incorrect amount of medication, or taking the medication at a wrong time, leading to either a drug overdose or an ineffective application of medication to the patient. The elderly are especially prone to problems since they often take several medications and have failing memories. The app will also display all the hospitals and clinics that are in the user's locality with their contact numbers. The application provides the facility to the users to book an appointment to visit the hospitals that are near user's location.

II.CURRENTLY USED SOFTWARE SYSTEM

We studied the previously developed applications thoroughly. The user interface created is hectic to use and one has to proactively use the application to get the gist of using it. Also the feature of storing and viewing prescriptions is not incorporated in the previously created applications. There is no more than one or two features in those applications. Users have to download separate application for having some First Aid

information, and a separate application for BMI calculation. There are more or less no applications that have all the features incorporated into one single application.

The problems faced in this applications are:

- The GUI is not user friendly.
- Absence of multi purpose features.
- No dynamic changes in the databases.
- No storing and viewing of prescriptions.

III. AIM & OBJECTIVES

Keeping a regular check on one's health is one of the most tedious task for humans. There are still serious problems while managing our health. Some may not have the time for visiting doctors and in some rural areas there isn't ample Healthcare facility. Some patients may not know the hospitals or clinics operating in their own locality. Therefore there is a great requirement for an application that provides all the first aid health related information. There is a requirement for an application that shows all the nearby hospitals and clinics which can benefit a lot if users come across some health issues during the nights. Our aim here is to develop a simple, easily understandable, and portable application, which could prove useful in managing health issues and provides some first aid solutions. This project aims for effective and easier way to view a prescription by the patient with very less user involvement.

IV. METHODOLOGY

The different modules in the system include:

4.1 Login Module

Only the authorized users can login into the site. Admin, Doctors and Receptionist can login using their username and password. If invalid username or password is given, then access will be denied.

4.2 Administrator Module

The administrator can add new doctors as well as change the password of the receptionist.

4.3 Registration

The patient details are entered by the receptionist and it is stored in the database.

4.4 Provide Prescription

The doctor provides the prescription and it is stored in the database.

4.5 Send Prescription

The prescription details are sent to the Prescription Viewer App installed in the patient's phone using Google cloud messaging. (GCM).

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V. WORKING OF THE SYSTEM

1) The user has to register on the application. The user will be provided with the login access.

Fig 1: User Login

2)For calculating the body mass index (BMI), User has to provide his/her height and weight as inputs so that the application can provide the user with his/her BMI.

3)The user can use the feature of prescription storing and viewing, which will help the user to keep a track on medication. Doctors will send the prescription from their respective logins to the patients on their phones.

Fig 2: Sending Prescription to the patient.

4) User can fix appointments with the hospitals, clinics, physicians registered on the application.

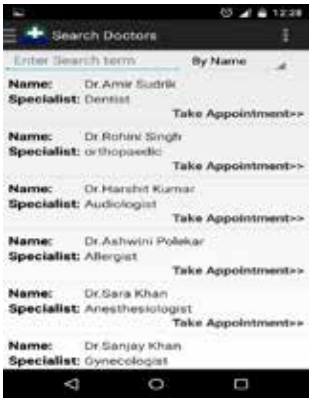

Fig 3: Scheduling Appointments

5) User can post their health queries on the application. The queries will be addressed with immediate effect.

6) Users will be provided with all the hospitals that are located in their area of interest with their contact numbers.

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Fig 4: Hospital Search Functionality

VI. SCOPE

An increasing number of patients are using mobile health applications on their smart phones to manage their health. Moreover, The app can fix an appointment whenever required with the doctors registered on the application. As a trusted source of information, health care providers can take advantage of this opportunity to connect with patients. Apps that help patients manage chronic diseases, update their health records, institute behavioral change, find health information and connect to remote monitoring devices have the potential to improve health outcomes, reduce costs and help differentiate providers from the competition. Providers should aim to develop easy-to-use apps that can be extended across a variety of devices and platforms and offer functionality that patients can use on a regular basis. In many cases, mobile health apps can become an extension of the web presence already established by providers.

VII. CONCLUSION

Our Android application will help everyone using Android devices with features such as BMI calculator, Prescription viewing, Search functionalities for doctors and hospitals, Scheduling appointments. One would be able to schedule appointments with doctors registered on the app. Prescription viewing makes it easier to view your prescription anytime and anywhere. Hospitals with their exact location using google maps are provided to the user too.

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BEHAVIOR OF PUMICE LIGHTWEIGHT CONCRETE

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ABSTRACT

Lightweight concrete has many advantages compared to conventional concrete. The light weight concrete has density is about 300 to 1850Kg/m^3 which is less than the conventional concrete weight density of about 2200 to 2600 Kg/m^3. The lightweight concrete generally made with natural lightweight aggregates or artificial aggregates. In the present investigation the pumice aggregates are used to produce the concrete and to improve the performance of concrete, Bagasse ash (by-product of sugar cane industry) is used as partial replacement material for cement in concrete mix with varying proportions 0, 5, 10, 15 and 20%. Experimental studies are conducted in compression and split tension. The results indicate that the optimum percentage of bagasse ash for lightweight concrete mix is 15%. To establish the relation between split tensile and compressive strength, a regression model was deduced.

Key words: Bagasse ash, Compression, Pumice, Split tension

I. INTRODUCTION

The use of lightweight aggregate concrete has many advantages of dead load reduction, high thermal insulation; increase the progress of building and lowers haulage and handling cost. The self weight of building on the foundation is an important factor in design, especially in the case of low bearing capacity soils and high rise buildings. In multistoried buildings, the structural components such as beams and columns have to carry load of floors and walls. If floors and walls are made up of lightweight concrete, it leads to economy to the structure. The lightweight concrete is also lowers power consumption for extreme climatic conditions due to possessing property of low thermal conductivity. The lightweight concrete is produced with the help of lightweight aggregates, which are produced with the naturally available aggregates or artificially aggregates. In nature the available low density aggregates at many places over the globe are pumice, diatomite, scoria etc. and the artificially aggregates are produced with combinations of cinders, clinker & breeze, foamed slag and bloated clay. Now days many people are also using the rice husk, fly ash, slag, sludge waste, palm oil shell, shale slate and other industrial by products with and without introducing the air entraining agents. To improve the strength of light weight concrete the industry people are using the the good quality of cement along with the admixtures. This helps to improve bond strength between materials of concrete.
A resent past literature is presenting herein on lightweight concrete and bagasse ash concrete. Y.J.Kum et.al (2007) conducted tests on one way slabs to evaluate shear strength. The slabs were prepared with the

lightweight concrete. The results indicated that the behavior of lightweight aggregate concrete closely mimics the response of normal weight concrete at service loads but the ultimate load carrying capacity is lesser than the natural aggregate concrete. Adewuyi A.P and Adeoke T (2008) studied the behavior of periwinkle shells as coarse aggregate in concrete. The usage of periwinkle shells as lightweight aggregates, encouraging the compressive strength results. Xiao Ma and Qiuhua Rao (2012) produced the lightweight concrete with the help of inorganic polymers (cement based). They varied the binder polymer from 0 to 50% and the cube compressive, prism compressive and elastic modulus were decreased but the ratio between prism and cube compressive strengths were increased form 088 to 0.95. Sivakumar A and Gomati P (2012) were used the fly ash as light weight aggregate after making the pelletized aggregates. The results indicated that pelletized aggregates usage promises cost effective construction material for concrete. Lokesh.S et.al (2013) conducted the experimental work on lightweight concrete. The concrete made with high volume fly ash and a little quantity of silica fume. The fly ash used as replacement for cement. The results indicated that, the compressive, split and flexural strengths were increased. Bhaskar Desai.V and Sathyam.A (2014) studied the strength properties of lightweight concrete. The concrete was produced with cinder aggregates. In the concrete the natural aggregates were replaced with cinder aggregates. The replacement up to 75% is shown as the compressive strength is not affected the design compressive strength of natural aggregate concrete. Abdolkarim Abbasi and AminZargar (2013) conducted experimental work on concrete with combination of bagasse ash as pozzolana material. The results found that there are no effect on the setting time and absorbing water capacity and also found that it is cost effective material for concrete. Kawade.U.R et.al (2013) studied the effect of bagasse ash on strength of concrete. The study showed that replacement up to 15% is effective. Sivakumar et.al (2013) studied the morphology and chemical analysis of concrete prepared with sugarcane bagasse. The replacement level of 10% is more effective for concrete rather than the other replacements. Shafana.R et.al (2014) found the mechanical properties of sugarcane bagasse ash concrete and the results showed that 10% replacement is more effective for enhancement of mechanical properties. From the past literature it is noticed that no work has been carried out on lightweight concrete with combination of bagasse ash as pozzolana material. In the present experimental work pumice aggregates were used as lightweight aggregate and bagasse ash as partial substitute material for cement. Bagasse ash is an agricultural/industrial waste and it is by-product of sugarcane milling process in sugarcane factories. The sugarcane is a major crop growing in Mysore and Mandya district. There are around 8 sugar mill factories in and around Mysore and Mandya districts (Karnataka (state)) which extract sugarcane juice from around 30 lakh metric tons sugarcane yearly to produce sugar. Sugarcane bagasse (SCB) which is a voluminous by-product in the sugar mills obtained when juice is extracted from the sugarcane. For each 1 ton of sugarcane crushed, a sugar factory produces nearly 300kg of bagasse. The present experimental study is limited to evaluate compressive and split tensile strengths

II.EXPERIMENTAL PROGRAM

To evaluate compressive and split tensile strengths 30 cubes and 60 cylinders are cast and tested. The compressive strength test was conducted on cubes and cylinders. The split tensile strength test was conducted on cylinders. The strength tests were conducted at 7 and 28 days. As per Indian standards there is no mix design procedure for the lightweight concrete, hence few trail batches were done in the laboratory as per ACI 213 R-03

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guide lines. From the trial mixes the optimum quantities per m^3 are cement 480Kg, Fine aggregate 865kg and coarse aggregate (pumice) 335 kg. The mix was provided with water cement ratio of 0.4.

III.MATERIAL USED

Cement: Ordinary Portland cement conforming to IS: 8112-1989 was used. The specific gravity of cement is observed as 3.05

Bagasse ash: The bagasse ash consists of specific gravity 2.15 and the specific surface area of 2475 cm^2/gram. The used bagasse ash was classified as Class F. The chemical properties are presented in table 1.

Table 1.Chemical Composition of Bagasse Ash (%)

SiO_2	Al_2O_3	Fe_2O_3	CaO	LOI
68.67	0.22	5.98	1.50	14.00

Fine Aggregate: Locally available sand was used and it is conformed to Zone II. The specific gravity and fineness modulus of sand is observed as 2.67 and 3.5.

Coarse aggregate: Pumice a natural lightweight aggregate was used as coarse aggregate. The properties are determined as per IS specification and the obtained test results depicted in table 2.

Table 2: Physical Properties of Pumice Aggregate

Specific Gravity	1.03
Bulk Density (kg/m^3)	
Loose	393.47
Compacted	457.65
Flakiness Index (%)	3.85
Elongation Index (%)	5.6
Water Absorption (%),	30

Water: Portable water used for the experimental work and it observed that it is free from organic matter

IV.TESTING OF SPECIMENS

The cubes and cylinders are tested in compression testing machine. The compression and split tensile tests were performed on the specimens as per IS specifications

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V.ANALYSIS OF RESULTS

5.1 Compressive Strength

Compressive strength of concrete is important for designers to design structural elements. The compressive strength of concrete is related to other strength parameters of tensile, shear, bond, bearing strengths etc., so the compressive strength of concrete place major role in the construction industry/technology. In India, UK and European countries to evaluate the compressive strength of concrete cube specimens were used, whereas in USA, Canada Australia and New Zealand, cylinders were used. In the present experimental work both were used to determine the compressive strength of concrete. From the experimental work the obtained cube and cylinder compressive strength results for 7 and 28 days were presented in the Table 3 and Figure 1. From this table it is observed that as the bagasse ash content up to 15% is effective and later on the strengths were decreased and the maximum strength results are obtained at 15%. From this it is concluded that 15% replacement of cement with bagasse ash is optimum. The strength enhancement may be due to the reaction between the calcium hydroxide and the bagasse ash. Once the content of calcium hydroxide is exhausted in the mix and then the bagasse ash is present in the mix as inert material. It does not contribute the strength to the mix and also the mix is become weak due less quantity of the binding material.

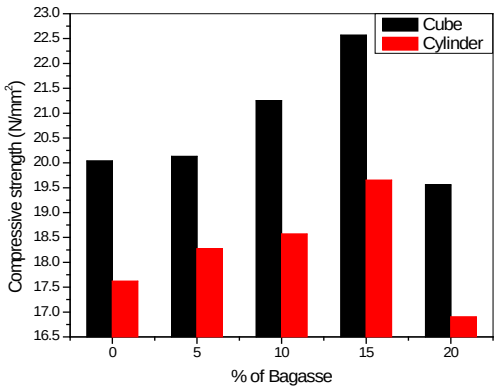

Fig.1: Compressive Strength Vs % of Bagasse Ash

5.2 Split tensile Strength

In general the tensile strength of concrete is not taken in to account in the design of concrete elements. But the knowledge of tensile strength of concrete is required when the elements subjected to transverse shear, torsion, and shrinkage and temperature effect. The tensile strength of concrete was also used while design of pre stressed and concrete structures, liquid retaining structures and run way slabs. Direct tensile strength of concrete is tedious to evaluate. Hence split tensile strength test is conducted to find the tensile strength of concrete. IS 5846:1999 specified the procedure to find the split tensile strength of concrete. In the present experimental work the split tensile strength is evaluated as per IS code and the results are presented in Table 3. From this table it is observed that the maximum strength is obtained at 15% of bagasse ash. The trend of the split tensile strength behaviour is similar to the compressive strength. IS 456 does not provide any relation to evaluate the split tensile

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strength of concrete. So in the present experimental work a regression model was deduced with a correlation value(R) as 0.885 and standard deviation of 0.176 and the same is presenting below.

$$f_{st}=1.50\sqrt{f_{ck}}$$

f_{st}= split tensile strength of concrete in N/mm2 at 28 days.

f_{ck} =cube compressive strength of concrete in N/mm2 at 28 days.

The performance of the model is presented in the Table 4 and Figure 2.From this table it is observed that the proposed model is well suited with the experimental work and the variation of the results observed as 4%.

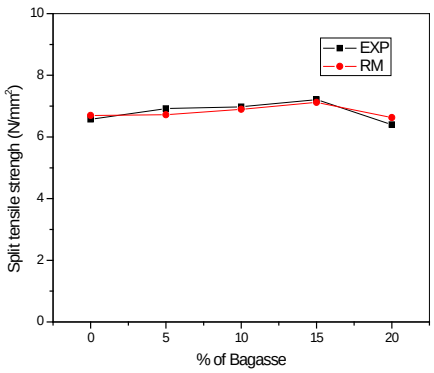

Fig.2: Performance of Regression Model

Table 3.Compressive and Split Tensile Strings of Bagasse Light Weight Aggregate Concrete

S.No	% of Bagasse ash	Cube compressive strength		Cylinder compressive strength		Split tensile strength	
		7 Days (N/mm^2)	28 Days (N/mm^2)	7 Days (N/mm^2)	28 Days (N/mm^2)	7 Days (N/mm^2)	28 Days (N/mm^2)
1	0	15.46	20.04	11.69	17.62	5.98	6.57
2	5	15.52	20.13	11.94	18.27	5.99	6.92
3	10	15.62	21.25	12.04	18.57	6.02	6.98
4	15	16.43	22.57	13.59	19.65	6.11	7.21
5	20	15.07	19.56	13.10	16.90	5.85	6.40

Table 4.Peroformance of Regression Model

S.No	% of Bagasseas h	Cube compressive strength 28 Days (N/mm^2)	Experimental split tensile strength 28 Days (N/mm^2)	Split tensile strength based on Regression Model (RM)	Ratio of EXP/RM Split tensile strength
1	0	20.04	6.57	6.70	0.98
2	5	20.13	6.92	6.72	1.02
3	10	21.25	6.98	6.90	1.01
4	15	22.57	7.21	7.12	1.01
5	20	19.56	6.40	6.63	0.96

VI.CONCLUSIONS

From the experimental investigation, the following conclusion were drawn

1. The compressive and split tensile strength results indicated that 15% replacement of cement with bagasse ash shown better strengths when compared with conventional lightweight concrete.

2. It can be concluded that, bagasse ash is predominant up to 15% as substitute for cement to produce structural light weight concrete which can be used for practical applications.

3. The proposed regression model well suited with the experimental results

4. The variation of strength results with the regression model is 4%

5. The bagasse ash can be used as supplementary or pozzolanic material for concrete works.

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AUTOMATED IRRIGATION SYSTEM WITH PUMP HEALTH DETECTION

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ABSTRACT

This paper deals with efficiently automating the irrigation process, which is the most important agricultural activity. This is achieved by determining two factors – availability of rain and moisture content of soil. There is a base station that fetches weather forecast to determine availability of rain and the pump node checks for soil moisture content to determine when to start pump. The communication between the base station and pump nodes are achieved using Zigbee protocol. When the soil moisture content goes below a certain percent, the pump node sends trigger to base station and return status of rain in the next 2 hours. Based on that response, if there is no upcoming rain, then the pump is started else it puts the pump on standby for next 2 hours. If rain does not occur during that duration, the pump is started. The pump remains active till a required moisture level is reached. This process saves a lot of ground water by smartly analyzing the conditions and deciding when to irrigate, without affecting plant health.

Keywords: Arduino, Irrigation, Moisture, Soil, Sensors, Wireless Sensor Networks, Zigbee

I. INTRODUCTION

India faces a major problem regarding water availability for irrigation of crops in the field. The management of irrigation in India is not fully developed and the irrigation facilities are inadequate. Under-irrigation of plants increases the salt content in the soil which is harmful for the growth of plants and second major problem is over-irrigation, which is mainly caused because of distribution of excess quantity of water to different varieties of plants. One of the basic and generic requirement for plants to grow is sufficient amount of water. This system provides a smart environment for plants to grow. It involves soil hygrometer sensors placed along with the crops on the field. These sensors measure the water content in the soil. The pump motors will also be constantly monitored and a plumber will be notified in case of mal-functioning. Systems using Weather forecast data (from Meteorological Department) can be effectively used in Smart Plant Watering System, weather forecasts provides the details of the weather conditions that help the farmers to decide whether to irrigate the field or not.

II.MICROCONTROLLER BASED IRRIGATION SYSTEM

The setup comprises of two nodes: 1)The Base station and 2) The Pump Node

1) The Base station - It uses a Raspberry Pi with Xbee and GSM Module [Fig. 1]. The GSM Module is used to fetch Weather forecast data (from Meteorological Department) and send SMS. The data received will be used to determine whether the pumps should be started, or wait if rain is expected within 2 hours. The communication between pump nodes and base station will take place using Zigbee protocol [1] in a star topology. The Base

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station acts as centralized management center. Solar cells are used to charge lithium ion batteries to power the whole system [2]. The base station can handle pump nodes within a range of 100 metres. The power requirements are very low and can be easily handled by solar cells.

2) The Pump node - It uses an Arduino UNO microcontroller [Fig. 2] to read and process data from soil sensors and start/stop the pump motor. The microcontroller will constantly monitor the soil moisture content using sensor and will trigger a request to Base station if moisture content goes below 15%. On successful response from the Base station, the pump motor will start and will continue irrigating till the threshold is reached. If rain is expected then the pump motors will stay on standby. If rain does not occur within the expected time period then the pump motors will start. The motors will keep running till the sensors detect the required amount of water in the soil. In case, the motor stops working or fails to start, a trigger is made to the base station module to notify the plumber via SMS.

2.1 The Schematic Diagrams

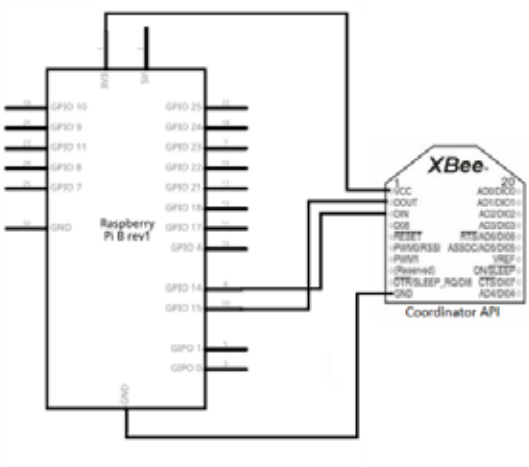

Fig 1 The Base Station

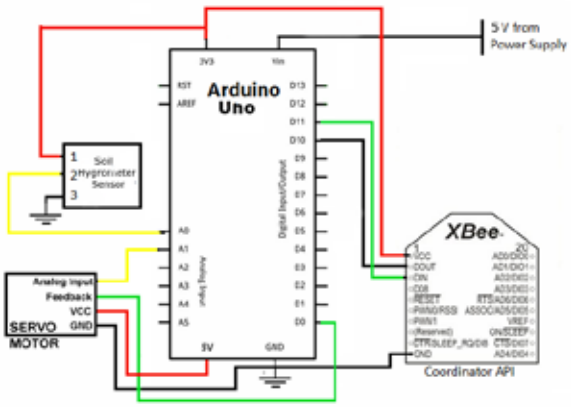

Fig 2. The Pump Node

2.2 Hardware components

1. Raspberry Pi (Model B) – Raspberry Pi is a credit-card sized computer with a 700 Mhz ARM v6 processor and 512 MB RAM. It has USB, HDMI, Audio out and LAN ports to allow a variety of input and output devices to connect to it. It has a very low power requirement of 5V and 700ma. It is used as base station to store information regarding different crops and, fetch and process weather forecast data from the Internet [4].

2. Arduino UNO – It is a microcontroller board based on the ATmega328. It has 14 digital input/output pins, 6 analog inputs, a 16MHz ceramic resonator and a USB port. It can be programmed easily using a computer. It is used to control the start and stop of motors based on data received from the soil moisture sensors.

3. XBee Module – The communication between the 2 nodes is accomplished wirelessly using the ZigBee protocol. XBee supports frequencies including 2.4 GHz, 902 - 928 MHz and 865 - 868 MHz [5][7].

4. GSM Module – The GSM module connects to the Internet using GPRS from the SIM card. It includes the SIM900 communication module.

5. Soil Hygrometer – This is a simple water sensor which can be used to detect soil moisture. When the soil moisture deficit module detects excess of water, it outputs a high level, and vice versa [3]. It has an operating voltage of 3.3V-5V. It has dual output mode, digital output and analog output, to be precise.

6. Pump Motor – The pump motor is controlled by digital pins of Arduino. It has 5V power supply. [6]

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III. SOFTWARE IMPLEMENTATION

The software code for handling the request and responses on the Base Station is written in Python on Raspberry Pi and in Arduino C for the Pump node on Arduino UNO. The figures belowdemostrate the working logic.

3.1 Flowcharts for the Software

Fig. 3 Workflow of the Base Station

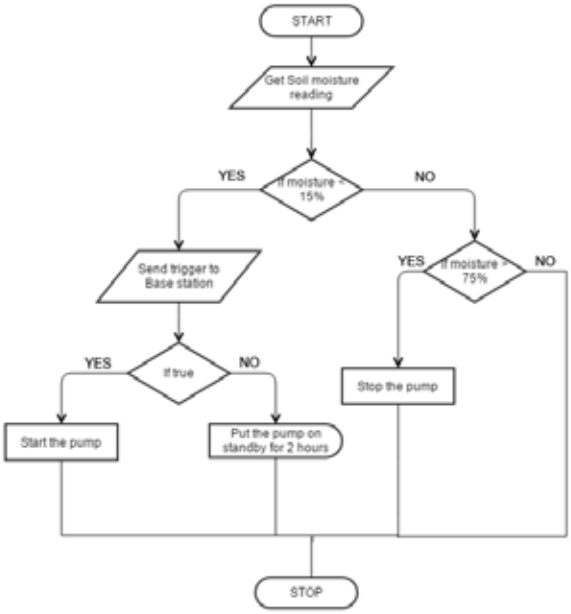

Fig. 4Motor Control on Pump Node

3.2 Software Code

Different Operational States Exchanged Between Both Nodes

S.No.	Operational States	Action Denoted
1	State 0	Request to Base Station
2	State 1	Response to start the motor
3	State 2	Response to delay for 2 hours
4	State 3	Notify plumber

3.2.1 The Base station

```
#Import required libraries
defrainStatus():
plumber = "+919500000005"
city = "Chennai"
current_date = time.strftime("%Y%m%d")
url =
'http://api.dataweave.in/v1/indian_weather/findByCity/?api_key=b20a79e582ee4953ceccf41ac28aa08d&city='+
city+'&date='+current_date
response = urllib2.urlopen(url)
data = json.loads(response.read())
```

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```
result = str(data["data"][0]["24 Hours Rainfall"][0])
if (result != 'NIL' and result != 'TRACE'):
        return 1
else:
        return 2
ser = Serial('/dev/ttyAMA0', 9600)
zb = ZigBee(ser)
while True:
try:
data = zb.wait_read_frame()
if data == '1':
        rain = rainStatus()
        zb.tx(dest_addr='\x00\x01', data=rain)
else if data == '3':
        sendSms(plumber);
exceptKeyboardInterrupt:
        break
ser.close()
```

3.2.2 The Pump node

```
#include <NewSoftSerial.h>
#include <Servo.h>
uint8_tpinRx = 10, pinTx = 11; // the pin on Arduino
longBaudRate = 9600;
char data;
intsoilSensor;
// Control and feedback pins
intservoPin = 0;
int feedback;
int state = 0;
// Initialize NewSoftSerial
NewSoftSerialmySerial(pinRx, pinTx );
Servo myservo;
void setup()
{
Serial.begin(BaudRate);
// This part is the NewSoftSerial for talking to XBee
mySerial.begin(BaudRate);
        myservo.attach(servoPin);
    }
voidmotorState(){
```

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```
            while(state == 1){
myservo.write(0);
delay(100);
myservo.write(360);
}
      }
void loop()
{
soilSensor = analogRead(A0);

if(soilSensor< 445){ //Moisture level below 15%
Serial.print("Moisture level below 15%");
data = '0';
mySerial.print(data);
}
else if(soilSensor> 850){ //Moisture level above 75%
Serial.print("Moisture level above 75%");
state = 0;
motorState(); //Stop the motor
}
// Monitor data from XBee.
if ( mySerial.available() ) {
data = mySerial.read();
if(data == '1'){
state = 1;
motorState(); //Start the motor
if(analogRead(A1) == 0){
                    data = '3';
                    mySerial.print(data);
                }
}else if(data == '2'){
delay(7200000); //Wait for 2 hours
   }
}
```

IV. CONCLUSION

The system optimizes irrigation procedures by eliminating human errors and providing optimum water requirement to the crops. It provides water at any time of the day based on the moisture content of the soil, which in turn reflects on plant health. Thus, by involvement of rain availability check, water conservation takes place and also helps to maintain the moisture to soil ratio at the root zone constant to some extent. This system

is scalable and can be easily deployed to fields of any size. The pump motors give feedbacks so whenever a motor fails to start, a notification message is sent from the base station to respective number via SMS.

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IMPLEMENTATION OF IRIS RECOGNITION USING FUSION OF HOMOGENEOUS FEATURES

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ABSTRACT

Biometrics is the integral part of the identification of individuals that is identity management. The work presented in this paper consists of developing an iris recognition system which will use the multiple features of the same person that is left and right eyes. This will help to increase the accuracy of the system. The system consist of segmentation stage which uses integro-differential operator for localizing the circular iris and pupil region, occlusions like eyelids and eyelashes, reflections. The segmented region was then normalized into rectangular block of fixed dimension. Finally, phase as a feature is extracted from normalized image using 1D-Log Gabor extraction. These extracted features scores of left and right iris are fused at feature level. The Hamming distance is used for matching the left with left image database and right with right image database.

Keywords: Biometrics, Feature Level Fusion, Iris, Log Gabor, Segmentation

I. INTRODUCTION

Iris is one of the features of the human body that can be used for the identification because of its uniqueness. Authentication plays a major role to defend against intruders. The three main types of authentication are: Something you know such as a password, something you have such as a card or token, something you are such as biometrics. Biometric identification utilizes physiological and behavioral characteristics to authenticate a person's identity as shown in Fig. 1.

Physical characteristics that may be used for identification include: Fingerprints, palm prints, hand geometry, retinal patterns and iris patterns. Behavioural characteristics include: Signature, voice pattern and keystroke dynamics. As in Figure 1 biometric system works by capturing and storing the biometric information and then comparing the scanned biometric with what is stored in the repository. A good biometric is characterized by use of a feature that is highly unique, stable, be easily captured.

Identity management refers to the challenge of providing authorized users with secure and easy access to information and services across a variety of networked systems. A reliable identity management system is a critical component in several applications that render their services only to legitimate users. Examples of such applications include physical access control to a secure facility, e-commerce, access to computer networks and welfare distribution. The primary task in an identity management system is the determination of an individual's identity.

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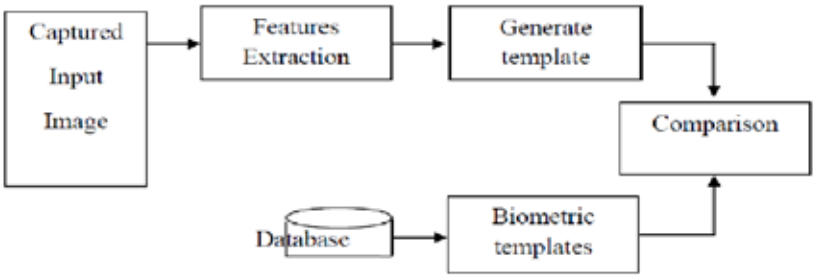

Figure 1: Biometric System

Traditional methods of establishing a person's identity include knowledge-based (e.g., passwords) and token-based (e.g., ID cards) mechanisms. These surrogate representations of the identity can easily be lost, shared or stolen. Therefore, they are not sufficient for identity verification in the modern day world. Biometrics offers a natural and reliable solution to the problem of identity determination by recognizing individuals based on their physiological and/or behavioral characteristics that are inherent to the person.

Iris recognition is a system that that will work as follows Image processing techniques can be employed to extract the unique iris pattern from a digitized image of the eye, encode it into a biometric template, which can be stored in a database. This biometric template contains an objective mathematical representation of the unique information stored in the iris, and allows comparisons to be made between templates. When a subject wishes to be identified by iris recognition system, their eye is first photographed, and then a template created for their iris region. This template is then compared with the other templates stored in a database until either a matching template is found and the subject is identified, or no match is found and the subject remains unidentified.

It is not always possible to capture the good quality of the single eye of the same person every time .so if we can use the both the eyes of the same person that is the multiple features the problem of missing features due to the noise or any environmental condition can be solved.

In this paper we proposed a work to consider both the eyes of the person to be identified. For this first the image is captured and an eye pair is detected and is classified as left and right and is stored in separate databases. And next the images in the databases are segmented and are normalized. Then the features are extracted and the scores of both the left and right iris are fused to get the single sore and that score is matched with the others for decision making.

II. PREVIOUS WORK

Many literary works uses the different methods for the iris recognition. [1] Make use of a constellation model to perform the iris segmentation task. The constellation model places multiple integro-differential operators at the current evaluating pixel in order to find the local minimum score. The pixel found to be at local minimum will be employed in the next iteration. The process is then iterated until it converges or the predefined maximum number of iterations is reached.

Two neutral network classifiers were trained by utilize local color features to classify image pixels into sclera/non-sclera and iris/non-iris categories. The trained classifiers operated in cascade order by firstly classifying sclera and then feeding the classified sclera pixels into the next classifier for iris pixels classification [2]. A new iris segmentation approach, which has a robust performance in the attendance of heterogeneous as well as noisy images, has been developed in this. The procedure starts with the image-feature extraction where

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three discrete i.e., (x, y) which corresponds to the pixel position, and z which corresponds to its intensity values has got extracted for each and every image pixel, which is followed by the application of a clustering algorithm which is the fuzzy K-means algorithm[3].

Simultaneously exploits two set of the features for sclera and iris classification. Iris features are extracted by exploiting localized Zernike moments. Sclera features are extracted by using discriminant color features. Pixel based strategy is in use [4]. Ocular recognition is a new area of investigation targeted at overcoming the limitations of iris recognition performance in the presence of non-ideal data. The coir database of metadata was developed by collecting the ocular features from the images which is already present in the database. Scale-invariant feature transform was able to dependably match ocular features without the need for segmentation [5].

In an iris recognition noise is considered as of the challenging issues. Where these noises having the different thresholds compare to normal regions, may cause improper detection of iris [6].To overcome the problems in the above mentioned works that only one iris feature is used always but we developed work for both iris in the remaining section.

III. PROPOSED METHOD

The proposed system as shown in fig.2 is to be composed of a number of sub-systems, which correspond to each stage of iris recognition. These phases are segmentation – locating the iris region in an eye image, normalization – creating a dimensionally consistent representation of the iris region, and feature encoding – creating a template containing only the most discerning features of the iris. An eye image will be an input to the system eye, and will get an iris template as the output, which will provide a mathematical representation of the iris region.

3.1 Segmentation

Segmentation is the first part of the iris recognition system after capturing the eye image. Daugman makes use of an integro-differential operator for locating the circular iris and pupil regions, and also the arcs of the upper and lower eyelids. The integro-differential operator is defined as in equation 3.1. This is done for the left and right eyes of the person.

$$\max_{(r,x_0,y_0)} G_\sigma(r) * \oint_{r,x_0,y_0} \frac{I(x,y)}{2\pi r} ds \qquad (3.1)$$

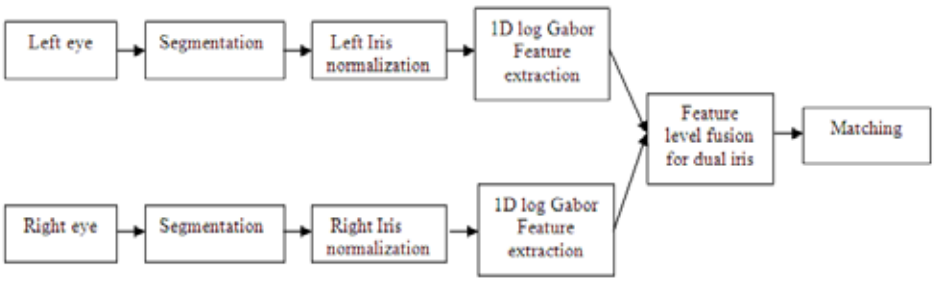

Figure 2: Proposed Method

3.2 Iris Normalization

Once the iris region is successfully segmented from an eye image, the next stage is to transform the iris region so that it has fixed dimensions in order to allow comparisons. Dimensional inconsistencies between eye images are mainly due to the stretching of the iris caused by pupil dilation from varying levels of illumination. For normalization of iris regions a technique based on Daugman's rubber sheet model is employed. :

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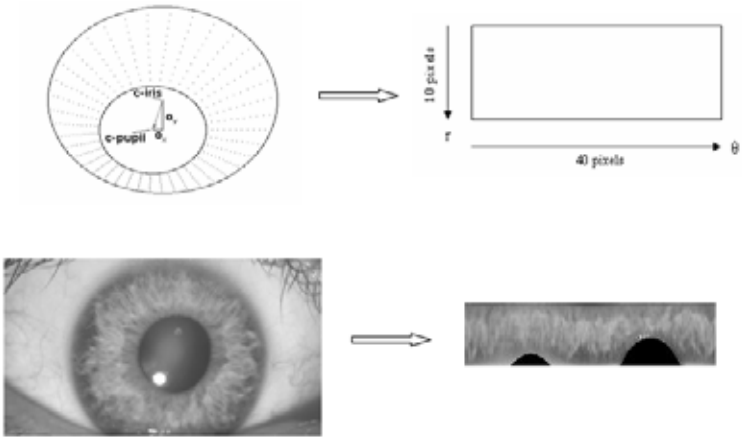

Figure 3: Outline of the Normalization Process

The illustration of normalization process is as shown in fig.3 with radial resolution of 10 pixels, and angular resolution of 40 pixels. Pupil displacement relative to the iris centre is exaggerated for illustration purposes. Once the two irises have the same dimensions, features are extracted from the iris region by storing the intensity values along virtual concentric circles, with origin at the centre of the pupil.

3.3 Feature Encoding

The most discriminating information present in an iris pattern must be extracted in order to improve the accuracy of the system. Evaluation between templates can be made accurately so only the important features of the iris must be encoded so that accuracy is improved. The template that is generated in the feature encoding process will also need a corresponding matching metric, which gives a measure of similarity between two iris templates.

Feature encoding as shown in fig.4 was implemented by convolving the normalized iris pattern with 1D Log-Gabor wavelets. The 2D normalized pattern is broken up into a number of 1D signal, and then these 1D signals are convolved with 1D Gabor wavelets. The rows of the 2D normalized pattern are taken as the 1D signal; each row corresponds to a circular ring on the iris region. The angular direction is taken rather than the radial one, which corresponds to columns of the normalized pattern, since maximum independence occurs in the angular direction.

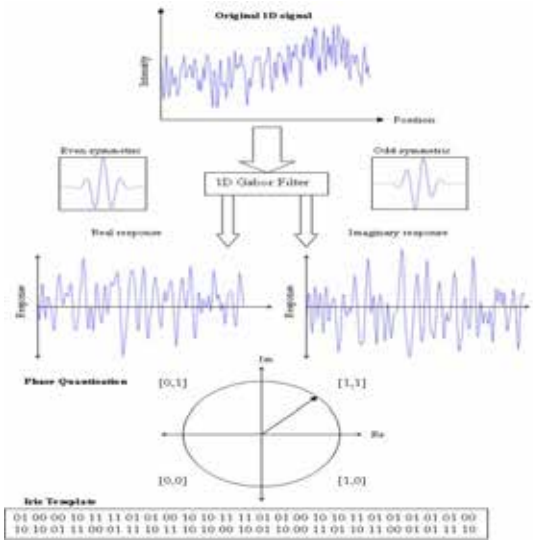

Figure 4: Feature Extraction

3.4 Feature Level Score Fusion

Feature level fusion refers to combining different feature vectors that are obtained from one of the following sources; multiple sensors for the same biometric trait, multiple instances of the same biometric trait, multiple units of the same biometric trait or multiple biometric traits.

When the feature vectors are homogeneous a single resultant feature vector can be calculated as a weighted average of the individual feature vectors. Feature level fusion can keep the intolerance of different biometric modal as much as possible. For dual iris fusion, suppose I_L and I_R are the left and right iris binary feature vectors. The complex fusion vector can be expressed as

$$F_{I_i} = I_{L_i} \times I_{R_i} \quad ien \qquad (3.2)$$

3.5 Matching

Normalized correlation between the acquired and database representation for goodness of match. This is represented as for matching, the Hamming distance was chosen as a metric for recognition, since bit-wise comparisons were necessary.

The Hamming distance algorithm employed also incorporates noise masking, so that only significant bits are used in calculating the Hamming distance between two iris templates. Now when taking the Hamming distance, only those bits in the iris pattern that match to '0' bits in noise masks of both iris patterns will be used in the calculation. The Hamming distance will be calculated using only the bits generated from the true iris region, and this modified Hamming distance formula is given as in equation 3.5

$$HD(A, B) = \frac{\|Code_A \otimes Code_B \cap Mask_A \cap Mask_B\|}{Mask_A \cap Mask_B} \qquad (3.5)$$

The distance between two feature vectors are calculated after fusing of the left and right iris is given by the following equation 3.6

$$HDF = (HD(I_{L_1}, I_{L_2}), HD(I_{R_1}, I_{R_2})) \qquad (3.6)$$

I_{L_1} and I_{L_2} are the left iris of first and second templates, I_{R_1}, I_{R_2} are the right iris template.

IV. CONCLUSION

For multibiometric systems, the effective fusion strategy is necessary for combining information from several single biometric systems. In this paper, an efficient multibiometric fusion approach that fuses left and right iris. It has better recognition performance and can defense the forgery attacks. High accuracy is obtained because even the twins don't have the same iris pattern, and patterns of the left and right eyes are unique.

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PERFORMANCE AND ANALYSIS OF T FLIP FLOP USING CMOS TECHNOLOGY

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ABSTRACT

This paper enumerates low power, high speed design of T Flip-Flop using CMOS technology. The design is implemented by converting D Flip flop to T Flip flop. The designed of T Flip-Flop is compared in terms of its area and power dissipation using DSCH and Microwind tools. As chip manufacturing technology is suddenly on the threshold of major evaluation, which shrinks chip in size and performance is implemented in layout level which develops the low power consumption chip using recent CMOS micron layout tools. The propounded design is the comparison between a flip-flop' auto generated CMOS layout and semicustom layout, which shows the corresponding reduction in power consumption from 57.766µW to 43.668 µW and area is reduced by 13 %.

Keywords: CMOS Technology, D Flip-Flop, T Flip-Flop, VLSI Design

I. INTRODUCTION

Wide utilization of memory storage systems and sequential logic in modern electronics triggers a demand for high-performance and low-area implementations of basic memory components. In these circuits, the output not only depends upon the *current* values of the inputs, but also upon preceding input values. These circuits are often called cyclic logic circuits. These Timing elements (TEs) include latches, flip-flops, registers, and memory storage cells are one of the most important components in synchronous VLSI designs[1,2].

Their performance has a critical effect on cycle time and they often account for a large fraction of total system power. Therefore, there has been significant interest in the development of fast and low power TE circuits, and correspondingly in techniques to evaluate their performance[4].

In electronics, a flip-flop or latch is a circuit that has two stable states and can be used to store state information. A flip-flop is a bistable multivibrator. The circuit can be made to change state by signals applied to one or more control inputs and will have one or two outputs. It is the basic storage element in sequential logic. Flip-flops and latches are a fundamental building block of digital electronics systems used in computers, communications, and many other types of systems[9]. These have applications which require the temporary retention of one or more bits. Some examples are counters, shift registers, and memories. Bistable circuits can also perform signal shaping functions, e.g., the Schmitt trigger, which exhibits hysteresis and is useful in this regard. The two requirements for realization of bistable operation are amplification (gain greater than unity) and positive feedback. A circuit meeting these requirements can be built using two cross-coupled inverters, as shown in Fig. 1. There are two stable states for this circuit: state 0 is characterized by $Q = 0$ and $Q' = 1$ and state 1 is

characterized by Q = 1 and Q' =0 Either state is stable and will be maintained as long as the system power is on; therefore, this circuit can retain 1 bit of information[10,11].

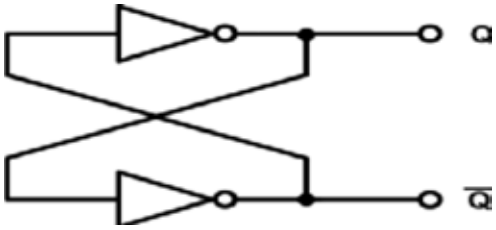


Figure 1: A Bistable Circuit Constructed With Cross-Coupled Inverters

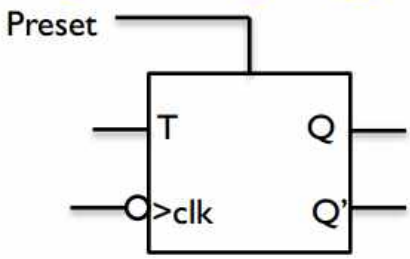
II. T FLIP FLOP

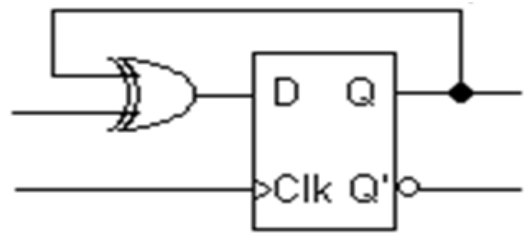
Toggle Flip flop which is also called T Flip flop symbol is shown in fig 2(a). If the T input is high, the T flip-flop changes state ("toggles") whenever the clock input is strobed. If the T input is low, the flip-flop holds the previous value.

This behavior is described by the characteristic equation:

$$Q_{next} = T \oplus Q = T\overline{Q} + \overline{T}Q$$

A T flip flop which is often used for counters can be realized by converting D flip Flop to T Flip Flop. This is accomplished by connecting an Ex-OR gate to the input of D Flip Flop.as shown in figure2(b). All of the popular flip flop can easily be modified to incorporate asynchronous set and/or reset inputs. A T flip flop alternately sends an output signal to two different outputs when an input signal is applied[2,7].





(a) A Circuit Symbol of T Flip Flop **(b) Conversion of D to T Flip Flop.**

Figure2. T Flip Flop

Table1: T Flip Flop's Characterstic & Excitation Table

T Flip Flop Operation							
Characteristic Table				**Excitation Table**			
T	Q	Q_next	Comment	Q	Q_next	T	Comment
0	0	0	Hold state (no clock)	0	0	0	No Change
0	1	1	Hold state (no clock)	1	1	0	No Change
1	0	1	toggle	0	1	1	Complement

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1	1	0	Toggle	1	0	1	Complement

Flip flops operation is illustrated in the above table which shows that T flip flop retain its state when the T is at logic '0', when T is at '1'state output get toggled.

The schematic design of the circuit is shown in figure3 where DSCH 3 is used as a logic editor and simulator.

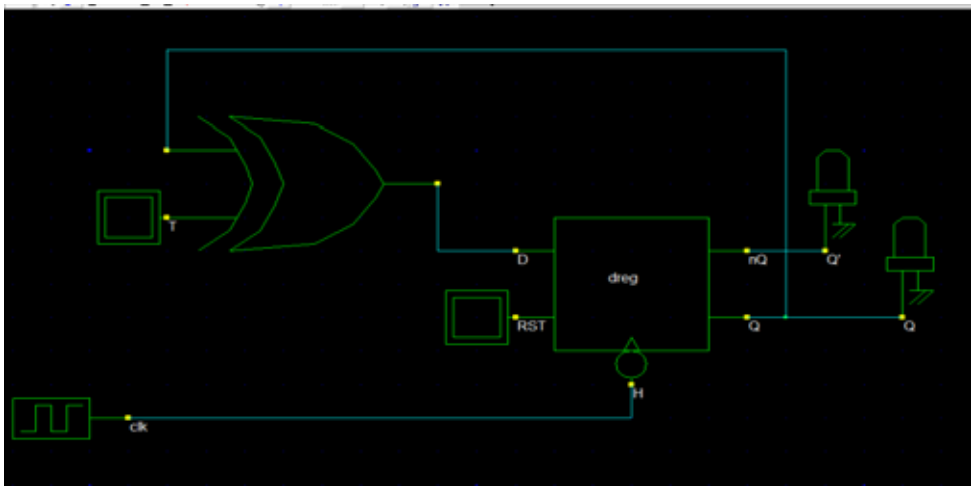

Figure.3 Schematic of T flip-flop

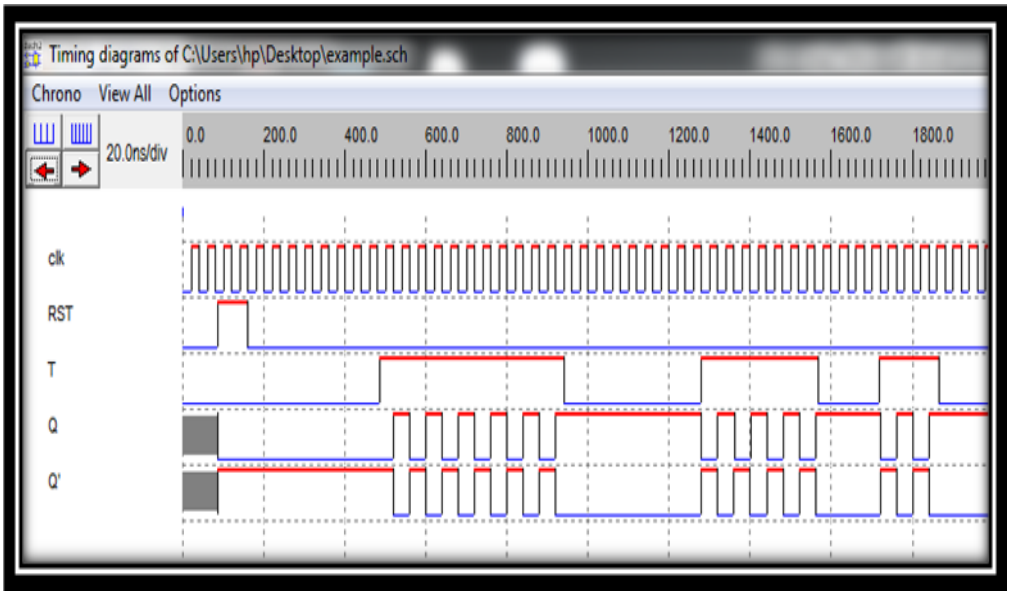

Figure.4: Transient Waveform of T Flip-Flop

III. DESIG OF LOW POWER, HIGH SPEED T FLIP FLOP USING CMOS

This propounded circuit is designed by using strong 1 (pull up) and strong 0 (pull down) transistors namely p-mos and n -mos transistors.

In the below figure, two 3 input NAND gates and two 2 input NAND gates have been used. Whereas out of them 10, n-mos transistors and 10 p-mos transistors, having total of 20 transistors. The efforts are done to give the common V_{dd} supply to reduce the power consumption.

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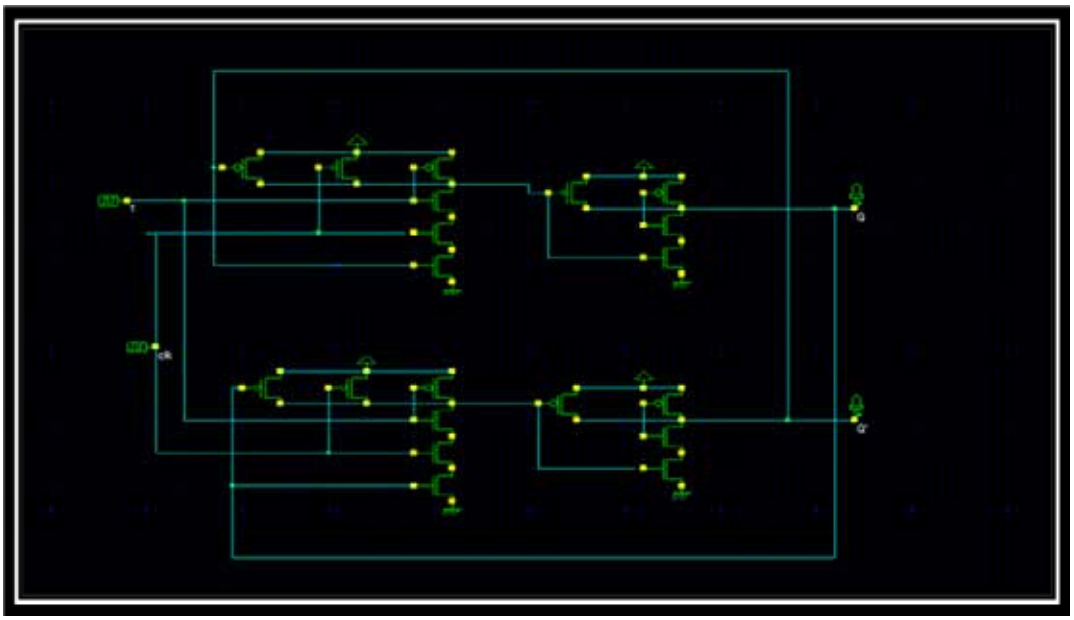

Figure.5: Schematic T Flip Flop in DSCH3

Layout Design Simulation: The first method is the designing of T Flip Flop in DSCH and generating its verilog file. Now in the Microwind this verilog file is compiled and an autogenerated layout is created.So selecting the different foundries available in the library of Microwind software. Here the foundry selected is 180 nm. The layout design of T Flip Flop generated is shown below fig 6.

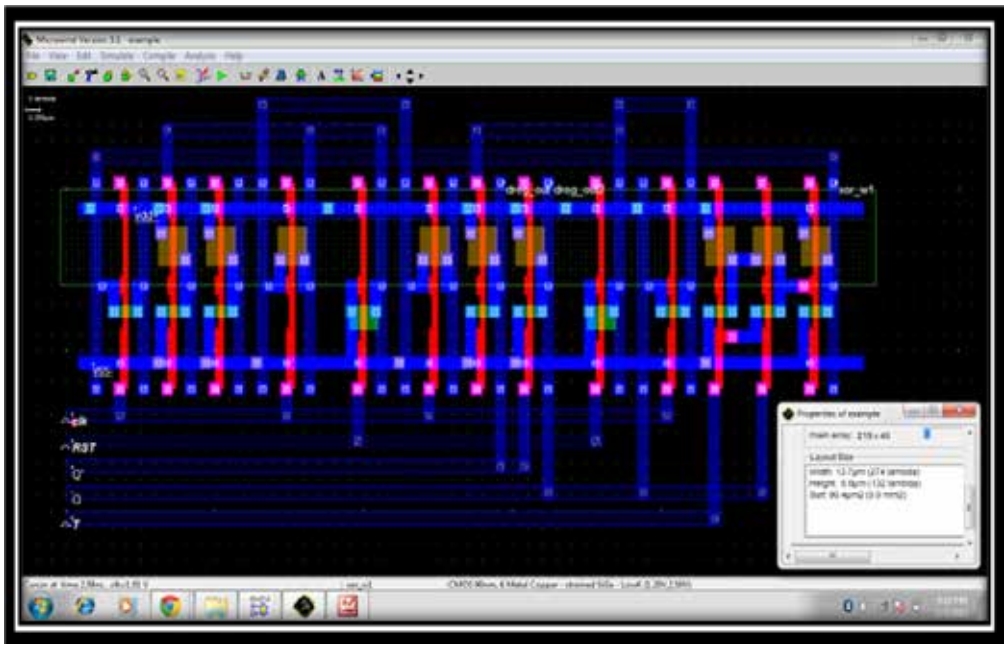

Figure.6: Autogenerated Layout of T Flip Flop

This layout is checked for DRC and if there is no error present, the layout is simulated. The output of the simulalation is checked and if the output matches the output of T Flip Flop, then further check out the area and power of this auto generated layout of the circuit.

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Figure.7 Simulated Waveforms of Auto Generated Layout of T Flip Flop

Figure 7 shows the simulated waveforms of the layout of fig 6. Simulation results shows that the auto generated layout has area of 90.4µm^2 and power is 57.766 µW.

The semicustom layout has been generated by using the inbuilt n-mos and p-mos with self-generated metal & poly silicon connections as shown in Figure 8. This design will leads to the less area consumption & low power consumption. When the layout is ready it is checked for the DRC and if there is no error present in the layout, the circuit is simulated and the outputs are obtained. The outputs are verified with the truth table of T Flip flop. After matching of the two further area and power are checked. Sumation result shows that it consume area of 77.2 µm^2 and power consumption is 43.668 µW.

Figure 8 shows the semicustom layout of T Flip Flop and figure 9 shows its simulated input output waveforms

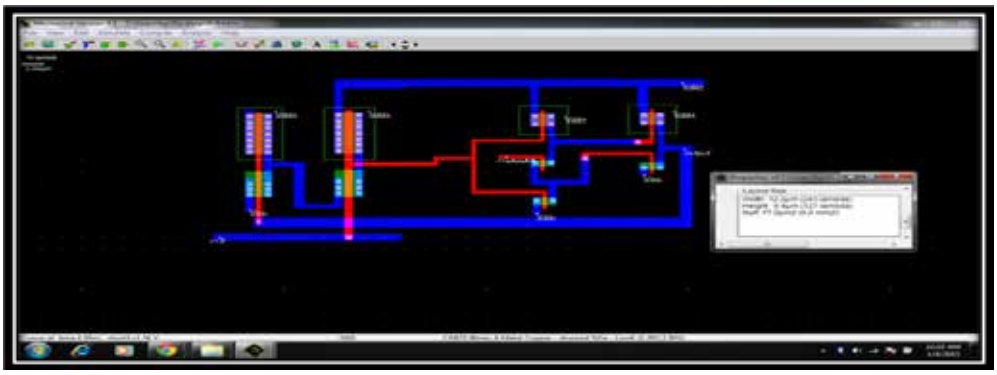

Fig.8 Semicustom Layout of T Flip Flop

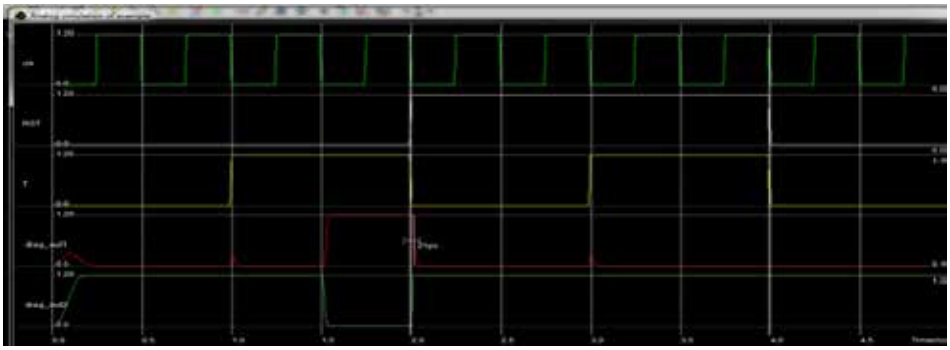

Figure 9 Simulated Waveforms of Semicustom Layout

IV. RESULT AND DISCUSSION

The below table is drawn on the basis of two parameters viz. power consumption & area used. Here analysis has done by comparing the layout of autogenerated and semicustom T flip flops.

Table 2: Comparative analysis of power and area consumption in T Flip Flop.

Parameter considered	Auto generated Layout	Semi Custom layout
Power Consumed	57.766 µW.	43.668 µW
Area Consumed	90.4µm^2	77.2 µm^2

A comparative analysis of this table shows that that the area reduced to about 13.2 % and power consumed by the layout reduced to about 14.09% in semicustom layout as compare to auto generated layout of the T flip flop.

V. CONCLUSION

In this paper, an exhaustive analysis and design methodology for T Flip-flop which is made by using D Flip-flop in 90nm CMOS topologies has been carried out. As the most serious problems in VLSI circuit is the area and power dissipation . So comparision has been performed with area and power consumed. The Flip-Flop designed using semicustom generated architecture decreases the power dissipation and area consumed as compared with the auto generated layout . Analysis result shows that the area reduced to about 13.2 % and power consumed by the layout reduced to about 14.09% in semicustom layout as compare to auto generated layout of the T flip flop.

VI. ACKNOWLEDGEMENT

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ARTIFICIAL HEART

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ABSTRACT

An artificial heart is a prosthetic device that is implanted into the body to replace the original biological heart. Artificial hearts are typically used to bridge the time to heart transplantation, or permanently replace the heart in case heart transplantation is impossible. Heart disease currently affects more than 100 million people around the world some of these diagnosed cases are so severe that patients may not survive the wait for a donor heart. In 1995, 2400 heart transplants were performed while 4000 patients awaited donor hearts; 731 of these patients died waiting. With the number of patients suffering from severe heart disease increasing and the number of donor hearts remaining constant, an immediate need exists for the advancement of artificial hearts. Artificial hearts provide a viable option for patient awaiting heart transplantation. Future developments on artificial hearts have the hope of eliminating the need for the transplantation completely.This paper evaluates the importance of artificial heart it aims prove to become the most effective choice for severely ill patients.Biomedical scientists and engineers have developed devices such as defibrillators, pacemakers, and artificial hearts to keep patients alive until a donor heart becomes available.

Keywords: Artificial Heart, Heart Failure, How Many People Suffer From Heart Failure

I. INTRODUCTION

Artificial hearts have been around since the early 1980s. The Jarvik-7 became the first permanent artificial heart in 1982. The patient implanted with the device lived for 112 days on the artificial organ. Patient was unable to leave his bed and was in severe pain until his death. Human life could be prolonged by artificial means, but patients still had to suffer after implantation. At this time, the risks, such as sub-standard quality of life, outweighedfuture benefits of artificial heart technology and all research was put off until positive results could be expected. After many technological developments in materials science as well as pharmaceuticals, artificial hearttechnology is once more in the spotlight. The complete artificial implantable heart and the ventricular assist device provide a mobile option for severely ill cardiac patients.At the end of 1998 American heart specialist Michael DeBakey performed a world - first in heart surgery with a totally new device. If this electric heart proves successful, it could be a permanent alternative to heart transplant.

II. HEART ANATOMY AND DISEASE

To completely understand the design development of the device, it is imperative to know the functions and diseases of the human heart. The heart is the most important organ in the human body. Even if a patient is considered brain dead, the patient is still considered alive until the heart stops beating. Though it serves such an essential role the mechanisms behind the human heart are relatively simple. The heart is pump that works based on positive displacement. Positive displacement refers to a change in volume with in a chamber due to the movement of fluid across its boundaries. From this volume change, pressure differences arise that drive the blood pumping

process. The heart has four chambers. These chambers or cavities are the right atrium, right ventricle, left atrium, and left ventricle. Each chamber connects to a one-way valve. When a cavity contracts, a valve opens and blood flows into the chamber. In summary, there are four valves, each associated with individual chamber. The following list identifies each valve with respective chamber.

•Mitral valve & left atrium

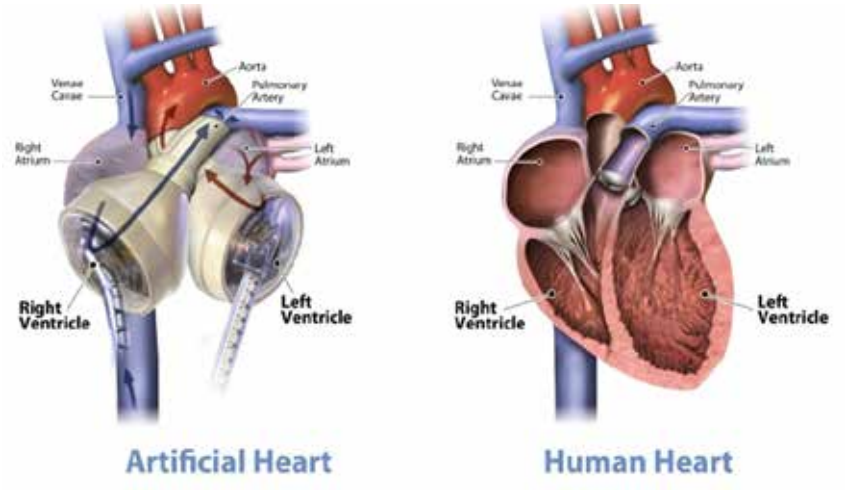
•Aortic valve & left ventricle

•Tricuspid valve & right atrium

•Pulmonary valve& right ventricle

The heart pumps blood to the body in two steps.First,the right and left atria contract, moving blood to the right and left ventricles. Second, the ventricles contract simultaneously to push the blood out of the heart and through the body. The heart then relaxes, allowing new blood to fill the atria. This contraction of the atria and the ventricles makes up aheartbeat.

Figure1 illustrates the anatomy of the human heart.



The human body needs oxygen in order to live. The circulatory system is responsible for filtering oxygenated blood and deoxygenated blood from the body. Blood enters into heart through two veins, the superior vena cava and the inferior vena cava. Both of these veins feed de-oxygenated blood into the right atrium. The right atrium contracts sending blood to the right ventricle. Blood flows from the right ventricle through the lungs by means of the pulmonary valve. Within the lungs the deoxygenated blood becomes oxygenated. The newly oxygenated blood flows through left atrium and ventricle, and the blood disperses through the body. Figure 2 recaps flow of blood through the heart. Like all machines, the Heart can malfunction numerous ways. Cardiovascular disease occurs when the heart becomes “clogged, broken down, or in need of repair”. Severe cardiovascular disease is the leading cause for heart transplantation, but other malfunctions such as valve damage and chamber problems also require the need for a new heart. Currently, 12 million Indians have at least one kind of cardiovascular disease. Heart disease is

thenumber one cause of death in India. Since many conditions fall under the in category of cardiovascular disease, we will focus on the two main causes for heart transplantation and artificial hearts:

1. Coronary Heart Disease(CHD):-afflicts approximately 20 percent of all patients diagnosed with cardiovascular disease. Patient’s symptoms can range from being mild to intolerable. CHD is the hardening of artery walls inside the heart. Arteries are essentially piping that connects heart valves together. In CHD, the transportation of blood becomes impaired when a mixture of fat and cholesterol, or plaque, lines the

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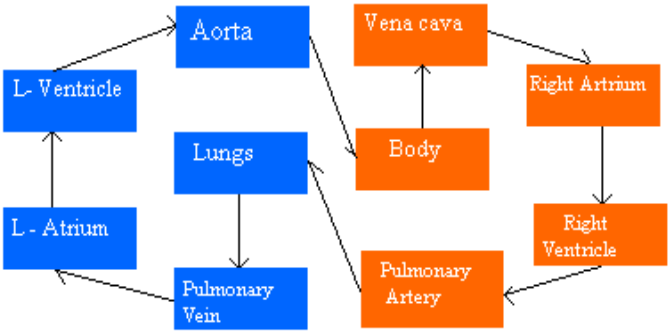
arteries the buildup of plaque restricts the free flow of blood, which induces pressure drop between the valves. The heart compensates for this pressure drop by pumping harder in order to provide enough blood for the entire body. Patients suffering from CHD often exhibit symptoms such as severe chest pain and fatigue due to the lack of oxygenated blood. For severe cases of CHD, the only cure is a heart transplant.

2. Congestive heart failure (CHF):- arises when the heart does not efficiently pump blood. Since the heart is unable to pump enough oxygen-rich blood, blood starts to fill in the lungs, which leads to congestion. Therefore, the heart must work harder in order to meet the body's oxygen demands. This behavior cause's excessive wear to the diseased organ initial symptoms of CHF, such as fatigue and swelling of the ankles, is usually so option. Until the condition becomes much more severe. As the disease progresses patients start to suffer from shortness of breath and palpitations even while remaining stationary. For extremely, severe cases, transplantation is the only option.



III. EFFECTIVENESS OF TRANSPLANTATION

Surgeons started developing heart transplantation techniques early as the 1900s. Preliminary transplantations conducted on animals proved to have fatal consequences caused by the donor organ rejection.Therefore doctorswere skeptical to try transplantation procedures on humans. In 1905, the first cardiac heart transplant was performed by two surgeons on a dog. They removed the heart of a dog and placed into the chest cavity of larger dog(Transplantation). Then the heartbeat resumed but the dog transplantation. Though the experiment had fatal results, this event stunned the medical community and spearheaded further research in field of cardiac expiredtwo hours after the operation.By definition, heart transplantation is "The replacement of a patient's diseased or injured heart with a healthy donor heart". Reaching the exact definition of transplantation proved to be an extremely difficult task. In order to deter organ rejection after transplantation, research was launched in field of immunosuppressant drugs. An immunosuppressant drug restrains a transplanted patient's immune system to prevent rejection of the implantedorgan. Dr. Gertrude Elion developed the first with end stage cardiovascular disease in 1957. Azathioprine proved to be useful tool that helped facilitate future advancements in organ transplantation.In 1967, Dr. Barnard performed the first human heart transplant in Cape Town, South Africa. Dr. Barnard implanted the donor heart from a 25-year old female into a 55-year old female with end stage cardiovascular disease. She lived for 18 days with the transplanted organ. Ironically, the medication prescribed to suppress rejection of the new organ weakened his immune system.Current heart transplantation techniques prove to be a viable option. According to the United Network of Organ Sharing (UNOS), 2,202 heart transplants were performed in 2001 compared to 170 transplants performed in 1970. Currently, approximately 70% of transplant patients live for five or more years after transplantation [UNOS, 1999]. These current statistics are staggering in comparison to the 14% survival

rate from the early 1970s. As of now more than 11,163 patients were awaiting heart transplant [UNOS, 2004]. Only about quarter of these patients will receive a new heart [UNOS, 2004].Since there is such a shortage of donor hearts. Therefore, further development provides a solution for all patients. Current development of artificial hearts strives to is necessary to provide a universal solution for these patients.

IV. TOTAL ARTIFICIAL HEART DEVELOPMENT

The development of artificial hearts reflects a transition from a support device to a completely self-contained machine. In the 1960s, the purpose of an artificial heart was to temporarily support patients until a donor heartbecame available. Surgeons attempted successful; however, many surgeons became wary of this device because it early 1980s by implanting an artificial heart intended for long-term therapy. The device they used was the Jarvik-7, a blood pump that replaces the heart's ventricles. The procedure was initially successful; however, many surgeons became wary of this device because it did not offer an acceptable quality of life. As a result, the public began to question the need for permanently removing vital components of the heart. The world of artificial heart technology then separated into two classes: assist devices and artificial hearts. In the 1980s, several organizations, including Penn State Medical Center, and the Texas Heart Institute, began developing ideas for new designs. Their intent was to engineer artificial hearts that could permanently sustain heart failure patients while providing a decent quality of life. These companies immediately encountered one huge barrier infection due to precutaneous or skin piercing, tubes. During the 1980s, every artificial heart had power cords, blood tubes, or air tubes protruding from skin. It was not until the early 1990s with the advent of transcutaneous technology.

V. MILESTONES IN THE ARTIFICIAL HEART TECHNOLOGY

•1960s – Surgeons implant the first temporary artificial heart.
•1970s – Engineers develop the ventricle assist device as an alternative to artificial heart
•1980s – First long term artificial heart results in poor quality of life.
VAD's show potential for long term support.
•1990s – Transcutaneous technology eliminates the need for skin –Protruding.
Electrical wiring, patients with long-term VDA's recovers from heart failure.
•2000s – Improved quality of life for patients after implantation.

VI. A COMPLETE ARTIFICIAL IMPLANTABLE HEART

This device is a permanent artificial heart that is completely self- contained within the body. Some cases like they may have failure on both left and right side of the heart. Before the introduction of the device, doctors had no option than to let these patients die. However, artificial heart developers, such as Penn State, focused their design parameters for patients who's hearts have irreversibly failing left and right ventricles. This category of patients comprises about 20% of those in need of a heart transplant. Designs for this device initially began in the early 1980s, around the time of the Jarvik-7. Only recently has the device artificial heart received. The device which was prepared by Abiomed with the same principle was approved by FDA for clinical testing. The large time span for approval results from the controversy caused by the Jarvik-7. The device design addresses key pitfalls encountered with the Jarvik-7. Improvements include better surface materials to reduce blood clotting

and a newly engineered power system that does not require skin piercingelectrical cords. These design considerations were applied to the new model and clinical testing of the device made by Abiomed has begun in the recent times. The first patient implanted with the device, was lived for nearly five months. This event caught the attention of the public because it was the first time a patient with an artificial heart was able to stand up and walk around. As of patients are alive today.

VII. DESIGN OF THE COMPLETE ARTIFICIAL IMPLANTABLE HEART

Three subsystems implanted under the skin make up the design of the device. These subsystems include the heart pump, a computerized pump controller, and a power source. All of the subsystems cumulatively,Weigh around 4 pounds and operate so quietly that stethoscope is needed to listen to the heart sounds. Surgeons implant the heart pump in the area from where the ventricles are removed. Channels that connect naturally to the ventricles are then sewn into artificial cuffs that snap on to the heart. Two independent hydraulic motors lie inside the heart. One motor maintains the pumping function to each ventricle while the other motor operates the motion of the four heart valves. The pumping motion operates through hydraulics by an oscillating pusher plate that squeezes sacs which alternatively expel blood to the lungs and the body. When the blood sacs become full, the exit valves are shut and the entrance valves are open. The pump then squeezes the sacs, which allows the exit valves to open and the entrance valves to close. The device is capable of producing more than two gallons of blood every minute, which signifies a higher output than the Ventricular assist devices(VAD). Similar in design to the VAD, a small computer secured in the abdomen of a patient automatically adjusts the output of the pump.The continual monitoring of blood flow guarantees that incoming flow matches outgoing flow. This rhythm ensures steady state pumping of the heart.

Picture of Complete Artificial Implantable Heart

The transfer of energy is also the same as in the VAD. Surgeons implant an electric coil in the abdomen area to allow for energy transfer across the skin. Patients wear a battery pack around the waist and must change the batteries several times daily. The system also includes an internal battery so that patient may uncouple the external power source in order to take a shower. One significant advantage to the device is the smooth surface of the blood sacs. Smooth plastics are important in order to ensure constant motion of blood cells. Any time blood stops moving along the of the device clotting develops. The smoothness of the plastic, called Angioflex, allows for minimal damage to the blood. Angioflex is also durable enough towithstand 1,00,000 beats a day for several years. This plastic is a major contibution to the life and to the safety of the device.

VIII.CONCLUSION

Heart failure is the leading cause of death in India and also all over the World. Most people die from heart failure chambers, fail to push enough blood through the body. A solution to donor heart rejection surfaced in the early 1980s with the advent of cyclosporine an immunosuppressant and this discovery, the average survival rate of heart transplant patients increased to more than 5 years. One of the drawbacks to heart transplantation is its availability is only half of the patients needing a heart transplant will receive a donor heart. The development of artificial hearts resurfaced again in 1993 with the advent of transcutaneous technology. Transcutaneous technology is based on the transfer of power across the skin by electric coils.This technology eliminates infection due to skin- protruding electrical tubes. Artificial hearts and heart transplantation are the only methods for saving the lives of patients with heart failure. As of today, heart transplantation is the official method for replacing the human heart. But, donor hearts are not available to all patients. Heart transplantation and artificial hearts are not a competing source of technology. These technologies exist parallel to each other in order to encompass the whole population of patients in need of a new heart. Hope this technology will soon reach to the common man in INDIA.

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SURVEY ON CAPTCHA-A NEW WAY OF GRAPHICAL SECURITY

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ABSTRACT

Graphical password schemes have been proposed as an alternative to text based password authentication, because users have difficulty in remembering passwords over time if they choose a secure password i.e. a password that is long and random therefore ,they tend to choose short and insecure passwords which consist of clicking on images rather than typing alphanumeric strings, may help to overcome the problem of creating secure and memorable passwords. In this paper we present a new security primitive based on hard AI problems, namely a novel family of graphical password systems built on top of captcha technology, which we call captcha as a graphical passwords(CGP).CGP addresses several security problems such as online guessing attacks, relay attacks and shoulder surfing attacks.

Keywords: CGP, Captcha, Graphical Password, Hotspots, Passpoints

I. INTRODUCTION

The most common user authentication scheme in computer systems today is the alphanumeric password. Although alphanumeric passwords are used widely, they have certain well known drawbacks such as low memorability of high entropy passwords. These drawbacks are not due to the authentication system itself but arise from the interaction between the users and the system. Since users usually cannot remember high entropy passwords they tend to select short or simple passwords, that can be broken by dictionary attacks. In order to improve the security of user authentication,we use hard AI (Artificial Intelligence), is an exciting new paradigm.Under this paradigm, the most notable primitive invented is Captcha, which distinguishes human users from computers by presenting a challenge.

CGP is click-based graphical passwords, where a sequence of clicks on an image is used to derive a password. Unlike other click-based graphical passwords, images used in CGP are Captcha challenges, and a new CGP image is generated for every login attempt.

CGP offers protection against online dictionary attacks on passwords, which have been for long time a major security threat for various online services. This threat is widespread and considered as a top cyber security risk [11]. Defence against online dictionary attacks is a more subtle problem than it might appear. CGP requires solving a Captcha challenge in every login.This impact on usability can be mitigated by adapting the CGP image's difficulty level based on the login history of the account and the machine used to log in.

II. LITERATURE SURVEY

Robert Biddle et.al,in their paper "Graphical Passwords:Learning from the First Twelve Years" ,presented a great many graphical password schemes as alternatives to text-based password authentication. In the beginning around 1999, a multitude of graphical password schemes have been proposed,graphical password improved the password memorability and thus usability, while at the same time improving strength against guessing attacks. Text passwords involve alphanumeric and/or special keyboard char- acters, the idea behind graphical passwords is to leverage human memory for visual information, with the shared secret being related to or composed of images or sketches. Like text passwords, graphical passwords are knowledge-based authentication mechanisms where users enter a shared secret as evidence of their identity. Text passwords are easy and inexpensive to implement but the disadvantage is that, passwords are typically difficult to remember, and are predictable if user-choice is allowed. One method to reduce problems related to text passwords is to use password managers. These typically require that users remember only a master password. They store and send on behalf of the user the appropriate passwords to web sites hosting user accounts. Ideally the latter are generated by the manager itself and are stronger than user-chosen passwords. However, implementations of password managers introduce their own usability issues[2] that can exacerbate security problems, and their centralized architecture introduces a single point of failure and attractive target: attacker access to the master password provides control over all of the user's managed accounts. In this paper they have provided a comprehensive review of the first twelve years of published research on graphical passwords. graphical passwords allows for better understanding of knowledge-based authentication in general by looking at issues such as user choice in password selection, memory interference, and the role of cueing in password memorability.

Alain mayer et.al,in their paper "the design and analysis of graphical passwords", they explored an approach to user authentication that generalizes the notion of a textual password and that, in many cases, improves the security of user authentication over that provided by textual passwords. Graphical passwords, which can be input by the user to any device with a graphical input interface. A graphical password serves the same purpose as a textual password, but can consist, for example, of handwritten designs (drawings), possibly in addition to text. The graphical password is due to Blonder [4],the scheme in which the user is presented with a predetermined image on a visual display and required to select one or more predetermined positions on the displayed image in a particular order to indicate his or her authorization to access the resource.In this paper author's have designed two graphical password schemes and those are considered to be more secure than textual passwords. The first graphical password scheme is based on textual password schemes, by enhancing the input of textual passwords using graphical techniques and the second scheme is called "draw a secret"(DAS), which is purely graphical, the user draws a secret design (the password) on a grid.

Susan Wiedenbeck et.al, in their paper "PassPoints: Design and longitudinal evaluation of a graphical password system", described a new, more flexible, and more secure graphical password system that have been designed and implemented, and also the security properties of the system compared to alphanumeric passwords and some other graphical password systems. In 1996 Blonder has proposed his idea for graphical passwords ,his approach was to let the user click, with a mouse or stylus, on a few chosen regions in an image that appeared on the screen. If the user clicks on correct regions, the user was authenticated, otherwise the user was rejected. Most of the graphical password systems can be classified based on either recognition or cued recall. Recognition In a graphical password system,the user has to be able only to recognize previously seen images, not generate them

unaided from memory. Cued recall is an intermediary form of recollection between pure recall and pure recognition an example of cued recall is scanning an image to find previously chosen locations in it.The existing graphical password uses these two schemes.A new graphical password scheme is proposed in this paper namely passpoints.This scheme is flexible because it allows any image to be used, e.g. natural images, paintings, etc. The images could be provided by the system or chosen by the user. By using passpoints Graphical password scheme users were able to create a valid password easily , but they had more difficulty learning their passwords than alphanumeric users, taking more trials and more time to complete the practice.

Sonia Chiasson et.al ,in their paper" Influencing Users Towards Better Passwords: Persuasive Cued Click-Points "focuses on Persuasive Cued Click-Points scheme which is effective in reducing the number of hotspots (areas of the image where users are more likely to select clickpoints) while still maintaining usability.This scheme is based on cued click-points scheme. The primary goal of PCCP was to increase the effective password space by guiding users to select more random passwords.Hotspots are a problem in click-based graphical passwords, leading to a reduced effective password space that facilitates more successful dictionary attacks. They investigated whether password choice could be influenced by persuading users to select more random click-points while still maintaining usability[6,7,8]. Using cued click points as a base system, they added a persuasive feature to encourage users to select more secure passwords, and to make it more difficult to select passwords where all five click-points are hotspots. Specifically, when users created a password, the images were slightly shaded except for a randomly positioned viewport. The viewport is positioned randomly rather than specifically to avoid known hotspots, since such information could be used by attackers to improve guesses and could also lead to the formation of new hotspots. The viewport's size was intended to offer a variety of distinct points but still cover only an acceptably small fraction of all possible points. Users were required to select a click-point within this highlighted viewport and could not click outside of this viewport. If they were unwilling or unable to select a click-point in this region, they could press the "shuffle" button to randomly reposition the viewport. While users were allowed to shuffle as often as they wanted, this significantly slowed the password creation process. The viewport and shuffle buttons only appeared during password creation. During password confirmation and login, the images were displayed normally, without shading or the viewport and users were allowed to click anywhere. PCCP encourages and guides users in selecting more random click-based graphical passwords. A key feature in PCCP is that creating a secure password is the "path-of-least-resistance", making it likely to be more effective than schemes where behaving securely adds an extra burden on users. The approach has proven effective at reducing the formation of hotspots and avoiding known hotspots, thus increasing the effective password space, while still maintaining usability.

Paul Dunphy et.al ,in their paper "Do Background Images Improve Draw a Secret Graphical Passwords?",they presented Draw a Secret [3] ,it is a representative graphical password scheme,in which a user's password is a free-form drawing produced on an N × N grid. DAS is alphabet independent and so is accessible to users of all languages. However, recent research suggests that DAS users might tend to pick weak graphical passwords that are vulnerable to the graphical dictionary attack [10]. In this paper, they presented their own solution to this problem, a novel variant of the DAS scheme which we call BDAS (Background Draw-a-Secret). In BDAS, instead of creating a password on a blank canvas overlaid with a grid, a user will first choose a background image to be overlaid by the grid, and then draw their secret as in DAS. We aim to study whether this variant will enhance the original scheme. Specifically, we are interested in exploring whether a background image would encourage users to choose more complicated passwords, which are usually less vulnerable to dictionary and

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other guess attacks. We are also interested in whether the background image could aid users to remember their passwords. BDAS is more effective than DAS both for user authentication and for key generation.

III. METHODOLOGY

3.1 Cgp: An Overview

In CGP, a new image is generated for every login attempt, even for the same user. CGP uses an alphabet of visual objects (e.g., alphanumerical characters, similar animals) to generate a CGP image, which is also a Captcha challenge. A major difference between CGP images and Captcha images is that all the visual objects in the alphabet should appear in a CGP image to allow a user to input any password but not necessarily in a Captcha image. Many Captcha schemes can be converted to CGP schemes, as described in the next subsection.

CGP schemes are clicked-based graphical passwords. According to the memory tasks in memorizing and entering a password, CGP schemes can be classified into two categories: recognition and a new category, recognition-recall, which requires recognizing an image and using the recognized objects as cues to enter a password. Recognition-recall combines the tasks of both recognition and cued-recall, and retains both the recognition-based advantage of being easy for human memory and the cued-recall advantage of a large password space.

3.2 User Authentication With Cgp Schemes

Assume that CGP schemes are used with additional protection such as secure channels between clients and the authentication server through Transport Layer Security (TLS). A typical way to apply CGP schemes in user authentication is as follows. The authentication server *AS* stores a salt *s* and a hash value $H(\rho, s)$ for each user ID, where ρ is the password of the account and not stored. A CGP password is a sequence of visual object IDs or clickable-points of visual objects that the user selects. Upon receiving a login request, *AS* generates a CGP image, records the locations of the objects in the image, and sends the image to the user to click her password. The coordinates of the clicked points are recorded and sent to *AS* along with the user ID. *AS* maps the received coordinates onto the CGP image, and recovers a sequence of visual object IDs or clickable points of visual objects, ρ', that the user clicked on the image.

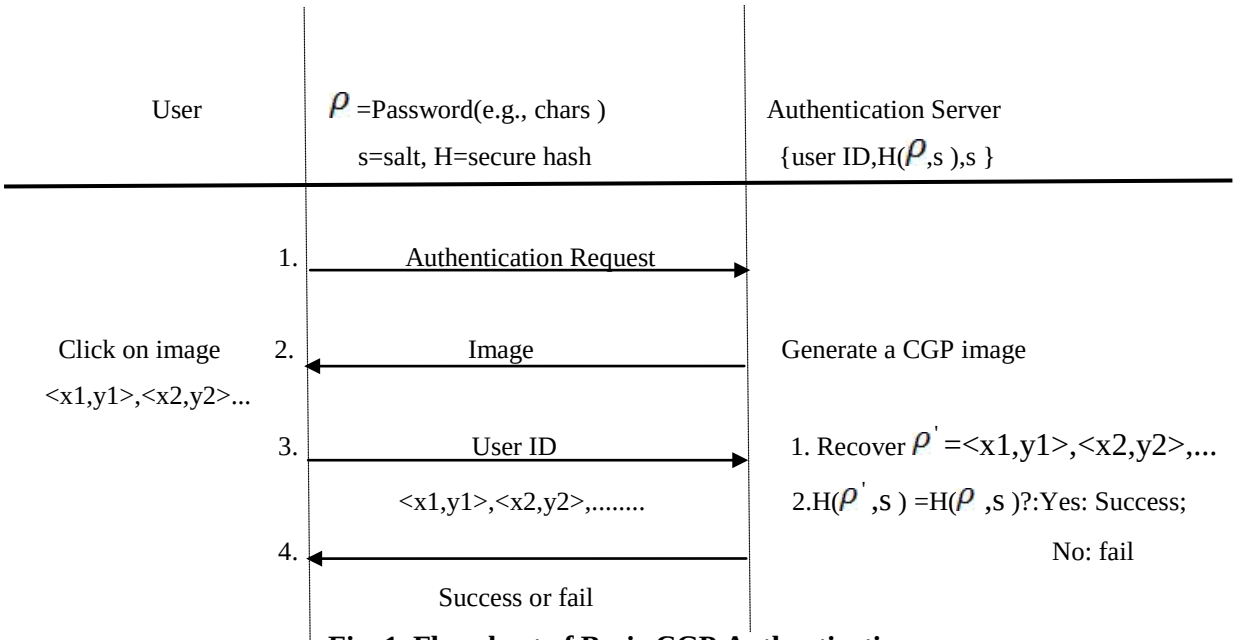

Fig. 1. Flowchart of Basic CGP Authentication

Then *AS* retrieves salt *s* of the account, calculates the hash value of ρ' with the salt, and compares the result with the hash value stored for the account. Authentication succeeds only if the two hash values match. This process is called the basic *CGP* authentication and shown in Fig. 1.

IV. CONCLUSION

We have presented a survey on graphical password scheme that achieve better security than conventional textual passwords.CGP is both captcha and a graphical password scheme. The notion of CGP introduces a new family of graphical passwords ,which adopts a new approach to counter online guessing attacks. a new CGP image, which is also a Captcha challenge, is used for every login attempt to make trials of an online guessing attack computationally independent of each other. CGP forces adversaries to resort to significantly less efficient and much more costly human-based attacks. CGP is also resistant to Captcha relay attacks, and, if combined with dual-view technologies, shoulder-surfing attacks and it can also help reduce spam emails sent from a Web email service. Typical application scenarios for CGP include, CGP can be applied on touch-screen devices whereon typing passwords is cumbersome, especially for secure Internet applications such as e-banks. For better results we would need to collect thousands of graphical password data for different types of images. Overall, our work is one step forward in the paradigm of using hard AI problems for security.

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APPLICATION OF GREEN CHEMISTRY IN TECHNOLOGY

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ABSTRACT

Green chemistry approach is changing the way a chemical industry creates new product for use and is slowly creating a revolution in the industry. Application of green chemistry in technology can be the solution for mounting scientific evidence and growing public concern about the risk of chemicals used in consumer products and main processes. This paper aims to correlate the concept of green chemistry in restraining the use and generation of hazardous substances and transforming the technology in a better way to ensure quality living and promote sustainable development. Green chemistry is a prevention oriented lifecycle approach based upon twelve principles like waste prevention, atom economy and use of renewable feed stock. It also directs to minimise the use of hazardous substances, develop innovative designs to enhance energy efficiency and curtails the use of stoichiometric reagent. In today's fast paced environment, human beings are at the centre of concern for sustainable development. They are entitled to a healthy and productive life in harmony with nature. With any problem, comes the opportunity to find creative solutions and application of green chemistry in technology is the perfect solution to meet this problem.

Keywords*: *Green Chemistry, Hazardous Substances, Sustainability, Stoichiometric Reagents, Ergonomic hazard.

I. INTRODUCTION

Today we are living in a scientifically dominated environment where science is controlling our life in almost every task we perform. Science has transformed our lives in many ways, ever branch of science Physics, Chemistry, Biology, Biotechnology to name a few are benefiting the society through research and development, innovations etc [1].

Chemistry to be specific has played a very important role in providing solutions in the areas related to medicines, polymers, food products, cosmetics, paints, agrochemicals, bio molecules etc. Scientists have worked hard to develop better and more appropriate solution to the consumer's problems and to create sustainability. But benefits and limitations go hand in hand and if we ignore the boundary conditions we may incur losses. On one side continuous research and development provides innovations, sustainability, it on the other will have detrimental consequences as well [2].

The problem arises when there is reckless usage of chemicals, unattended disposal of harmful substances that creates environmental imbalance. Because of such practices much legislation came to existence and emphasis

has been on the development of measures to address these issues. This has led to the development of concept of GREEN CHEMISTRY [3].

II. GREEN CHEMISTRY

By definition, Green chemistry is the design, development, and implementation of chemical products and processes to reduce or eliminate the use of substances hazardous to human health and the environment. The efforts are focused on how to reduce the evil consequences of the chemical industry and also to allow economic progress and environmental growth to proceed in harmony through modifications of engineering practices and bioremediation and eco-friendly reaction media leading to almost zero waste [4].In order to achieve such goals this concept utilises a base in the form of principles to be followed for achieving the desired objective. These principles are termed as the foundation stones of this concept. The 12 principles of green chemistry are

2.1Prevention

It is better to prevent waste than to treat or clean up waste after it has been created.

2.2 Atom Economy

Synthetic methods should be designed to maximize the incorporation of all materials used in the process into the final product

2.3 Less Hazardous Chemical Syntheses

Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to human health and the environment.

2.4 Designing Safer Chemicals

Chemical products should be designed to affect their desired function while minimizing their toxicity

2.5 Safer Solvents and Auxiliaries

The use of auxiliary substances (solvents, partition agents , etc.) should be made unnecessary wherever possible and innocuous when used.

2.6 Design for Energy Efficiency

Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure

2.7 Use of Renewable Feedstocks

A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable.

2.8 Reduce Derivatives

Unnecessary use of blocking groups, protection/ de-protection, temporary modification of physical/chemical processes should be minimized or avoided if possible, because such steps require additional reagents and can generate waste

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2.9 Catalysis

Catalytic reagents (as selective as possible) are superior to stoichiometric reagents.

2.10 Design for Degradation

Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment

2.11 Real-time analysis for Pollution Prevention

Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances.

2.12 Inherently Safer Chemistry for Accident Prevention

Substances and the form of a substance used in a chemical process should be chosen to minimize the potential for chemical accidents, including releases, explosions, and fires [5].

III. GREEN CHEMISTRY IN TECHNOLOGY

Undoubtedly science plays a key role in research and development but applied science i.e the Technology is no more inferior to it as well. Technology is nothing but the application of basic sciences to real time methods for the production and development of products [1]. As we are concerned with the detrimental effects of chemistry in science there are ill effects in the technological aspects as well. In a process industry to be specific there are many risks and hazards associated with such as 1. Physical Hazard, 2. Chemical Hazard, 3. Ergonomic Hazard, 4. Psychological Hazard and 5. Biological Hazard. So to address these risks and hazards and to counter their effects green chemistry principles can be helpful. When green chemistry principles are applied to the applied science the green chemistry will convert to green engineering. Thus parallel to green chemistry Green engineering is defined as the design, commercialization, and use of processes and products, which are feasible and economical while minimizing *(i) Generation of pollution at the source and (ii) Risk to human health and the environment*. Green engineering practice requires concerns about environmental quality related not only to production and product use but also to useful materials or potential energy embedded in products because this product becomes input to several product cycles instead of merely ending up as waste ready for land filling after one life cycle. Like principles of chemistry there are 12 principles of green engineering as under [6].

3.1 Inherent Rather Than circumstantial

Designers need to strive to ensure that all materials and energy inputs and outputs are as inherently nonhazardous as possible.

3.2 Prevention Instead of Treatment

It is better to prevent waste than to treat or clean up waste after it is formed

3.3 Design for Separation

Separation and purification operations should be designed to minimize energy consumption and materials use.

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3.4 Maximize Efficiency

Products, processes, and systems should be designed to maximize mass, energy, space, and time efficiency.

3.5 Output-Pulled Versus Input-Pushed

Products, processes, and systems should be "output pulled" rather than "input pushed" through the use of energy and materials.

3.6 Conserve Complexity

Embedded entropy and complexity must be viewed as an investment when making design choices on recycle, reuse, or beneficial disposition.

3.7 Durability Rather Than Immortality

Targeted durability, not immortality, should be a design goal.

3.8 Meet Need, Minimize Excess

Design for unnecessary capacity or capability (e.g., "one size fits all") solutions should be considered a design flaw.

3.9 Minimize Material Diversity

Material diversity in multi component products should be minimized to promote disassembly and value retention.

3.10 Integrate Material and Energy Flows

Design of products, processes, and systems must include integration and interconnectivity with available energy and materials flows

3.11 Design for Commercial "Afterlife"

Products, processes, and systems should be designed for performance in a commercial "afterlife."

3.12 Renewable Rather Than Depleting

Material and energy inputs should be renewable rather than depleting. [7]

IV.CONCLUSION

The green chemistry revolution is providing an enormous number of challenges to those who practice chemistry in industry, education and research. With these challenges however, there are an equal number of opportunities to discover and apply new chemistry, to improve the economics of chemical manufacturing. In the future, the synthetic chemist will need to be as concerned about atom efficiency as the synthetic route and the process chemist will need to be as concerned about the waste produced as the product to be made. It is already becoming evident that the more successful chemical manufacturing companies of the future will be those that can exploit the economic, legislative and public image advantages that a clean technology approach to chemical manufacturing can provide. [8]

The twelve principles of Green Chemistry cover the fundamental aspects of chemistry, chemical engineering and technology. In the case of Green Engineering the twelve principles are similar aspects of basic aims and goals for attaining sustainability. The framework of Green Engineering through its 12 principles covers some of the most important industrial processes and technological issues developed in the last decades. The 12 principles of Green Engineering are not a list of goals, but a set of the important methodologies that need changing in order o achieve these goals and promote sustainable development. [9]

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A REVIEW ON BAYESIAN NETWORK TECHNIQUES FOR INFERRING GENE REGULATORY NETWORKS

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ABSTRACT

Gene regulatory networks are gaining lots of importance among researchers now-a-days. Gene regulatory networks (GRN's) play an important role in evolution of every living being. GRN's are the networks of interaction among genes where nodes represent genes and edges represent interaction among them. GRNs are also of great use in drug designing research as more effective drugs can be produced by using precisely predicting Gene regulatory network tools and methods. Researchers have proposed many approaches to infer Gene regulatory networks. Bayesian networks approaches has been widely used due to its stochastic nature. This paper presents a review of Bayesian networks and its extension in Gene regulatory networks.

Keywords : Bayesian Networks, Directed Acyclic Graphs, Gene Regulatory Networks (GRN's)

I. INTRODUCTION

Research in cellular biology has attracted many researchers in last decade. There has been a shift in biological research. The focus of research was study of smaller molecules such as RNA, DNA, and Proteins etc. But now researcher have started thinking about how these molecules are related to each other. Now-a-days researchers believe that the system can be understood as whole rather than to analyze each molecule differently.

Genes play an important role in production of proteins which are building blocks of living being system. Information is required for production of proteins from genes in genome of every cell. This information controls which genes will produce which protein from that cell. This process of production of protein is central dogma of molecular biology. Some proteins regulate production of different proteins via interaction with different genes. Now this interaction of proteins with genes may have different impact on production of proteins. They may enhance the production of proteins and are known as *activators*.

In contrast they may reduce the production of proteins and are known as *suppressors* or *inhibitors*. These produced proteins may interact with other genes for production of other proteins and this cycle goes on. This genomic level interaction can be represented as a network where nodes represent the proteins or genes and edges represent their relationship i.e. activation or inhibition. No edge means two are not related directly. This special network of interaction of genes, proteins is known as Gene Regulatory Networks. At particular experimental conditions status of genes and their effect on other genes is observed to construct GRN's.

Reconstruction of GRN is quite interesting but difficult task for researchers. In medical, root of many diseases caused due to improper functioning of regulatory processes can be simplified by using effective tools for predicting GRN. Many costly and tedious experiments will be replaced by these GRN inferring methods which will save lots of effort, time and money involved in large biotechnological projects. GRN can also be used to

study and analyze the long term effect of drugs in our body. This will also be helpful in analyzing the dynamics of genes under drugged, diseased or experimental conditions. Hereditary diseases can also be analyzed and studied in greater detail with precise GRN inference methods. With these advantages many techniques have been proposed to model and infer gene regulatory networks.

In literature many reviews[1]–[5]have been made which consider all the major approaches. One of most widely used is Bayesian network for construction of Gene regulatory networks. This method considers the expression data as set of random variables and associates probabilities with them. Then these probabilities are used to construct networks. In this paper a review on the available techniques/variations in GRNs using Bayesian networks has been presented. At the outset, the overview of all other approaches and the basics of Bayesian networks are given. Then the brief description of different computational approaches for construction of GRNs is highlighted followed by description of Bayesian network techniques to infer the GRNs. At last the conclusion is given.

II. COMPUTATIONAL APPROACHES TO INFER GRN'S

Gene regulatory networks show the interaction among a number of genes. GRNs should be accurate and reliable as much as possible. Different approaches like Boolean networks [6]–[8], Probabilistic Boolean network[9]–[12], Ordinary Differential Equations [13]–[15], Artificial Neural Networks [16]–[18], Bayesian Networks have been used to maximize the accuracy and reliability of the constructed GRNs. The description of the Bayesian network and its various variations used to infer GRNs is mentioned below

III. BAYESIAN NETWORK TECHNIQUES TO INFER GRNS

Bayesian networks have been widely used in modelling gene regulatory network because of their stochastic nature. These networks are also noise resistant in nature and can also deal with missing gene expression data values. These can also model GRN's quantitative aspects. These network poses some difficulties such as learning is categorized as NP-hard problem for Bayesian networks. But to counteract these problem certain extensions of Bayesian networks have been proposed that use heuristic search methods to search for best network topology having highest score defined according to certain criteria. In this section the brief introduction of the Bayesian networks is given followed by some extensions or applications of Bayesian networks to construct gene regulatory networks

3.1 Bayesian Networks

Bayesian networks are directed acyclic graphs (DAGs). DAG structure is represented using tuple D= (Z, E), with a set of local probability distributions C, where Z represents the set of nodes (which represent random variables) and E represents the set of directed edges (which are direct dependencies between random variables). C has local probability distribution for each node Z_i conditioned on parents of that node, represented as p(Z_i|parents(Z_i)). In particular if there is an edge Z_i to Z_j then it represents there is dependency of variable Z_j onZ_i. In other words, value of variable Z_j is dependent of value of variableZ_i. Also, in this case Z_i is referred as parent and Z_j is referred as child.

3.2 Bayesian Network To Handle Perturbed Expression Profiles

Pe'er et al.[19] used the framework given by Friedman[20] to infer finer relations from perturbed gene expression profiles. They try to answer questions which deal with finer structure. For example, which genes are responsible for interaction between cluster of gene or within clusters? What is the type of interaction between genes? Gene expression for each gene was treated as a random variable provided by gene expression. Most standard methods focuses on pairwise relationships of genes but biological process of gene regulatory network may not be so simple, there may be a chain of mediators between a pair of genes. Pe'er et al. also addresses this concept during inference of gene regulatory networks.

3.3 Bayesian Networks Combined Expression Data With Prior Knowledge

Werhli and Husmeier[21] reconstructed gene regulatory networks with the use of prior biological information to obtain better results. Prior knowledge is represented in form of energy functions. They derived and tested Markov Chain Monte Carlo (MCMC) sampling to sample networks and hyper-parameters from posterior distribution. This enabled automatically learning by system to tradeoff between information from expression data and prior biological knowledge. This approach was combined with Bayesian coupling scheme to reconstruct gene regulatory networks from datasets, which were sampled under different experimental conditions.

3.4 Bayesian Networks And Cross Correlation For Large Number of Genes

Yavari et al.[22]tried to reconstruct gene regulatory network for larger number of genes. Increase in number of genes cause number of possible graphs to increase exponentially and this makes an exhaustive search intractable. So number of genes is increased but they are clustered using existing biological knowledge (gene ontology annotations). After applying clustering, Bayesian network is used to model casual relations among genes in individual groups. And the sub-networks are integrated to make a global network. Also, there is time delay in real GRNs but Bayesian network is a static method which does not consider time delays so Yavari et al.[22]proposed a technique to include time delay in Bayesian networks using concept of cross correlation applied on co-clustered genes

3.5 Bayesian Network Based Sparse Graph Search Algorithm

Yang et al.[23]proposed an algorithm based on Bayesian network to reduce computational time of reconstructing gene regulatory networks. The authors called it Sparse Graph Search algorithm (SGS). They used heuristic approaches to find optimal network in network space

3.6 Bayesian Model Averaging Approach To Infer Large Scale Grns

Kim and Gelenbe[24] presented a technique for reconstructing large scale gene regulatory networks. Constructing large scale GRNs for large number of genes has always been a challenging problem. They combined many appropriate models using Bayesian model averaging approach (BMA). This method is applied on human brain tumor dataset and three large scale networks were built and it included 4422 genes

3.7 Bayesian Network With Uniting Of Partial Problems

Watanabe et al.[25] presented an estimation method of inferring gene regulatory network. Partial problems were united using Bayesian networks. Two problems were addressed. This method can estimate large scale networks.

As real gene regulatory system may contain cyclic structure, this method allows cyclic structure in graph. Firstly whole problem is divided into partial problems of three genes (triplet) each. After dividing problem into sub-problems, scores of all possible DAGs for each sub problem is calculated. Next the three-gene networks are combined to solve original problem

IV. CONCLUSION

This paper has discussed many methodologies using Bayesian network framework to infer gene regulatory network. Some of these methods have reduced computational time and some have tried to reduce dimension of dataset using some preprocessing of datasets. Brief overview of these methods and techniques is given in TABLE 1. The problem of dimensionality is major focus of future research. Another problem is to infer precise network for large number of genes. There has been tremendous growth in this area of research in last few decades. Tools have been developed to reduce dimensionality to increase accuracy and precision in GRN's. At the end, there is need for faster and efficient algorithms that can infer GRNs not only precisely but also for large number of genes.

Table 1: Overview of Methodologies/Techniques Using Bayesian Network

Ref. No.	Description	Dataset	Key points
[19]	Inferred network for perturbed gene expression profiles	Saccharomyces cerevisiae	· Discretization process applied to datasets · Inter-cluster interactions also discovered
[21]	Combined the expression data with prior knowledge	Saccharomyces cerevisiae Synthetic RAF-pathway	· a Bayesian coupling scheme for learning gene regulatory networks · better network accuracy
[22]	Clustered the genes and applied cross correlation to include time delay	Saccharomyces cerevisiae	· Accuracy and sensitivity increased
[23]	Sparse Graph algorithm based on Bayesian network	Escherichia coli	· Computational time reduced,detected relations between 100 nodes in few minutes
[24]	BMA approach for large scale networks	Human brain tumor	· Prior knowledge added · Uncertainties in model selection taken into account · Better performance
[25]	Bayesian network with uniting partial problems	Mouse adipocyte and osteoblast	· More accurate with reduced computational time

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