

ANDROID BASED OBJECT RECOGNITION INTO VOICE INPUT TO AID VISUALLY IMPAIRED

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ABSTRACT

In this paper we present the main features of software modules dedicated to the aid of visually impaired or blind users. The main aim of developing this software is to reduce or eliminate the need of separate dedicated devices for object recognition and motion detection. The software modules are designed for Android operating system, used in majority of the smart phones today. This project proposes a principal component analysis (PCA) algorithm to recognize the object. To support real-time scanning of objects, we developed a key frame extraction algorithm that automatically retrieves high-quality frames from continuous camera video stream of mobile phones. The sequence is approximately capture 3 frames per second. The object is recognized then converted into text, BY text to speech application it is converted into the voice output. so we have developed an off-line navigation device that uses 3-D sounds to provide navigation instructions to the user.

Keywords: *Blindperson, Principal Component Analysis (PCA), Text-To-Speech(TTS), Imageprocessing, Object Recognition, Visually Impaired.*

INTRODUCTION

The visually impaired and blind people face numerous challenges in routine tasks such as making coffee or crossing roads. Identification of objects and movement in the surroundings is a primary challenge for them which normal sighted people take for granted. We aim to provide some assistance to them via software based on android platform which will help ease the difficulty of performing the task of object identification and motion detection. There are about 285 million visually impaired people in the world, around 39 million of which are blind. Currently, the most popular choice of Smartphone's among visually impaired users is iPhone or Android based phones. Commonly, the non-operating system devices are not preferred by blind users as they do not offer special functions such as text to speech conversion.

One can find a number of dedicated devices for navigation and object recognition. These wearable devices have the disadvantage that they are expensive in comparison to software. Also, the blind users are required to carry a number of gadgets and devices, each for a different purpose such as object identifiers, navigators and mobile phones.

Software that will run on the blind user's Smartphone's will eliminate the need to carry several devices.

Development of PCA algorithms for object detection on Android is gaining popularity. Most algorithms focus on desktop applications.

The other solutions available at present include: Low-tech labeling systems in which labels are attached to objects, e.g. with tactile signs or text messages in Braille. High-tech systems that employ 1-D and 2-D barcodes,

talking labels or radio-frequency identification devices (RFID).RFID can be used to search for objects at short distances to which RFID tag was applied using an acoustic signal.

These systems are not only costly but they also require continuous maintenance to keep them up to date.

In this paper we aim to present an aid for visually impaired and blind people for object recognition and motion detection. The software is based on image processing system running on Android platform. The object recognition and motion detection notifications are provided to the user via verbal messages.

The paper is structured as follows. In section I we review software applications for mobile devices that are specially devoted to blind users. In section II (A) image processing and analysis algorithms that were applied in object recognition module in the developed applications are described. In section II (B) image processing and analysis algorithms that were applied in motion detection module in the developed applications are described.

II.RELATED WORKS

We have chosen the Android platform because of the immense popularity of Android devices. According to Gartner's analysis in the end of 2012 this mobile platform has gained 70% share of the Smartphone market. [1] Further it also provides built in speech synthesis software. Google search through voice has been available since initial release. Voice actions for calling, texting, navigation, etc. are supported on Android 2.2 onwards. As of Android 4.1, Google has expanded Voice Actions with ability to talk back and read answers from Google's Knowledge Graph when queried with specific commands. The voice search and Talkback services in android facilitate use for blind people. Further, most smart phones have built-in, good quality digital cameras, GPS services, audio and video recorders, etc. These can be utilized by the dedicated software with ease.

A number of image analysis software's for mobile devices can be found in the market. The Eye Ring project is one such application. It is a finger-worn device intended as an aid for blind users. This device communicates with an Android phone which runs the speech processing and image analysis algorithms. It provides facilities such as bank note recognition, color recognition and distance calculation. It also works as a virtual cane. However the major drawbacks of Eye Ring are its high cost and that the blind user has to wear an additional device. Another software developed to aid blind and visually impaired people is Recognizer developed by LookTel. This application is developed for iPhones and can recognize objects that are previously stored in a local database. In most cases it requires a sighted person to capture objects and an audio message is to be recorded identifying the objects. It is intended to help visually impaired people identify household objects. But, for images with arbitrary orientation of objects, the results of recognition are not specified . Further, Matusiak et al provide software modules for object recognition, color detection and light source detection. They have used a combination of SIFT and FAST algorithms. However, the modules do not have any provision for motion detection. Performance of the algorithms used depends on the quality of the built in camera.

III. SYSTEM DESIGN

Figureshows the overall architecture of our proposed method which considers all the above issues as shown in fig 1.

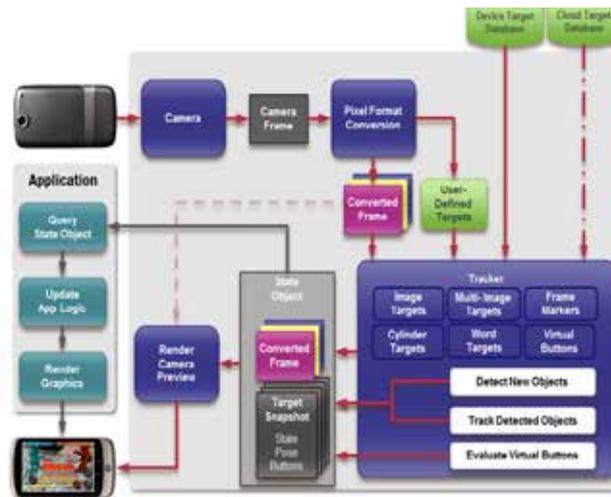


Fig 1: System Architecture

3.1 Image processing methods

There are two types of methods used for image processing:

- i. Analog image processing or visual techniques of image processing: used for printouts and photographs.
- ii. Digital image processing: processing digital images by using a computer. This technique includes three phases for processing images: pre-processing, enhancement and display, information extraction.
 - Ø Image pre-processing or image restoration consists of correcting the image from different errors, noise and geometric distortions.
 - Ø Image enhancement improves the visual aspect of the image, after the correction of errors, to facilitate the perception or interpretability of information in the image.
 - Ø Information extraction utilizes the computer's decision-making capability to identify and extract specific pieces of information or pixels. The different image processing techniques used in the Phone Reader Project help in extracting the text contained in the image taken by the user.

3.2 Data Flow Diagram

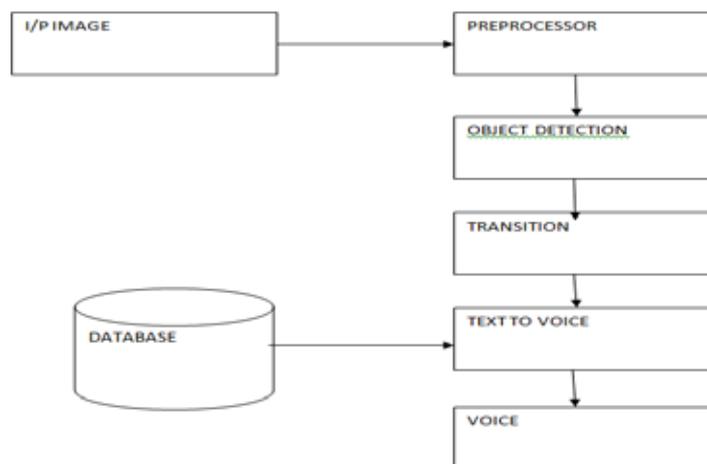


Fig 2: Data Flow Diagram

IV. MODULES

4.1 Frame Extraction

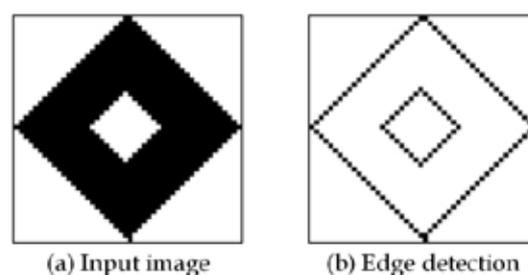
The application allows recognizing objects from images recorded by the camera of a mobile device. The object recognition algorithm should be insensitive to image registration parameters, i.e. scale, rotation and lighting conditions. Moreover, the recognized object should be robustly detected and localized in the image context (e.g. among other similar objects).

An RGB image is captured using the mobile phone camera. First, this image is blurred to reduce effect of noise. A 5X5 kernel is used for the same and average of the R, G and B values for the 25 pixels is found and applied to the central pixel. Blurring is done in order to reduce defects in the image such as small dark spots. This image is then converted to Grayscale format. Thus, now only the intensity information of the image is contained in the pixel. This image which is made up of shades of grey is obtained by iteratively taking the average of the R, G and B values for each pixel forming the image. Fig3 represents the flow of image detection in our module. Following functions are performed.

4.2 Edge Detection

The Sobel operator is used for edge detection. We use a 3X3 Sobel matrix which is convoluted with our source image. The x-coordinate is defined here as increasing in the right direction changes, and the y-coordinate is defined as increasing in the down direction changes. According to this the gradient can be approximated. These gradient approximation in the x and y direction can be used to calculate Gradient Magnitude.

After calculating Gradient for the image, the required Edges can be detected as is seen in Fig1. The required features of the image (i.e. object to be detected) are extracted using thresholding method. In this method, a binary image is generated with only black and white color. The required features are converted to white (or black) and the background is set to black (or white), respectively.



4.2.1 Thresholding

Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images with only black or white colors'. It is usually used for feature extraction where required features of image are converted to white and everything else to black (and vice-versa). Fig2 represents a thresholded image made up of only black and white colors'.



4.2.2 Blob Detection

The next operation performed is blob detection. Blob detection refers to mathematical methods that are aimed at detecting regions in a digital image that differ in properties, such as brightness or color, compared to areas surrounding those regions. Informally, a blob is a region of a digital image in which some properties are constant or vary within a prescribed range of values; all the points in a blob can be considered in some sense to be similar to each other. Since we have separated foreground (say black) and back ground (white) of an image in thresholding process. Hence by using those intensity values we compare x-coordinates of an image to find x min and x max. Similarly we do for Y-axis and find y min and y max and store it in a matrix and draw a blob over an object.

Further, a key point detection procedure is performed. To improve performance of the application the Features from Accelerated Segment Test (FAST) algorithm was implemented. It is one of the fastest corner detection algorithms. The FAST corner detector is commonly used to track objects in different frames [2]. That is, FAST corner detector algorithms extract feature information, and rotation and movement information in different frames can be computed through feature matching, which is often based on a distance between the vectors, e.g. the Euclidean distance of feature vectors.

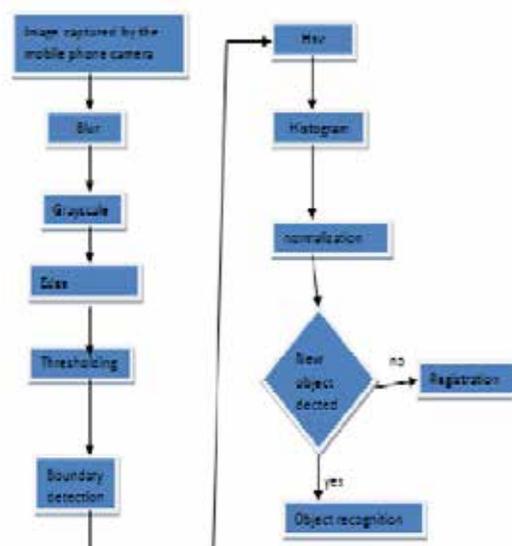


Fig 3: Blob Detection

In the application, corner information is extracted from the input image using the FAST corner detector and objects are recognized via BPNN (Back Propagation Neural Networks) machine learning. The number of

interest points is then adjusted by normalization of extracted corners. [2] The FAST corner detector finds corners by examining a circle of sixteen pixels around the corner candidate. This candidate is detected as a corner if the intensities of a certain number of contiguous pixels are all above or all below the intensity of the center pixel by some threshold. The extracted interest points lie on distinctive, high-contrast regions of the image .

4.2.3 Histogram

Key points descriptor obtained from SIFT method is based on gradient magnitudes computed for 16 or 4 pixels adjacent to a key point. These values are used to form the histogram. By looking at the histogram for a specific image a viewer will be able to judge the entire tonal (i.e. representation of variation in the perception of a color) variation of an image. The left side of the horizontal axis represents the black and dark areas, the middle represents medium grey and the right hand side represents white area. Thus if an image is dark then majority points will be located in the left side of the histogram similarly the grey points and the lighter points of an image can be located respectively in the middle and the right side of an histogram.

4.2.4 Object Recognition

In this object is recognized by selecting the frame by a key frame algorithm for efficient frame selection, after that the object is converted into pixels. Then pixels is matched with the stored folder if the object recognized it will convert it to voice output, otherwise it take the object as new one then it will be saved if recommended.

4.3 Background Removal

When the frame is captured from the video is converted to pixels, the most repeated pixel are removed because it is a background image, it is done to make easy recognition of object soon. In this module we construct the color histogram of each frame and remove the colors that appear most frequently in the scene. These removed pixels do not need to be considered in subsequent detection processes. Performing background color removal cannot only reduce object info but also speed up the detection process.

4.4 Object Extraction

The second module of our application is the motion detection module. Fig4 shows the flow of operations performed in this module. Here a video stream is taken using camera of android mobile phone and is processed to estimate motion. The aim of motion detection is to identify moving objects from a sequence of image frames especially traffic which will alert the blind user. Several approaches have been proposed to the problem of motion segmentation. In conventional video surveillance systems, most of the motion detection is performed by using thresholding methods video stream is nothing but the stream of images taken continuously after 0.25 seconds. Hence we work on these images to detect motion and on successful detection we alert the user about it .Along similar lines, users are alerted when the motion (specifically moving vehicle) has stopped and there is no motion in front of the camera. As seen in the object detection module, the image is blurred to reduce effect of noise. A 5X5 kernel is used for the same and average of the R, G and B values for the 25 pixels is found and applied to the central pixel. Blurring is done in order to reduce defects in the image such as small dark spots. This image is then converted to Grayscale format. Thus, now only the intensity information of the image is

contained in the pixel. This image which is made up of shades of grey is obtained by iteratively taking the average of the R, G and B values for each pixel forming the image.

4.5 Feature Extraction

In this module we extract the feature from the image frame. In this module we do the following Edge Detection, Corner Detection, color Transformation and color classification and it will determine obstacle and image recognition result.

4.5.1 TTS

After the object recognition, the text stored in the object below is converted into the voice output to the blind user. It is done by the text to speech application in android OS.

V. OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

- a) Designing computer output should proceed in an organized, well thought out manner; the right output must be developed while ensuring that each output element is designed so that people will find the system can use easily and effectively. When analysis design computer output, they should Identify the specific output that is needed to meet the requirements.
- b) Select methods for presenting information.
- c) Create document, report, or other formats that contain information produced by the system.

5.1 Speech output

This module has been added specifically to alert user about the motion in front of them and to convey the results of object detection to the blind users (especially when crossing roads). If motion is detected, the object is recognized and it converted into the TTS to alert the users. Due to this, blind users can take necessary precautions or stop for a while till the motion in front of them stops.

VI. CONCLUSION

With over 39 million visually impaired people worldwide, the need for an assistive device that allows the blind user navigate freely is crucial. We have developed an off-line navigation device that uses 3-D sounds to provide navigation instructions to the user.

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A COMPREHENSIVE STUDY OF THE RECOMMENDATION SYSTEMS IN LOCATION BASED SOCIAL NETWORKS

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ABSTRACT

With the astonishing growth of the social networks, especially Location-Based Social Networks (LBSNs), and the increase in the number of users, there is a vigorous need for services based on location-based social networks. These LBSNs allow users to check-in at various locations and to share their current location among their friends. They provide a large amount of data for analysis. This can be used for location recommendation, activity recommendation, generic and personalized travel recommendations, itinerary planning etc. In this paper we are going to have an extensive study on the current trends in LBSN. Then we identify the demerits of the existing works and propose new methodologies that would essentially overcome the demerits of the existing methodologies.

Keywords: Location-Based Social Networks, location recommendation

I. INTRODUCTION

A Location-Based Social Network consists of a social network structure comprised of individuals who are connected by means of an interdependency acquired from their physical locations in the real world and the location-tagged media content shared by them on the different locations. The interdependency between two persons can be the knowledge or the information derived from the individual's location history and the location-tagged data. It can also be the location history, common interests, behaviors and activities of the individuals who are supposed to be part of the respective social network. The evolution of LBSN is marked with the introduction of Dodgeball in the year 2000. The Dodgeball users could check-in and broadcast their current location to their friends who are available within a specific radius through the use of short messages. With Dodgeball the users could arrange meetings among their friends by sending shouts. Dodgeball was acquired by Google in 2005. Then Google replaced Dodgeball with Google Latitude in 2009. Meanwhile, another location based social networking site named Foursquare was started by the founder of Dodgeball. It allows people to check-in at various places and to post their tips. It was also possible for the users to post their tips to Twitter or Facebook. It provides the users with recommendations of locations, from which he or she can opt. A number of LBSNs are available for use now-a-days viz. Brightkite, Gowalla, Facebook Places. It is studied that the number of people using smartphone has increased from 46% in 2012 to 62% in 2014. Almost 75% of the people use their phone to get the recommendations. Around 18% of the people use smartphone to access location-based social network services. More than 82 million people have subscription to LBSNs by last year. By 2016, LBSN marketing is

heading to be about \$1.8 billion business. Studies have shown that similar patterns occur in the location histories of users in the LBSNs. For instance, the user check-in patterns differ during weekdays and weekends. Similarly, the number of check-ins decreases as the radius increases. Such kind of pattern analysis helps in near absolute recommendations for the users in LBSNs.

II. CATEGORIZATION OF LBSNS

The social networking services can be broadly classified into three groups based on what the user shares. They are discussed below.

- **Geo-tagged-media-based:** allows addition of a location label to the media, either implicitly or explicitly. This can be further used to enrich the media content in a geographical context.
Eg: Flickr, Geo-Twitter
- **Point-location-based:** allows users to share their current locations, so that it can be viewed by others. This facilitates the initiation of activities at particular locations. The user generated contents shared by people at various locations can be used for near accurate recommendations.
Eg: Foursquare, Google Latitude
- **Trajectory-based:** allow people to share locations and routes or the trajectories connecting various locations. User generated contents can also be taken into account while performing recommendations. This information can be used for various objectives like route recommendation, itinerary planning, activity recommendation etc.
Eg: Microsoft GeoLife, SportsDo

III. SURVEY OF RELATED WORK

We will proceed with the survey with respect to the taxonomy of recommendation systems. This classification is based on various aspects like what is being recommended and the technique used by the recommendation system. The taxonomy for the recommendation systems can be represented as shown in fig.1.

Location recommendation systems recommend stand-alone locations to the user. Stand-alone locations refer to Point of Interests and regions. Itinerary recommendation usually refer to travel routes and sequences. User recommendation systems recommend popular users, potential friends or communities.

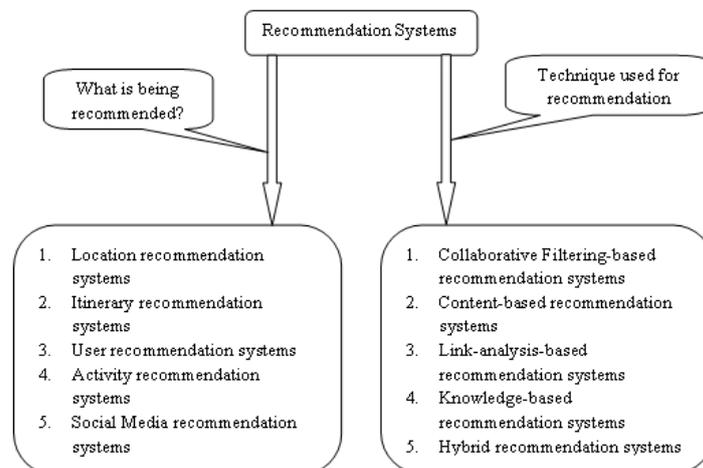


Fig.1: The Taxonomy of The Recommendation Systems In Lbsns

Popular users refer to local experts and opinion leaders, potential friends refer to users with similar interests and preferences and communities refer to group which the user may like to join. Activity recommendation systems recommend the activities the user may be interested. This may be found out from the users' interests and current location. Social media recommendation systems recommend social media such as videos, photos or web contents. CF-based recommendation systems identify user preferences from historical behaviours. Content-based recommendation systems make use of the data from the users' profile and the location features for recommendation. Link analysis based recommendation systems determine experienced users and interesting locations based on link analysis models such as PageRank, HITS etc. Knowledge-based recommendation systems makes use of the knowledge gained from the users and the descriptions of the locations for recommendations. The hybrid recommendation system is any combination of the other recommendation systems. Users' profile data refer to gender, age, educational qualifications, preferred cuisines etc. and location features refer to information like tags, categories and descriptions associated with the location. The detailed discussion is done in the following sections.

3.1 Classification Based on What Is Being Recommended

In this category, the recommendation systems in location-based social networks are classified based on what they recommend. A detailed discussion is given in the subsequent sections.

3.1.1 Location Recommendation Systems

A number of researchers have turned their focus towards stand-alone recommendation systems. The location recommendation systems recommend locations by checking the match between the user's profile and the location metadata. The location metadata can be description of the location, tips or the comments left by the users, semantic text and tags. The work in [1] tries to find the match between the user's profile data and the price and category of a restaurant, which are nothing but features of the location. The system makes use of the Bayesian network model.

The spatial and temporal relationships among distinct locations within trajectories are explored in [2]. It then adds semantic meaning to the subsequences from the trajectories formed out of the activities indulged in by the users. The method to extract location features form users' check-ins is put forward in [3]. This work is being extended in [4] by considering two additional aspects like the total number of check-ins, the total number of unique visitors, the maximum number of check-ins by a single visitor, the distribution of check-in times in a week, and the distribution of check-in times in a 24-hour interval, and the correlations between locations in check-in behavior.

Apart from using the user profiles alone, a recommendation system could take a user's location history as the input for providing better recommendations. The users' location history consists of their online rating history of locations and their check-in history in location-based social networking systems. The quality of the recommendation is being increased greatly because of the use of the user location history as part of the input. Only the well rated or best-reviewed locations are taken into account, ignoring the others.

Some of the existing systems use CF-based models to provide personalized location recommendations based on the users' ratings. Here, the notion is that similar users will rate similar locations in a similar way. Web services

allow users to rate different locations of interest. This rating can contribute to the popularity of the location. There are systems which makes use of the ratings generated by the top-k most similar users. The work in [5] suggests that merely using the ratings of a user's friends is more efficient than using the ratings generated by the top-k similar users. With experiments they show that a user's friends share more preferences than others. The factors to be taken into account to provide consistently efficient location recommendation in a mobile environment are discussed in [6].

The impacts of the various aspects like the CF-model, geographical distance, and social structures in making location recommendations are being studied in [7]. They conclude that geographical distance has the largest impact. In [8], the authors concluded that the three key components in a location recommendation system as:

- the user's current location, which constrains the location candidates,
- the user's location histories, which reflect the user's preferences, and
- the location histories from the other users (including local experts), which is considered as the social context.

A more accurate recommendation can be done using user trajectories as input by the recommendation systems. User trajectories carry more amount of information compared to the individual location data. The information includes the sequence of visiting the location, the path followed between locations and the waiting time at each location. In other words, we can conclude that trajectory data can be used to more accurately estimate a user's preferences. [9, 10] propose a recommendation framework to find expert users and interesting locations by mining GPS trajectory data. In [11], a clustering algorithm is proposed in a collaborative location recommendation framework that takes advantage of user classes.

3.1.2 Itinerary Recommendation Systems

By taking into account the users' location history; it would be possible to understand how the users' interests are related to one another. Here, paths will be recommended instead of locations. The objectives could be like visiting the maximum number of interesting places in a trip while minimizing travel time or cost incurred or energy consumed. The input to the systems can be either geo-tagged social media contents viz. texts, photos, videos, audio or users' GPS trajectories. These systems recommend locations by mining the above mentioned data. Sequential location recommendations can be done by mining a user's geo-tagged social media content [12, 13]. In [14], location information is extracted from geo-tagged photos and a sequence can be formed out of this information. Then, techniques like association rule mining and sequence mining are deployed for recommendation. The system was used to suggest a sequence of interesting locations for the user based on his/her location history and the popularity of the locations. [15] has put forward a Travel Route Suggestion algorithm to suggest personalized travel plans that take into account the time spent at each location, the total travel time, and user preferences. In [16], a route recommendation system is implemented which makes use of a graph model for the representation of the socio-spatial networks which stores information about frequently traveled routes. Another route recommendation system is proposed in [17]. It takes as input a user's own historically preferred road segments, which can be mined from the user's historical trajectories, with the notion that users prefer to travel more on familiar roads.

3.1.3 User Recommendation Systems

Location-based social networks facilitate recommendations by also considering users' location histories. Location histories provide rich contextual information and have significant correlations to real social behaviors [18]. Geographical information is considered to be the main factor influencing the user relationships within social networks. [19] shows that at least 2/3 of the friendships in an online social network are determined by the users' locations. It is established that considering users' location histories in an LBSN can improve the effectiveness and efficiency of user recommendations. The user recommendation for location-based social networks can be classified based on the objective as given below.

- popular user discovery,
- friend recommendation, or
- community discovery.

Popular user discovery: In LBSNs, 'popular users' are regarded as the users with more knowledge about the locations. In LBSNs, finding experienced users is pertinent for the recommender systems since these experienced users may help to give high quality location recommendations. [9] concludes that a user's traveling experiences are region-specific, and it can be found out merely by considering the number of locations visited and the qualities of the locations. Zheng et al. finds out experienced users by applying a HITS inference model over a Tree-Based Hierarchical Graph of users' historical trajectories. [20] found out that users who share more trajectories get more attention from other users, and users who are popular are more likely to connect to other popular users.

Friend recommendation: Usage of location information improves the effectiveness of friend recommendations drastically when compared to the traditional recommendation systems. Here, the notion is that user location histories disclose his/her preferences and it is learnt that users with similar location histories have similar preferences and are more likely to become friends. [21] concludes that the users living close to each other are more likely to be friends. [22] analyzed data from Gowalla and proposed a link predication model using supervised learning that considers the users' visited locations.

The similarity between users can be understood from their historical locations and trajectories. One such user similarity algorithm is proposed in [23]. The users with similar traveling patterns are identified by using a sequence matching algorithm which makes use of location hierarchies. Inclusion of semantic information to the locations improves the recommendation further. Such an improvement is provided in [24]. [25] enhanced this work by giving the following phases.

- semantic trajectory transformation
- maximum semantic trajectory pattern mining
- semantic similarity measurement
- potential friend recommendation

Community discovery: With the inclusion of location information, community discovery in LBSNs can be regarded as the discovery of user communities with similar location preferences. [26] finds user communities based on the users' traveling patterns, which are mined from their trajectories. In [27], a hierarchical clustering of users is proposed. The method works as follows. A hierarchy of user clusters is built at different levels of similarity, where a cluster denotes a group of users sharing some similar interests. The clusters on the higher layers stand for larger communities in which people share some high-level interests. The clusters occurring at

the lower layers denote people sharing some finer interests.

3.1.4 Activity Recommendation Systems

Unlike location recommendation, activity recommendation in an LBSN refers to recommendation of one or more activities that are appropriate for a query location. For instance, sightseeing, boating, and trekking could be recommended for a tourist spot. The various activities possible at each location could be obtained from various sources like user-labeled tags, users' location histories and the semantic data attached to each location. There are basically two approaches followed for activity recommendation. They are as discussed below.

- **Individual Inference-based Approaches:** Users logging into various locations may indulge in different activities and they may post geo-tagged social media data. So, the user's activities at a certain location can be inferred from the user's geo-tagged social media data and the POI dataset. [28] had done an extensive study on the geo-tagged photos gathered from Flickr and came up with some interesting distributions of different topics across the geospatial area. This study was followed by the one from [29] on a large set of geo-tagged tweets and they concluded that the topics, and thus activities, are often geospatially correlated. [30] proposed a method to automatically detect activities using the spatial temporal attractiveness of points of interest (POI).
- **Collaborative Learning-based Approaches:** To better deal with data sparseness, an alternative approach based on collaborative learning uses information from all users to discover activities. In [31], the location semantics is taken from GPS data and is used in conjunction with user profile data to identify activities. [32] has introduced a new system to provide location-specific activity recommendations using a user-location-activity rating tensor.

3.1.5 Social Media Recommendation Systems

Social media recommendation is the recommendation of photos, videos, or other web content to the users. In LBSNs, this suggestion could be more effective and efficient because of the usage of location information along with the media content. [33] concluded that people at different locations have different interests and preferences. [34] learns events and suggests media using both social and location information. If the pertinent information is identified by taking into account the location data associated with the social media, the efficiency of recommendation systems can be improved. A real-time recommendation system for online web content using a collaborative filtering method is proposed by [35] to make more diverse and customized recommendations within a geographical area.

3.2 Classification based on the Technique used for Recommendation

Most of the conventional recommendation systems were based on the community opinions. In LBSN, with the inclusion of the location information new methodologies are required to meet with the challenges of recommendation in an efficient and effective manner. Here, we can have a categorization of the main methodologies used by recommendation systems in location-based social networks. They are

- Collaborative filtering-based recommendation systems,
- Content-based recommendation systems,
- Link analysis-based recommendation systems,

- Knowledge-based recommendation systems, and
- Hybrid recommendation systems

3.2.1 Collaborative Filtering-based Recommendation Systems

Collaborative filtering (CF) model is adopted for recommendations in LBSNs with the notion that a user is more likely to visit a location if it is preferred by similar users. The CF-based location recommendation systems works by candidate selection, similarity inference and recommendation score prediction. They suffer from the following problems.

- Because of the large number of the users and items in the system, the similarity model construction is time consuming. This may also pose a problem to the scalability. This may be further worsened by the rapid growth and evolution of LBSNs.
- When the rating matrix is sparse the system would fail in making the accurate or effective recommendations. This may happen when the number of user ratings is low.
- The system performs poorly with the cold start problem.

The system is constrained if the number of visitors is comparatively less. The three processes involved in CF-based approach are discussed below.

- **Candidate Selection:** IN order to reduce the computational overhead, a subset of the users is selected as the candidate users for including in the recommendation process. It is done by finding the most similar users (or locations, activities, etc.) as the candidates. In the context of LBSNs, we can also use geographic bounds or spatial range to prune candidate locations [6].
- **Similarity Inference:** Similarities between users (or locations, activities, etc.) are inferred from the correlations between the users' ratings and location histories in LBSNs. Some of the popular similarity functions are Cosine correlation, Pearson Correlation, Jaccard Similarity Coefficient etc. Majority of the existing recommendation systems in LBSNs provide location recommendations based on the distribution of user's ratings over their visited locations using the above equation [6, 36, 5, 37]. Similarity inference between users (and locations etc.) can also be done by analyzing the pattern of location co-visitation. [38, 39] proposed the use of the number of visits (e.g., tips and check-ins) at locations as an implicit rating of the location. Location similarity can also be computed using sequential relations [23] or semantic similarities [24].
- **Recommendation Score Predication:** Finally, CF systems predict a recommendation score for each object (locations, social media, etc.) in the candidate set. These scores are calculated from ratings given by the set of users and the similarity measures between individual users. The recommendation score calculated will be a function of the weighted rating given by the users. The weight factor is calculated based on the similarity score computed.

The **collaborative** filtering models do not need to maintain well-structured descriptions of locations, activities, etc. or users, and they take advantage of community opinions, which provide high quality recommendations. However, CF models do not work well when data is sparse. The similarity model construction process is very time consuming, presenting a scalability challenge that is worsened by the rapid growth and evolution of LBSNs. Also, the CF model deals poorly with the cold start problem.

3.2.2 Content-based Recommendation Systems

Content-based recommendation systems make recommendations based on the contents like user preferences and location features. These systems usually match user preferences with features extracted from locations. Users' preferences can be discovered from their profiles and location features can be like the tags and categories associated with the locations. The major requirement with such systems is the need for accurate and structured information for both the user profiles and the location features to make high quality recommendations. Some of the prominent works under this methodology are [1] and [40].

The content-based approach is robust against the cold start problem for both new users and locations. If the newly added user or location has the appropriate descriptive content, they can be handled effectively. In the context of LBSNs, content-based recommendation systems may give low quality recommendations as they do not ponder the aggregated community opinions. Also, they require the information regarding the users and locations to be structured, which can be costly and tedious.

The significant thing to be noted here is that none of the systems are considering the tips left by the user in the checked-in locations, along with other gathered contents, while making recommendations. This could help in making more appropriate suggestions.

3.2.3 Link analysis-based Recommendation Systems

The two most commonly adopted link analysis algorithms in LBSNs are viz. PageRank [41] and Hypertext Induced Topic Search (HITS) [42, 43]. They are primarily meant for ranking the web pages. The basic idea behind these algorithms lies in the fact that they extract qualified nodes from a complex network by analyzing the network structure. In the context of LBSNs, there are various types of networks like user-user, user-location, and location-location networks, which are usually interconnected. In [10] the HITS algorithm is being enhanced for determining experienced users and interesting locations in an LBSN. Here, each location is assigned a popularity score, and each user is assigned a hub score, which indicates their travel expertise. A ranking of expert users and interesting locations is calculated based on a mutually reinforcing relationship.

The link analysis-based methodologies are strong enough to overcome the cold start problem that occurs when new users and new locations are added to the system. They also take advantage of using user expertise while making recommendations and amplify ratings from experienced users. But, most serious, they can give only generic recommendations for all users and do not consider users' personal preferences.

3.2.4 Knowledge-based Recommendation Systems

Knowledge based recommendation systems makes use of the knowledge gained by the system from the users and the descriptions about the locations. The knowledge may be gained from the users either implicitly or explicitly. These recommender systems may be used to recommend locations with low number of available ratings, which may not be the choice of other recommendation systems though they are of interest to the user in some cases. This system could contribute more if the users want to define their requirements explicitly. These systems tell the users, which locations/ activities fit best for them based on their needs and interests. These systems are designed to use the following techniques.

- Explicit domain knowledge of the experts
- Conversational interaction strategy

- Constraint-based recommendation

The expertise of the domain experts is utilized for recommendation in the first case. Continuous interaction between the user and the system is anticipated in the second method to keep the recommendation finer and better. In the third method, a rule based model is developed which works with inputs like variables and descriptions pertaining to the users and the locations apart from the knowledge base and the rules themselves.

3.2.5 Hybrid Recommendation Systems

The hybrid recommendation systems are some combinations of the other recommendation systems that we have already discussed. This is usually deployed to overcome the demerits associated with other recommendation systems. The various design methodologies for hybridization are given below.

- Monolithic
- Parallel
- Pipelined

IV. DISCUSSION

Although many recommendation systems have been proposed in LBSNs, there are still many open questions and challenges to be addressed. In this section, we summarize the challenges and introduce the potential research directions to improve the effectiveness and efficiency of recommendation systems in LBSNs.

4.1 Challenges

The various challenges to be met with while dealing with LBSNs are discussed first. These challenges are classified as 1) location context awareness, 2) the heterogeneous domain, and 3) the rate of growth.

A recommendation system will have to take into account different aspects like the current location of a user, the location history of the user, and the location histories of other users while making a recommendation. A user's current location influences his future travel decisions. It is justified by the sequential property of locations. Studies like [44, 45], suggest that a user's behaviour and interests can be learned from his location history. Another study by Zheng reveals the fact that a user's historical location learned from an LBSN will be more accurate than online behavior[46]. Learning a user's personal preferences from the user's location history is really tedious because of the following reasons.

- Location data will be sparse as the users may not share all the locations they visit.
- Users' may have more than one interest which even may have multiple levels of values when represented.
- A user's preferences may be hierarchical in nature with varying granularities.
- These user preferences may be evolving at a faster pace and may even depend on location.

Different people will have different location histories which may not be comparable always. Also it would be difficult to deduct knowledge from such histories. Knowledge level of people will vary from one geospatial region to another. An expert in one region could be a novice to some other region. An LBSN may be represented by a heterogeneous graph. Deducting the similarities between locations in a heterogeneous graph is tedious. The rate at which a Location-based social network grows in terms of social structure and properties is astonishing. So this may lead to problems of scalability, efficiency and updating strategies.

4.2 Effectiveness and efficiency of Recommendations

The obvious way to improve the effectiveness of recommendation systems is to have more accurate estimates of user preferences and social knowledge. This can be achieved by means of

- using diverse data sources,
- integrating and hybridizing different types of recommendation methodologies, and
- increasing context awareness.

So, we have proposed a new hybrid methodology which integrates the CF-based, content-based and link analysis-based techniques. Notably, this new methodology is context aware.

The efficiency of the recommendations can be improvised by

- Developing advanced recommendation algorithms which makes use of the prior computations are developed, then it can reduce the cost of continuous recommendation requests.
- Devising new recommendation techniques to efficiently address the update frequency in LBSNs. Incremental methodologies will support this.

Our algorithm developed for the computation of user preferences and similarities makes use of the prior computations, which will reduce the overhead.

4.3 Proposed Methodology

The proposed methodology is a hybrid methodology constituting the crux from all the three mentioned methodologies. It takes in to consideration the user's profile, location history, expressed interests, the location histories of similar users, tips left by different users in the locations, and the location features. It also takes into account the popularity of the location and the travel experience of the users which are updated mutually using HITS method. All these are combined with the rating provided by the similar users for the location and also the rating provided by the user for the similar locations. This can give better location recommendations to the users. Using link analysis-based method, an expert user will be found out. Then a subset of the users will be found out. This subset will include the expert. Then the expert will be asked to give inferences for the places. The tips left by the users in the locations will also be taken into account. These are used together to find out the suggestion to be given to a particular user. User groups or communities are formed among the existing users. This grouping is based on the demographic data given by the users. This data include age, gender, occupation, marital status and the native location. Now, for each group a best representative profile is formed. This profile can be formed by integrating the profiles of all the users in the group. This profile will contain knowledge about the group. The proposed recommendation system could overcome all the demerits associated with the content-based, link analysis-based and the CF-based recommendation systems.

V. CONCLUSION

A comprehensive and extensive survey of the existing works in the domain of location based social networks is reported here. This paper also gives the trends in the area and also the issues and challenges in the domain. Future directions for research in the domain are also discussed in the paper.

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SAFETY MEASURES IN BIO CODE WORD USING NEURAL NETWORK ALGORITHM

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ABSTRACT

In existing system, a person who attempts to access information stored on the computer or online by using standard input device such as the keyboard. Use of biometrics such as face, fingerprints and signature requires additional tools to acquire the biometric which leads to an increase in costs. In proposed system, to avoid all the bio-metric devices. Static verification approaches analyze keystroke verification characteristics only at specific times, for example, during the password for login sequence. The practical importance of using keystroke dynamics as a biometric for authenticating access to workstations. Keystroke dynamics is the process of analyzing the way users type by monitoring keyboard inputs and authenticating them based on habitual patterns in their typing rhythm. This is used only for time based authentication system. The stored information on a particular system is very secure and privacy. There are two methods called monograph and diagraph these methods are used to allow the user for giving different keystroke password. The threshold value is a technique for calculating the time given by user. It defines Held Time as the time (in milliseconds) between a key press and a key release of the same key. This is defined as the time in milliseconds between two consecutive keystrokes. A Sequence can be of any length, the minimum being two. More specifically, a trait with 'good' permanence will be reasonably invariant over time with respect to the specific matching biometric algorithm. Measurability (collectability) relates to the ease of acquisition or measurement of the trait.

Keywords: Diagraph, Code word, Keystroke, Monograph, Threshold

I. INTRODUCTION

Biometrics refers to metrics related to human characteristics and traits. Biometrics authentication (or realistic authentication) is used in computer science as a form of identification and access control. It is also used to identify individuals in groups that are under surveillance. Biometric identifiers are the distinctive, measurable characteristics used to label and describe individuals. Biometric identifiers are often categorized as physiological versus behavioral characteristics. Physiological characteristics are related to the shape of the body. Examples are not limited to fingerprint, face recognition, hand geometry, iris recognition Behavioral characteristics are related to the pattern of behavior of a person, but not limited to typing rhythm, voice. Such as a password or personal identification number. Since biometric identifiers are unique to individuals, they are more reliable in verifying identity than token and knowledge-based

methods; however, the collection of biometric identifiers raises privacy concerns about the ultimate use of this information.

1.1 Password Verification

In verification (or authentication) mode the system performs a one-to-one comparison of a captured biometric with a specific template stored in a biometric database in order to verify the individual is the person they claim to be. Three steps are involved in the verification of a person. In the first step, reference models for all the users are generated and stored in the model database. In the second step, some samples are matched with reference models to generate the genuine and impostor scores and calculate the threshold. Third step is the testing step. This process may use a smart card, username or ID number (e.g. PIN) to indicate which template should be used for comparison. Positive recognition' is a common use of the verification mode, "where the aim is to prevent multiple people from using same identity".

1.2 Password Identification

In identification mode the system performs a one-to-many comparison against a biometric database in attempt to establish the identity of an unknown individual. The system will succeed in identifying the individual if the comparison of the biometric sample to a template in the database falls within a previously set threshold. Identification mode can be used either for 'positive recognition' (so that the user does not have to provide any information about the template to be used) or for 'negative recognition' of the person "where the system establishes whether the person is who she (implicitly or explicitly) denies to be". The latter function can only be achieved through biometrics since other methods of personal recognition such as passwords, PINs or keys are ineffective.

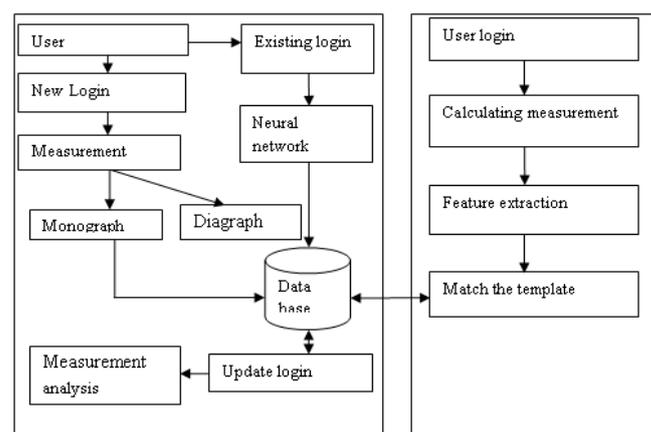


Fig. No:1 System Architecture

II. LITERATURE SURVEY

2.1. "A Parallel Decision Tree-Based Method for User Authentication Based on Keystroke Patterns", Author's Name :Yong Sheng, Vir V.Phoha, Steven M.Rovnyak.

We propose a Monte Carlo approach to attain sufficient training data, a splitting method to improve effectiveness, and a system composed of parallel decision trees(DTs) to authenticate users based on keystroke patterns. For any research involving pattern recognition techniques, one should conduct an experiment to collect two sets of data. One is for training or reference, and the other is for testing or verification. Since the method is

relatively simple but effective, we tried their approach. Using our reference vector in place of their reference signature, we obtained an FFR of 37.0% and an FAR of 7.72%, which are too large to be accepted. DTs are a type of learn. By example pattern recognition technique and have been applied to many data mining problems. A DT for a particular user was trained to recognize him as the only legal user and all other users as illegal. When a single DT solution cannot reach a certain level of effectiveness for some problems, one can try parallel DTs.

2.2"Password Hardening Based on Keystroke Dynamics", Author's Name: Fabian Monrose Michael, K.Reiter Susanne Wetzel.

We present a novel approach to improving the security of passwords in our approach, the legitimate user's typing patterns are combined with the user's password to generate a hardened password that is convincingly more secure. The login program takes the following steps whenever the user attempts to login . Suppose that is g -th attempt to log into a , and let $ped \sim$ denote the sequence of characters that user typed. Consider the "oithne" attacker who obtains account as history file and attempts to find the value of password presuming that the encrypt of the history file using password as secure. To presented a novel approach for hardening passwords by exploring the keystroke dynamics of users. Our approach enables the generation of a long-term secret that can be tested for login purposes or used for encrypt of files, entry to a virtual private network.

2.3."Two-Stage biometric Authentication method using through activity brain waves", Author's Name: Ramaswamy Palaniappan.

Brain waves are proposed as a biometric for verification of the identities of individuals in a small group. The approach is based on a novel two-stage biometric authentication method that minimize both false accept error (FAE) and false reject error (FRE). An electrode cap was used to record EEG signals from positions C3, C4, P3, P4, O1 and O2 defined by the 10-20 system of electrode placement. The subjects were asked to mentally compose a letter to a friend without vocalizing. The standard principal component analysis (PCA) was used to reduce the feature size. This stage was used only for those test patterns that were detected as impostors in the earlier stage. The threshold Th_2 was used to determine whether the test patterns detected as impostors from 1st stage authentication were really clients or impostors a novel method of authenticating individuals using these would circumvent the requirement of using PCA to reduce the number of features.

III. PROBLEM DESCRIPTION

3.1 Existing System

Tri-graphs, which are the time latencies between every three consecutive keys, and similarly, n -graphs, have been investigated as well. In their study on keystroke analysis using free text, investigated the effectiveness of digraphs and more generally n -graphs for free text keystroke biometrics, and concluded that n -graphs are Discriminative only when they are word-specific. As such, the digraph and n -graph features do depend on the word context they are computed in. It can be used in a browser or on the server side only.

3.1.1 Disadvantages

1. The privacy and security purpose for so many devices connected.

2. It should not maintain properly.
3. Every person must possess the characteristic / attribute without timing.
4. The properties should be suitable for capture with waiting time and cannot be easy to gather the attribute data passively.

3.2 Proposed System

Raw data collected from a specific user's sessions are processed and converted to monograph and digraph formats. It consists of an iterative process which starts with calculating the mean and standard deviation for the data set. In the first iteration an assumption is made that the data has only one doubtful observation. The neural network architecture and provide a visual representation of the monograph and digraph signature produced in order to illustrate the similarity in behavior for different users sessions. The process will be repeated until no more entries are eliminated. It has been used keystroke biometric and neural network algorithms.

3.2.1 Advantages

1. Generated monographs and digraphs are sent as a batch to the monograph and digraph sorting modules.
2. Each of those modules will process the data and calculate.
3. It has been reduced devices and the cost.
4. It has been more securable.
5. If any other person cannot open the file.

IV. METHODOLOGIES

There are three modules are:-

1. Enrollment phase
2. Verification phase
3. Monograph and digraph phase

4.1 Enrollment Phase

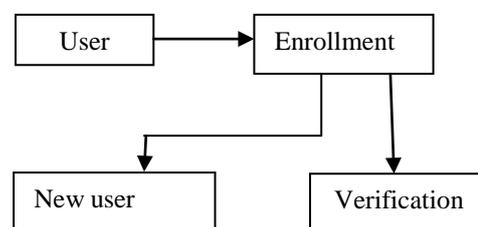


Fig. No:2 Enrollment Phase

User types at a terminal by monitoring the keyboard inputs given many more of times per second, and attempts to identify them based on habitual rhythm patterns in the way they type. A keystroke is a single press of a key on a keyboard. Each key press is a keystroke. Keystrokes can be used for programming purposes to respond to the user pressing a particular key. The user retypes the password four times for future verification.

4.2 Verification Phase

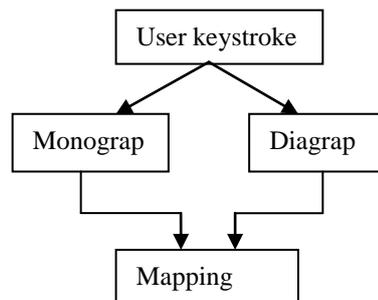


Fig. No:3 Verification Phase

Each and every person press key is a keystroke. Keystrokes can be used for programming purposes to respond to the user pressing a particular key. It can be used for things such as keystroke logging, where a user's keystrokes are tracked either knowledge or consent of the user. The keystroke is purpose for more security and privacy. It has been maintain properly. The users are given username and password for verification purpose. After that go to monograph and digraph process.

4.3 Monograph and Digraph Phase

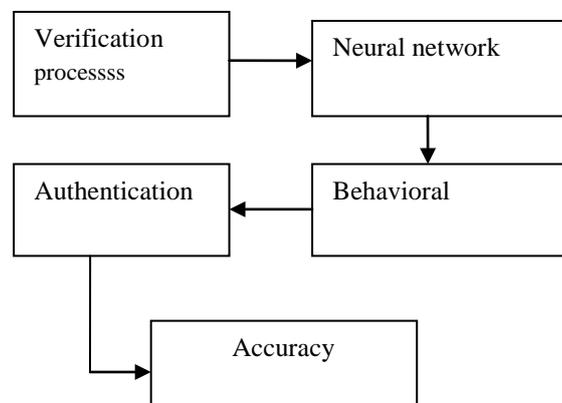


Fig. No:4 Monograph & Digraph Phase

Each of those modules will process the data and calculate a mapping table. Calculated monograph and digraph mapping tables are considered part of the user's signature and stored for future use. We use neural networks to model the user behavior based on the encoded sets of monographs and digraphs. Although the neural network architecture remains the same for all users, the weights are user specific. The proposed neural network architecture and provide a visual representation of the monograph and digraph signatures produced in order to illustrate the similarity or dissimilarity in behavior for different users' sessions.

V. CONCLUSION AND FUTURE WORK

Bio- Password analyzes the ability of keystroke dynamics authentication systems for their application to collaborative systems. The authors present some useful and easy techniques in order to improve the quality of a keystroke dynamics system without modifying the algorithms. These good practices of composing keystroke dynamic based passwords could be better accepted than the good practice of classical passwords. In Future , The system and algorithms have to be modified to allow the use of backspace key to correct the password (because errors can be characteristic of the user).

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BIOGRAPHY

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PREDICTION OF MICROHARDNESS OF Al-Si ALLOY USING NEURAL NETWORK AND RESPONSE SURFACE METHODOLOGY

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ABSTRACT

For product development manufacturers and designers need information about the existing materials and new material and its properties as early as possible. This paper presents a method of predicting the properties of Al-Si alloy using artificial neural network and developing a mathematical model using response surface methodology (RSM). As micro hardness mainly depend upon Ti content and aging time, the present study deals with prediction of micro hardness using neural network and response surface methodology. Application of the presented method enables a scientist to make free analyses of the effect of the alloying elements occurring in processing condition also using only computer simulation, without having to carry out additional and expensive experimental investigation. Simulating results will show that model can effectively predict micro hardness of Al-Si alloy.

Keywords: *Micro Hardness, RSM, NN.*

I. INTRODUCTION

Al-Si alloy is a well-known casting alloy with high wear resistance, good corrosion resistance, and improved mechanical properties at a wide range of temperatures. These properties led to the application of Al-Si alloys in the automotive industry, especially for cylinder blocks, cylinder heads, pistons, and valve lifters. The manufacturers and designer should have update information about fast changing technologies and methods. They need the information regarding new material as soon as possible. The identification of properties of unknown material in the material testing laboratory requires heavy investment and also it is very time consuming. The use of simulation software in conducting experiments and prediction of properties of material will reduce the cost and time immensely. [1]

Neural Networks (NNs) are non-linear mapping structures based on the function of the human brain. They are powerful tools for modeling, especially when the underlying data relationship is unknown. NNs can identify and learn correlated patterns between input data sets and corresponding target values. After training, NNs can be used to predict the outcome of new independent input data. The networks imitate the learning process of the human brain and can process problems involving non-linear and complex data even if the data are imprecise and noisy. Neural network has great capacity in predictive modeling. A neural network is a computational structure that is inspired by observed process in natural networks of biological neurons in the brain. It consists of simple computational units called neurons, which are highly interconnected. They are parallel computational models comprised of densely interconnected adaptive processing units. These networks are fengtine-grained parallel

implementations of nonlinear static or dynamic systems. A very important feature of these networks is their adaptive nature, where “learning by example” replaces “programming” in solving problems. This feature makes such computational models very appealing in application domains where one has little or incomplete understanding of the problem to be solved but where training data is readily available. Neural networks are now being increasingly recognized in the area of classification and prediction, where regression model and other related statistical techniques have traditionally been employed. [2]

Neural Network (NN) is simplified models of the biological nervous system. NN in general is a highly interconnected network for a large number of processing elements called neurons in an architecture inspired by the brain. They can therefore be trained with known examples of a problem to acquire knowledge about it. Learning in neural networks is highly important and is undergoing vivid research in both biological and artificial networks. Learning is not a unique process; there are different learning processes, each suitable to different process. The back-propagation algorithm is an evolved mathematical tool; however, execution of the training equations is based on iterative processes and thus is easily implementable on a computer. [3]

II. EXPERIMENTATION

High purity elements, aluminum (99.9 wt.% purity), silicon (99.95 wt.% purity), and titanium (99.99 wt.% purity) were melted in a graphite crucible at 1400°C for 30 min under argon gas atmosphere in a high-temperature programmable furnace (Nabertherm, model LHT 02/18). Three different alloys were prepared by them and chemical composition of alloy is given in table 1. The melt was poured at a cooling rate of 10³ K/min in a steel mould to produce a casting of 14 mm in diameter and 80mm in length.

The micro hardness of as-cast and heat-treated specimens was measured using a digital Shimadzu Micro hardness Tester HMV-2000, using a load of 300 gm for 15 sec. The increase in Ti content results in an increase in the micro hardness values. This is due to the increase in the volume fraction of the relatively hard-phase Al₃Ti. This design is based on two process parameters such as Ti content, aging time with three levels each. The process parameters and their levels are shown in Table 2. All experiments have been conducted by N. Saheb. and et.al. [1]. The aim of this paper is to predict micro hardness of Al-Si alloy using RSM and NN.

Table 1 Chemical Composition of alloy

| ALLOY | COMPOSITION (wt. %) | | |
|--------|---------------------|-------|------|
| | Al | Si | Ti |
| ALLOY1 | Balance | 11.93 | 1.05 |
| ALLOY2 | Balance | 11.75 | 2.15 |
| ALLOY3 | Balance | 11.46 | 3.96 |

Table 2 Process Parameters and Experimental Design levels

| VARIABLES | SYMBOLS | LEVELS | | |
|------------|------------------|--------|------|------|
| | | (-1) | (0) | (1) |
| Ti CONTENT | Ti | 1.05 | 2.15 | 3.96 |
| AGING TIME | AGING TIME (hr.) | 0 | 4 | 8 |

III. RESULTS AND DISCUSSIONS

3.1 Response Surface Methodology

Taking micro hardness as output and process parameters (Ti content, aging time) as input, the prediction model using response surface methodology (RSM) has been developed at 95% confidence level. Response surface methodology is a collection of mathematical and statistical techniques that are useful for the modeling and analysis of problems in which output or response is influenced by several input variables and the objective is to find the correlation between the response and the variables investigated (Montgomery, 1997). Using least square fitting, the model is developed.

The experiments are conducted based on full factorial design, which gives a comparatively accurate prediction of micro hardness average. The first step of RSM is to find a suitable approximation for the true functional relationship between micro hardness and set of independent variables utilized. In the linear model, the micro hardness is well modeled by linear function. However, in the second order model like response surface methodology, there is a curvature in the system. The second order response surface representing the micro hardness can be expressed as a function of two process parameters such as Ti content, Aging time. It has been expressed applying regression analysis using least square method. The following second order equation (1) for quality characteristics is obtained.

$$\text{MICROHARDNESS} = 68.1512 + 12.2306 * \text{Ti} + 2.0896 * \text{AGING TIME} - 1.5427 * \text{Ti} * \text{Ti} - 0.0938 * \text{AGING TIME} * \text{AGING TIME} - 0.1947 * \text{Ti} * \text{AGING TIME} \text{----- (1)}$$

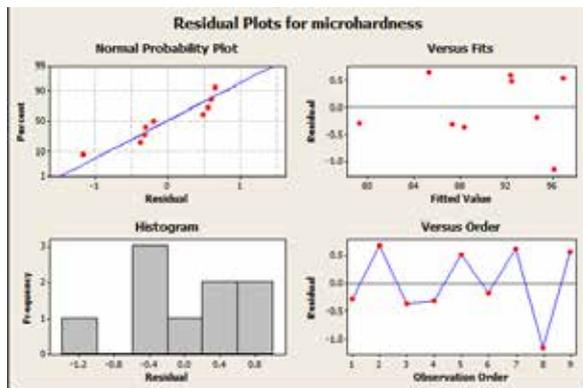


Fig.1 Residual plots for micro hardness

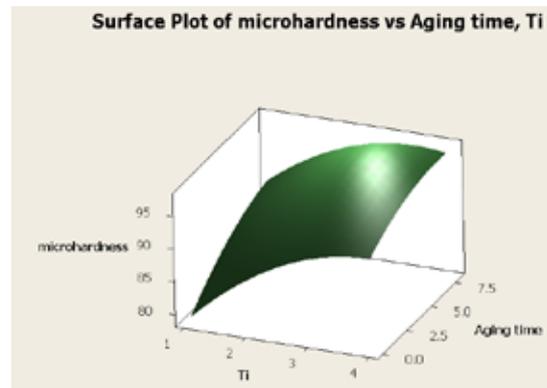


Fig. 2 Surface plot of micro hardness vs Aging time and Ti

Table 3 Estimated Regression Coefficients for micro hardness

| Term | Coef | T | P |
|-----------------------|---------|--------|-------|
| Constant | 68.1512 | 30.762 | 0.000 |
| Ti | 12.2306 | 6.377 | 0.008 |
| Aging time | 2.0896 | 4.894 | 0.016 |
| Ti*Ti | -1.5427 | -4.234 | 0.024 |
| Aging time*Aging time | -0.0938 | -2.088 | 0.128 |
| Ti*Aging time | -0.1947 | -2.252 | 0.110 |

Table 4 Results for Micro Hardness By RSM

| Source | DF | Seq SS | Adj SS | Adj MS | F | P |
|-----------------------|----|---------|---------|---------|-------|-------------------------|
| Regression | 5 | 265.403 | 265.403 | 53.0807 | 51.43 | 0.004 <0.05 SIGNIFICANT |
| Linear | 2 | 237.164 | 61.550 | 30.7748 | 29.82 | 0.010 |
| Ti | 1 | 163.664 | 41.973 | 41.9727 | 40.66 | 0.008 |
| Aging time | 1 | 73.500 | 24.720 | 24.7200 | 23.95 | 0.016 |
| Square | 2 | 23.002 | 23.002 | 11.5011 | 11.14 | 0.041 |
| Ti*Ti | 1 | 18.502 | 18.502 | 18.5022 | 17.93 | 0.024 |
| Aging time*Aging time | 1 | 4.500 | 4.500 | 4.5000 | 4.36 | 0.128 |
| Interaction | 1 | 5.237 | 5.237 | 5.2368 | 5.07 | 0.110 |
| Ti*Aging time | 1 | 5.237 | 5.237 | 5.2368 | 5.07 | 0.110 |
| Residual Error | 3 | 3.097 | 3.097 | 1.0322 | | |
| Total | 8 | 268.500 | | | | |

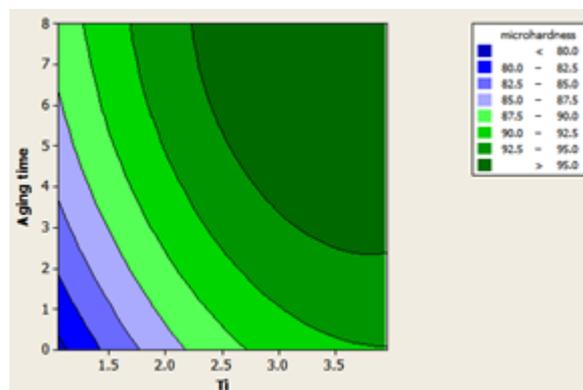
**Fig.3 Effect of TI and Aging Time on Micro Hardness**

Table 3 shows estimated Regression Coefficient for Micro hardness. Table 4 shows results obtained by RSM. The regression and linear terms are significant ($P < 0.05$). Again Table 4 shows that all linear and interaction coefficients are significant. From the square coefficients only one i.e. $Ti*Ti$ is significant. From all significant coefficients the highest F value is obtained for P equal to 51.43, means it has highest effect on the response. The F value for the Ti is equal to 40.66, which indicates that the Ti has a relatively higher effect on the process and similarly the F value of Ti and other coefficients are very low indicate that less effect on the response.

The residual plot for micro hardness is shown in Fig.1. This residual plot in the graph for normal probability plot indicates the data are normally distributed and variables are influencing the response. And the Residuals versus fitted value indicate the variation is almost constant. According to the histogram, data are not skewed and not outline exist approximately. Residual versus order of the data indicates that there are systematic effects in the data due to time or data collection order. Fig. 2 shows surface plot for micro hardness. Figure 3 show effect of Ti and aging time on micro hardness.

3.2 Neural Network

NNs are computational models, which replicate the function of a biological network, composed neurons are used to solve complex functions various applications. The NN used here consists of three layers named as input layer, hidden layer and output layer as shown in Fig.3. The Input layer consists of different number of inputs variables/process parameters as described before. The Back Propagation Algorithm (BPA) is essentially

stochastic approximation to nonlinear regression. [4, 5] .Several researchers are used BPA to model micro hardness and predict mechanical properties using neural network. [6]

In this work, MATLAB 7.9 is used for training the network model for micro hardness prediction. The designed neural networks structure used here is 2-1-1, with 2 corresponding to the input layer neurons, 1 to hidden layer neurons and 1 to output layer neurons. The numerical optimization technique used for this work is called Levenberg-Marquardt (LM). The developed NN architecture is trained with help of back propagation algorithm using 9 data sets. The neural network described in this work, after successful training, is used to predict the micro hardness of alloy. The % errors listed in Table 5 are calculated between the experimental and predicted value ranging between ± 2.01624 . This result elucidated that, the developed neural network model have high accuracy for the micro hardness prediction.

3.3 Comparison Between RSM and NN

Comparison of RSM and NN showed in table 5. The maximum % error in case of RSM is 1.2281 and maximum % error in case of NN is 2.01624. Both RSM and NN can be used to predict micro hardness of Al-Si alloy. Table 6 shows comparison between RSM, NN and experimental values of micro hardness. The result show good agreement with experimental micro hardness.

Table 5 Comparison between RSM and NN

| Ti | Aging time | Micro hardness (HV) | RSM | % ERROR | NN | % ERROR |
|------|------------|---------------------|---------|---------|---------|----------|
| 1.05 | 0 | 79.0 | 79.2925 | 0.3703 | 79.4135 | 0.52342 |
| 1.05 | 4 | 86.0 | 85.3333 | 0.7752 | 84.5434 | 1.693721 |
| 1.05 | 8 | 88.0 | 88.3742 | 0.4252 | 88.9419 | 1.07034 |
| 2.15 | 0 | 87.0 | 87.3157 | 0.3629 | 87.4896 | 0.56276 |
| 2.15 | 4 | 93.0 | 92.5000 | 0.5376 | 91.1667 | 1.97129 |
| 2.15 | 8 | 94.5 | 94.6843 | 0.1950 | 93.6855 | 0.861905 |
| 3.96 | 0 | 93.0 | 92.3918 | 0.6540 | 94.8751 | 2.01624 |
| 3.96 | 4 | 95.0 | 96.1667 | 1.2281 | 95.9763 | 1.02768 |
| 3.96 | 8 | 97.5 | 96.9415 | 0.5728 | 96.6131 | 0.909641 |

Table 6 Comparison between Experimental and Predicted Micro Hardness Values By RSM and NN

| SR.NO. | Ti | AGING TIME | MICROHARDNESS | RSM | NN |
|--------|------|------------|---------------|---------|---------|
| 1 | 1.05 | 2 | 85 | 83.3131 | 84.84 |
| 2 | 1.05 | 6 | 87 | 87.522 | 86.987 |
| 3 | 2.15 | 2 | 90 | 90.386 | 90.1535 |
| 4 | 2.15 | 6 | 94 | 93.847 | 94.273 |
| 5 | 3.96 | 2 | 95 | 94.7026 | 94.501 |

IV. CONCLUSION

From the above discussion following important conclusions are derived

1. Ti content (%wt.) has strong influence on micro hardness. By changing the Ti value the response will be changed dramatically, so the Ti value should be carefully selected.
2. The aging time has also strongly affected the micro hardness but less than Ti content. But we cannot ignore this parameter.

3. Both RSM and NN show good agreement with experimental results. The results obtained by RSM and NN shows small % error (< 2.01624 %) while predicting micro hardness.
4. Therefore both methods can be effectively used to predict micro hardness of Al-Si alloy.

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MULTILEVEL PATCH-BASED CONTEXT ANALYSIS FOR CLASSIFICATION OF LUNG NODULE

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ABSTRACT

A novel method is proposed for the classification of lung nodule which induces cancer and development.. A Low Dose Computed Tomography(LDCT) scanned images are taken for this approach.The four types of lung nodules are offered here, namely Well-circumscribed, Vascularized, Juxta-pleural and Pleural-tail.This paper has three main procedures by combining the anatomical structures and nodules. The amplification of the input image gives the required process of the segmentation.Adaptive patch-based division is helped for multilevel partition, SVM(Support Vector Machine) classifier is used for the classification process.Texture, Intensity and gradient details of the image are derived form a feature set.SIFT(Scale-Invariant Feature Transform) descriptor is used in the feature set for getting the information of the given image. Probabilistic estimation is applied for the classification and analysis procedures. In the classification process texture information is more important for the nodules.Concentric level partition gives the better classification rate than the other methods.

Keywords: Nodules, Patches, Quickshift, Sift, Superpixel.

I INTRODUCTION

A malignant cell presented in lungs is cause for lung cancer. Identification of the lung nodule is the required process for the treatment of the lung cancer. Around the world 20% of cancer related deaths occur due to the Lung cancer. Lung nodules are very small compare than the lungs.We have to classify the nodules for the medical treatments. The approach from Diciottiet al. is the most popular classification and it differentiate nodules into four types: well-circumscribed (W) with the nodule located centrally in the lung without any connection to vasculature, vascularized (V) with the nodule located centrally in the lung but closely connected to neighboring vessels, juxta-pleural (J) with a large portion of the nodule connected to the pleural surface and pleural-tail (P) with the nodule near the pleural surface connected by a thin tail.

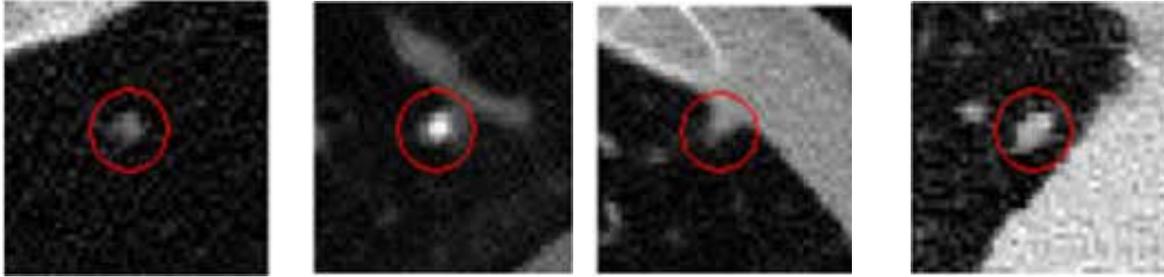


Fig 1 A. Well-circumscribed Lung nodule B. Vascularized Lung Nodule C. Juxta-pleural Lung nodule D. Pleural-tail Lung nodule

CT scanned images are used for this paper and this CT images will give the information of nodules and surrounding anatomical structures. Due to the small size of the nodule the CT scan is used and classification of the nodules is helpful for the diagnosis process. Here these types of nodules presented in the lungs are have to detect for the clinical process. CT images are used for the lung cancer because it gives high resolution images and good acquisition. And also used for detection of small lung nodules. The four types of lung nodules are taken for the novel classification technique. This proposed technique has three important processes. The input images are taken from the publically available data through the internet from ELCAP (Earlier Lung Cancer Program)

II EXISTING METHODS

In the classification process the SVM classifier is widely used. Yan Song approaches the novel classification method for lung nodules. The four types of nodules are classified with the graph construction process. In the optimized graph model global and region based terms are involved and labeling is introduced. Parenchyma, vessel, pleura and pleural-tail are the anatomical parts of the lungs. The foreground is for nodule and background is for the parenchyma and vessel and pleural wall. Patch-based method is used for partitioning the given input image into multiple and order less small images. In feature extraction, filter based approaches are also used. The clustering is used in superpixel image formulation and this is used for classification. Quick shift also used as it is the fastest approach compare with the other methods.

The problem in the classification process is to classify the overlapped nodule in the anatomical parts of lungs. Here Fan Zhang introduced the improved classification method for overlapping nodes. Here it deals with the Clique Percolation Method (CPM) in the classification of lung nodules. The SVM classifiers are involved and K-means are introduced for the segmenting the given input image. Cluster is labeled to the type which has the highest frequency according to the SVM classifier. Most of the the overlapped nodules are between the well-circumscribed and vascularized. For the better nodule classification K mean is used in SVM classifier. SVM is utilized for computing each nodule among the different nodules. Here also the four type of nodules are presented in the lungs and gives classification over the overlapping nodule with the anatomical parts.

III PROPOSED METHOD

The input image given to the concentric level partition, before this method the image has to be amplified. As the images from LDCT are low intensity images the image interpolated to get the samples. Here we separate the nodules from the anatomical parts for classification process.

Here we proposing the classification techniques over the four types of nodules in the lungs. PLSA (Problematic Latent Semantic Analysis) is used for computing the probability of the level-context. In this paper we classify the nodules and get the comparison results over the other classification methods.

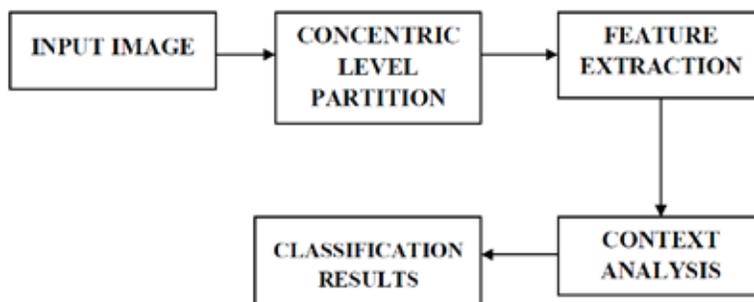


Fig 2:BLOCK DIAGRAM OF PROPOSED METHOD

3.1 Concentric Level Partition

This paper approaches the patch-based division for the partitioning of the given image. The superpixel formulation is the initial process of this method. Before going to the super pixel is required the enlarged image. In the proposed method amplification is performed over the small size of the image.

This partition is based on the patch-based approach that the given input image is divided into multiple parts with the segmentation. After the segmentation the image has to be enlarged.

3.1.1 Superpixel Method

The quick shift algorithm is proposed with the upsampling and downsampling of the given image. For the upsampling process the interpolation is applied and it gives the enlarged image. The amplified image is used for the segmentation process.

Here the well-circumscribed input image is taken and this image is taken as input for the segmentation. Before the segmentation, upsampling is performed over the image. The input image is interpolated by a factor of four in order to enlarge the image. Figure 3 shows the given input image for the process of the concentric level partition.

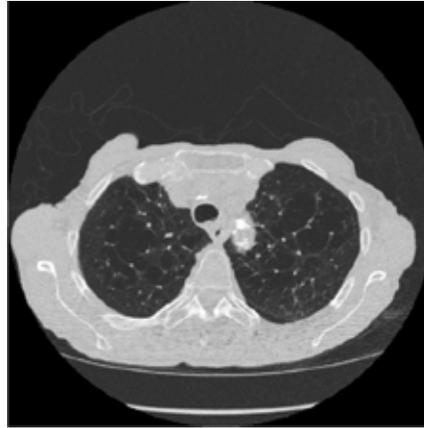


Fig 3 Input Image

Kernel size and maximum distance are the two parameters introduced in quick shift method. The given input image is cropped for the interpolation and the nearest pixels are enlarged in the cropped image. In the segmentation process the superpixel method is applied for the multiple small images.

This approach divides the image into multiple patches so that we can classify the nodules. After the segmentation process context level partition is applied over the segmented image. The downsampling process gives the original segmented image.

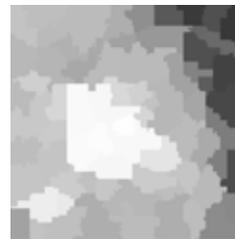
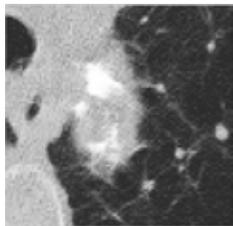


Fig4 (a) Cropped image

4(b) Interpolated image

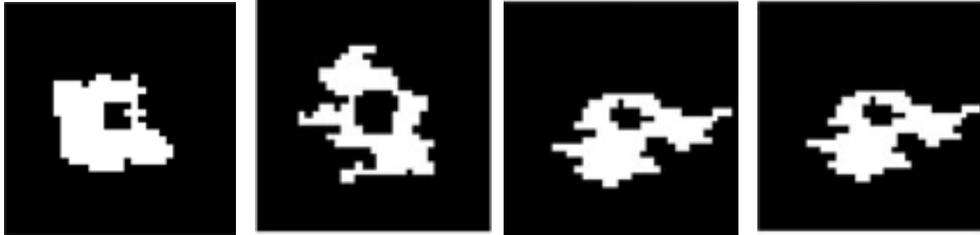
4 (c) Segmented Image

In the segmentation process nearest pixels are segmented and they are partitioned to their regions. The levels of the nodules are formed by the context level partition. Initially the kernel size is 2 and maximum distance also 2. Figure 5 shows the context level of the four types of lung nodules in the lungs. In this concentric level partition nodules are partitioned. Here the patches are partitioned in different shapes. The context levels are used for the classification results. Here the nearest pixels are formulated for the context levels.

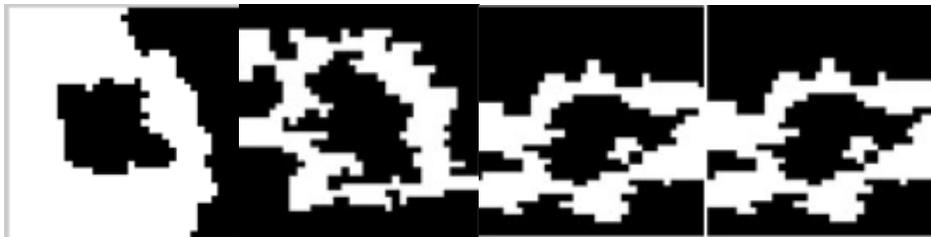
| | | | |
|---------------------|----------------------------|---------------------|----------------------|
| Pleural-tail | Well- circumscribed | Vascularised | Juxta-pleural |
| Lung nodule | Lung nodule | Lung nodule | Lung nodule |



(A)LEVEL NODULE



(B)LEVEL CONTEXT 1



(C)LEVEL CONTEXT 2

Fig 5: Partition Levelsfor the four types of loung Nodules

3.2 Feature Extraction

For the classification of lung nodules,we propose a feature set for getting the information of the given input image. Here SIFT descriptor is introduced for the desription of the image. In this feature extraction texture, intensity and gradient information of the given images are specified. It gives the information by using the keypoints of given input image.SIFT descriptor is invariant for the images translation and rotation.This process is used for getting the required parameters for the classification of four types of lung nodules.

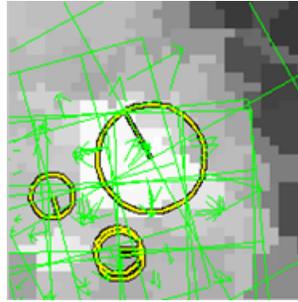


Fig 6 SIFT Descriptor

Figure 6 shows the SIFT description of the given input image. Here for every key point 128-bit length vector is generated. This gives the details of the texture and intensity information. The feature set has the information of lung nodule data. This transformation doesn't change for rotation and translation of the images and it is used for the classification and detection techniques.

IV CONCLUSION

The classification is done for the four types of lung nodules in the lungs. The superpixel formulation is applied for the many patches from the given input image. The LDCT images are used for this process. The quick shift algorithm is faster than the other methods. After the SIFT descriptor, we need to apply the context analysis for the classification process. The derived feature set is used for classification results.

This patch-based division of the image has many advantages for the classification of the image. Concentric level partition has good classification rates and the feature set is very important for the classification of the lung nodules. By classifying these four types of nodules, they are very useful for lung cancer treatments. It has some limitations over the early stages of the cancer, so we have to detect and classify the nodules in the early stage.

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ONLINE E-PAYMENTS FOR GOVERNMENT TAXES

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ABSTRACT

There are many types of tax payment in government of Tamil Nadu online bill payments. Like EB Tax, Water Tax, Service Tax, Income Tax, Property Tax, and Telephone Tax. The above mentioned taxes are only payable at their responsible places. But now the user can pay all those taxes at the single site. Also by implementing this application we can get the exact information immediately by getting the statement bills. However the manpower will get reduced by a single user to control all activations. The legal definition and the economic definition of taxes differ in that economists do not consider many transfers to governments to be taxes. Some transfers to the public sector are comparable to prices and fees for utilities provided by governments. Yet compulsory transfer of resources from the private to the public sector levied on a basis of predetermined criteria and without reference to specific benefit received. Provide hassle free one-stop solution to the citizen. Minimize multiple interaction points for the citizen and hence reducing the wastage of their valuable time provide better turnaround time in receipt, processing and issue of services. We implement the payable taxes are:

Ø Electricity Bill Tax Water Tax Service Tax
Ø Income Tax Property Tax Telephone Tax.

Keywords: E-Commerce Security, Online Fun Transfer, Verification Of Amount From Seller And Customer, Commercial Tax, Authentication

I. INTRODUCTION

The vision for this project is to create a knowledge-based society through extensive use of I.T. as a medium for effective interaction between the Administration and the public so that exchange of information and access to government departments is speedy and easy, leading to a better quality of life. Provide hassle free one-stop solution to the citizen. Minimize multiple interaction points for the citizen and hence reducing the wastage of their valuable time provide better turnaround time in receipt, processing and issue of services.

II. SYSTEM STUDY

2.1 Existing System

Before this initiative the common man had to make multiple visits for a single transaction apart from standing in long queues and wait for a few days to few weeks for the end result. At times he had to face harassment due to lack of transparency. After this initiative the Administration was successful in providing a one stop solution at the e-payment as various services, which were available earlier at independent islands and sometimes resulted in duplication of work, are being delivered at these centers. The processing time has been minimized as the efficiency of the service delivery system has been optimized by making it I.T. enabled thereby regarding eradicating the long queues and waiting hours for the public.

2.1.1 Disadvantages

- Ø Time Consuming process
- Ø Lack of transparency.

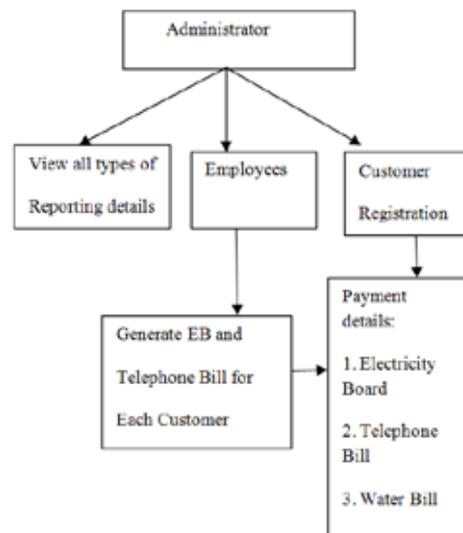
2.2 Proposed System

E-Payment facility of Central Excise and Services Tax is a part of the e-Government initiatives. The issue of on-line payment of Central Excise and Service Tax through the internet portals of various banks had been under consideration. The system requirements, methodology and suggested process flow was developed, without having any implication of the existing procedure of the executive and accounting agencies of the Department, and given to banks for suggesting the solutions. While most of the banks have intimated their acceptance of providing this option, and are developing the solutions at their IT Departments, 7 Banks have so far come up with the necessary software.

2.2.1 Advantages

- Ø Facility is available 24 X 7 bases.
- Ø One can pay on behalf of the firm, company and others.
- Ø Online payment of taxes, no more queues and waiting.
- Ø Filling of one single challah.
- Ø Instant cyber receipts for payments made.

III. SYSTEM ARCHITECTURE



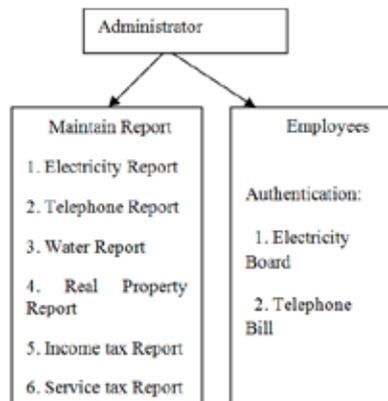
IV. MODULES

- Ø Administrator
- Ø Employees Page
- Ø Customer Registration
- Ø Electricity Board
- Ø Telephone Bill
- Ø Water Tax
- Ø Real Property Tax
- Ø Income Tax
- Ø Service Tax

V. MODULES DESCRIPTION

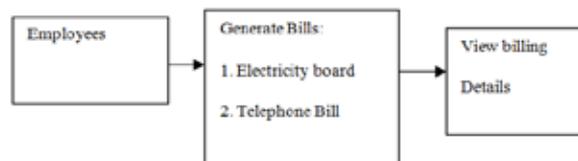
5.1 Administrator

The role includes the development and design of database strategies, monitoring and improving database performance and capacity, and planning for future expansion requirements. Co-ordinate and implement security measures to safeguard the database. The duty or duties of an administrator in exercising the executive every functions of this position. The performance and operations and thus the making or implementing of a major decision. Administration can be defined as the universal process of organizing people and resources efficiently so as to direct activities toward common goals and objectives.



5.2 Employees Page

A person who is generates to provide services to a government bills on a regular basis work for compensation.



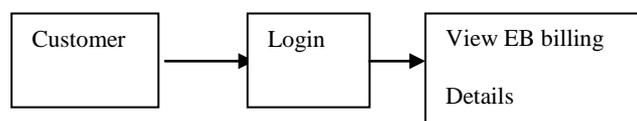
5.3 Customer Registration

When you first access a site store, you see a 'Register' link at the top of the screen next to the Login field. The fields in this scenario relate to the registration form that customers complete in order to become a registered user of the site.



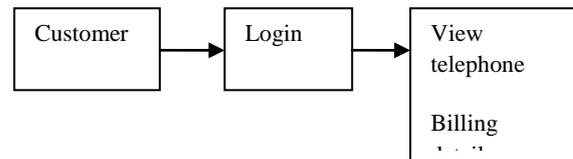
5.4 Electricity Board

View Current Bill (Full Bill). Go to the Bill & Payments page in my account & transfer amount. An e-payment transaction may be defined as one in which monetary value is transferred electronically or digitally between two entities. However it is obvious that any payment that is not transacted by paper based instruments is considered e-payment transactions.



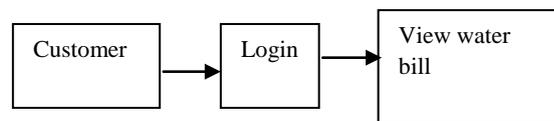
5.5 Telephone Bill

To which all telephone numbers of a customer (subscriber) are charged in a consolidated telephone bill, instead of showing charges under each telephone number. Also called billed telephone number.



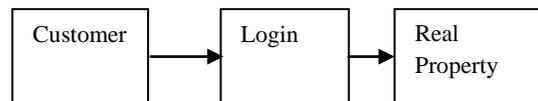
5.6 Water Tax

Water tax payments for every six months pay in online. To view your account information or pay your bill you will need to provide a valid account number. This number can be located on a printed copy of your water bill. If you would like to store your account information you will first need to create an account.



5.7 Real Property Tax

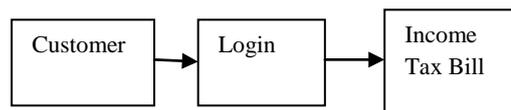
Real property is property that includes land and buildings, and anything affixed to the land. For a business, real property would include warehouses, factories, offices, and other buildings owned by the business. Real property only includes those structures that are affixed to the land, not those which can be removed, such as equipment.



5.8 Income Tax

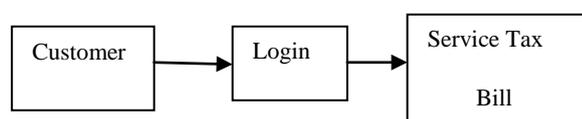
This module is determined by applying a tax rate, which may increase as income increases, to taxable income as defined. Individuals and corporations are directly taxable, and estates and trusts may be taxable on undistributed income. Partnerships are not taxed, but their partners are taxed on their shares of partnership income. Residents and citizens are taxed on worldwide income, while nonresidents are taxed only on income within the jurisdiction. Several types of credits reduce tax, and some types of credits may exceed tax before credits. An alternative tax applies at the Federal and some state levels.

Taxable income is total income less allowable deductions. Income is broadly defined. Most business expenses are deductible. Individuals may also deduct a personal allowance (exemption) and certain personal expenses, including home mortgage interest, state taxes, contributions to charity, and some other items. Some deductions are subject to limits



5.9 Service Tax

This module provided in relation to promotion or marketing of service provided by the client is leviable to service tax under business auxiliary service. Marketing or promotion means activities which are directed towards furtherance of sale.



VI. CONCLUSION

The online payment mode based on has a lot of limitations, such as interface standard, security authentication, payment and business process, data to deposit in his own way and across banking payment obstacle. This online payment mode meet development needs of e-business in our country. So we must perfect the mode to solve a great deal of problems existing at present. The concrete thinking is as follows:

1. Set up unified interface standard. Unify the interface between the commercial banking systems; unify the interface between the customer application systems. This can make data message which the entities transmit discerned by each other.
2. Set up the unified security authentication process, and guarantee the security of online business.
3. Set up the unified trade and payment process, and preserve data with the same form. Combine the Three Flows of e-business to realize the information resource sharing.
4. Solve across banking payment obstacle. This may involve the transformation of the baking business system, and also need to upgrade CNAPS. Then this can make them meet the need of online payment.
5. Carry on the transformation, set up database for against the money laundering and fraud.

This enables the country to supervise the flow-direction of fund, to attack the crime of money laundering and fraud.

VII. FUTURE ENHANCEMENT

In feature this implementation accesses any ware and any time. Once deploy the project in real time after that user can access any ware and any time using any of the browsers. Once register the user details and then all taxes pay within one place.

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AN OVERVIEW OF COMPUTATIONAL LINGUISTICS AND MALAYALAM

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ABSTRACT

Computational linguistics is an interdisciplinary field related with the modeling of natural language from a computational viewpoint. As part of computational linguistics several Malayalam transliteration tools are available to the public. This tool allows you to type in Malayalam by its equivalent English characters. That means type the Malayalam words as it sound in English. A few machine translation systems are also developed in Malayalam for translating Malayalam to English and vice versa but these are not offered to the public. These works are based on Rule Based Machine Translation (RBMT) systems, Statistical Machine Translation systems, Example Based Machine Translation systems and Hybrid Machine Translation systems. This paper explains the efficiency of each system based on BLEU score or human evaluation. So many machine transliteration systems are available now but Malayalam translation systems are only in the beginning stage and needs to develop more.

Keywords: Computational Linguistics, Example Based System, Hybrid System, Machine Translation, Malayalam to English, Rule Based, Statistical, Transliteration.

I INTRODUCTION

Machine translation system is the part of computational linguistics which helps to convert one language to another. The importance of machine translation is increasing day to day because communication between different languages reduces the distance between two ends of the world. A wide range of research is going on machine translation area now and a fully automatic translation system is the aim of researchers. English is the international language so a lot of translation systems are concentrated on the conversion of English to local language and vice versa. Translation tools for other language pairs are also available.

Malayalam is the Dravidian language which has intricate nature and morphological richness. It is the mother tongue of Kerala. In order to communicate from Malayalam to English it is necessary to use a translation tool. English is the most popular language in the world but most of the people in Kerala are not so familiar with English. For the easy communication it is required to use the translation tools for converting Malayalam to English language in the applications like instant message systems, communication systems etc. On the other hand, many research people concentrated on English to Indian language translations. They are interested to review foreign websites, articles, and manuals. English to Malayalam translation systems satisfy the needs of these people. Machine translation is a good approach for localization of languages and it is a difficult job for translating morphologically rich and syntactically different languages.

II MACHINE TRANSLATION METHODS

There are four machine translation methods available now. Following are the brief explanation of these methods:

2.1 Rule Based Machine Translation (RBMT)

It selects rules from dictionaries and grammars based on the linguist information about source target language pairs [1]. Source language structure is directly converted into target language structures in this method. The advantages of RBMT are predictability and easy customization. At the same time lack of good dictionaries, expensive dictionary building and ambiguity in the rules are considered as its drawbacks. Eg. UNITRAN (UNIversal TRANslator)

2.2 Statistical Machine Translation (SMT)

SMT concept is coming from information theory and it uses the statistical models in order to generate the output. There is no customization work needed because translation tool learns methods from statistical analysis of bilingual corpora [2]. It is less expensive than RBMT and it has better resource usage. Corpus is the basis of this method but its creation is expensive with limited resources [3]. SMT does not work well with languages that have different word orders and it is not possible to predict the result in SMT. Eg: n-gram based SMT

2.3 Example Based Machine Translation (EBMT)

Examples are the basis of translation in EBMT system. It uses examples from the corpus to translate similar types of sentences [4]. It is possible to generate output quickly in this method because it uses examples to train the system. If the data set is small it works well but if deep linguistic analysis is required it act as inefficient. Eg. PanEBMT

2.4 Hybrid Machine Translation (HMT)

It combines the advantages of Rule Based systems and Statistical Machine Translation systems to translate source language to destination language [5]. HMT confers the better output comparing to other methods. It needs less post-editing of destination language. Accuracy of HMT is high and it provides fast and quality output. HMT uses the properties of RBMT and SMT so it combines the drawbacks of different approaches. Eg. DFKI-LT

III GLOBAL TRANSLATION SYSTEMS

The rapid growth of machine translation system leads to the development of commercial and non commercial translation systems. Commercial translation companies concentrated to develop quality products for the market [6]. It increases the competition and a good number of translation tools came into existence. Babylon, @prompt, Systran etc are some of the commercial machine translation software systems that are popular in the world. The study of current translation systems lead to the development of a website (<http://translation-softwarereview.toptenreviews.com>) which finds out top ten commercial translation tools worldwide. TABLE-1 shows the top ten profit-making machine translation tools which obtained from the above site:

Table 1. Top ten machine translation tools in the world

| Position | Machine Translation Software |
|----------|------------------------------|
| 1 | Babylon |
| 2 | Power Translator |
| 3 | Prompt |
| 4 | WhiteSmoke |
| 5 | Translate Personal |
| 6 | Prompt Personal |
| 7 | Translution |
| 8 | LingvoSoft Translator |
| 9 | IdiomaX |
| 10 | Ace Translator |

IV COMPUTATIONAL LINGUISTICS AND MALAYALAM

4.1 Centre for Linguistic Computing Keralam

This is a joint undertaking of Computational Linguistic Team @ C-DIT, Kerala State IT Mission and Dept: of Linguistics, University of Kerala for research [7]. The use of information technology demands the need of local language to communicate to local people. For achieving this Computer Linguistic Team decided to develop software which helps the people in Kerala to understand and use information technology features in Malayalam. Their first product NILA was launched in 2004 that provides the facility to use e-governance and socialize the government programs through Malayalam. Next product Kaveri was launched in 2006. It assists text processing in Malayalam. As part of text processing it also provides transliteration system of major South Indian Languages and English-Malayalam translation help. Periyar is the next product (2010) and Pamba and Kabani are the incoming products of this team.

4.2 Malayalam transliteration tools

Several Malayalam transliteration tools are available in the websites. It is not translation tools but it allows you to type in Malayalam by its equivalent English characters. That means type the Malayalam words as it sound in English. These are also called as phonetic converters. Keraleeyam is one popular phonetic converter that is used by many users to type in Malayalam. TABLE-2 shows some phonetic converters available in the internet.

Table 2. Malayalam transliteration tools

| Sl.No. | Malayalam Transliteration tools |
|--------|---------------------------------|
| 1 | Keraleeyam |
| 2 | Varamozhi |
| 3 | Changathi |
| 4 | Easy Malayalam |
| 5 | TamilCube |
| 6 | Aksharangal |
| 7 | English To Malayalam Translator |
| 8 | Yahoo! Transliteration |
| 9 | Malayalam Typing Software |
| 10 | QUILLPAD Writer |
| 11 | Softoni malayalam typeing |

| | |
|----|----------------------------------|
| 12 | HariSree Malayalam Software Pack |
| 13 | MyMalayalam.com |
| 14 | LIPIKAAR |
| 15 | NHM Writer |

4.3 Machine Translations Works in Malayalam

There are some translation systems for converting Malayalam sentences into its equivalent English translation and English to Malayalam translations. But the software implementations for the translations are not available till now. This section discusses the available studies on machine translations related to Malayalam.

4.3.1 English to Malayalam Translations

There is no tool available for English to Malayalam translation but various researches are progressing in this line.

R. Rajan et al. [8] have used the RBMT method in order to convert English sentences to Malayalam. It uses bilingual dictionaries and rules and is based on the parts of speech tag and dependency information from the parser. Transfer link rule and morphological rules are used here. English Malayalam bilingual dictionary is dictionary used in this work.

Aneena George [9] proposed an SMT system based approach for English to Malayalam conversion. In order to build an SMT it uses the probabilistic model. Parallel corpus is aligned by Berkeley word aligner and Hidden Markov model is used for the development of training and evaluation. Language model calculates the probability of destination language sentences and translation model computes the probability of target language sentences given the source language sentence with the help of Baum Welch training algorithm. 50 English and Malayalam sentences are included in the parallel corpus for train the system. The quality of the output in this system depends upon the size and quality of the corpus used for training.

Mary Priya Sebastian et al. [10] have also proposed an SMT system based approach which utilizes the bilingual English Malayalam corpus and monolingual Malayalam corpus in the training phase. Techniques to improve the alignment model, removing insignificant alignments, suffix separation from Malayalam corpus and stop word elimination from the bilingual corpus are the methods used for improving the efficiency of the system. Quality of output in this system is measured using BLEU score. Sentences in Training set has BLEU score 74 and Unseen sentences have 43.

Nithya B. et al. [11] have proposed an approach based on hybrid translation which is the combination of rule based and statistical machine translations. In order to perform hybrid English to Malayalam translation, statistical machine translator and translation memory caches are used. A statistical machine translator uses the machine learning techniques on the corpus. Translation memory caches are used for eliminating the redundant translations. This system is evaluated by BLUE score and human evaluation. This system proves 69.33 BLUE score and manual evaluation shows the accuracy of 75.3%.

J. Sangeetha et al. [12] have proposed a hybrid system based approach which translates English to Indian languages such as Tamil, Malayalam and Hindi. This system is the combination of statistical and ruled based methods. Rule based system builds rules which help to re-order the syntactic structures of source language. Context Free Grammars is applied for the generation of language structures and statistical technique is used to correct the errors in the translated text. Simplifying and segmenting are applied in source language for improving the quality of machine translation. This work is implemented with BLEU score 79.23.

4.3.2 Malayalam to English Translations

There are three works available under the category of Malayalam to English translations. These are based on RBMT, EBMT and Hybrid translation methods.

A transfer based RBMT approach is proposed by *Latha R Nair et al.* [13] for Malayalam to English translations. This system includes preprocessor for dividing the compound words, a syntactic structure transfer module, bilingual dictionary and morphological parser (context disambiguation and chunking). Rules for Malayalam morphology and rules for syntactic structure transfer are two rules used in this system. Artificial intelligence techniques are used here and it is possible to build translation system for other language pairs easily. After the implementation about 20% of output shows the exact translation of input and remaining were meaningful but small limitations due to some reasons.

Another Malayalam to English translation system is proposed by *Anju E.S et al.* [14] using EBMT method that has three steps such as example acquisition, matching and recombination. This is evaluated by human experts based on the perfection of the translated output. System works well for the simple sentences with 75% quality in translation and remaining have reordering problems. In order to improve the performance it is recommended to use large aligned corpus and more reordering rules.

Rajesh. K. S et al. [15] have proposed a Hybrid approach which is the combination of word-aligned parallel corpus based and dictionary lookup methods. First three IBM models and Expectation Maximization (EM) algorithm are the basis of corpus and bilingual Malayalam-English Dictionary is used for dictionary lookup approach. Malayalam-English corpus has 950 sentence pairs and 255 sentence pairs were used for testing. This approach gives 91% precision for translated output.

V RESEARCH FINDINGS

Translation systems in Malayalam are in developing stage. There are many profitable and non profitable systems globally available but the Malayalam translation tools require long way to reach to this perfection. A lot of open source transliteration and free systems are available to the public but it provides only Malayalam sentences when typing equivalent English sounds. There is some translations systems are developed but as a tool it is not available to public and its efficiency is questionable. So it can conclude that the Malayalam translation tools are in developing stage compared to global translation tools and it requires lots of research to reach to perfection.

VI CONCLUSION

Machine translation is the process of translating one natural language to another with the help of computer system. Numerous translation systems are available in the market today. Translation systems in Malayalam are in developing stage and computer linguistic team of CDIT contributes some text processing systems including translation aid to the area of machine translation. Several machine transliteration tools are available today but that does not translate Malayalam to other languages or vice versa. Some Malayalam machine translation systems were developed but its implementation is not available to the people. It is an acceptable fact that translation systems in Malayalam are in emerging stage and requires lots of research in this regard.

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EXPERIMENTAL INVESTIGATION OF POLYMER GEL SOLAR POND

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ABSTRACT

Polymer gel solar pond is a promising technology which aims to reduce the heat loss occurring at the top convective layer of a solar pond. In conventional salt gradient solar pond, the heat stored in the lower convective zone is heated by the solar radiation transmitted through the upper convective zone and non-convective zone of the pond. Due to the buoyancy effect, the water heated at the lower convective zone will be raised to the surface and the heat is finally released to the atmosphere through convection. Such Convective heat losses inhibit the thermal energy storage and the storage capacity of the medium. To reduce the evaporation heat loss in conventional salt gradient solar pond, the UCZ and NCZ of the pond is replaced by the polymer gel. Polyethylene glycol is a polymer gel base which is capable of inhibiting the convective heat loss from the surface of the pond and thereby it enhances the thermal energy storage capacity of the pond.

Keywords: Polyethylene glycol, UCZ, LCZ, HSZ, polymer gel.

I. INTRODUCTION

The sun is the primary source of heat energy, which is available in abundant on the earth which cannot be sourced out. The energy reaped from sun acts as a main source of renewable energy which is available in two different forms namely, light energy in terms of photons of energy packets and heat energy in terms of electromagnetic radiation.

The solar pond technology was developed during the beginning of 20th century[1]. The solar ponds are a typical thermal energy storage structures which collects large amount of solar radiation from sun and make it available when needed[2]. Solar ponds are used for desalinating the brine water, power production and supplies heat energy for process industries[3][4].

The salt gradient solar pond composed of three zones. The first zone, upper convective zone (UCZ) in that zone the fresh water is filled[2][5][6]. The fraction of the radiation is first absorbed by UCZ[4]. However this absorbed heat is lost through convection and radiation heat transfer through atmosphere the remaining radiation penetrates through second layer. The second zone, non-convective zone (NCZ) where, the brine density is gradually increases towards the bottom of the pond[6]. The depth of NCZ is half height of solar pond height[2][7][8]. The third zone, lower convective zone (LCZ) or heat storage zone (HSZ) in that zone the brine density is high compare to other two zones due to this the brine solution at LCZ is capable enough to store high heat for long duration[9][2].

In conventional salt gradient solar pond the solar radiation from sun reaches the water surface and the energy from the radiation is trapped by the solvent in the pond [10]. In salt gradient solar pond, the heat storage gradient is higher at the lower convective zone where the concentration of the salt is high and it reduces gradually to the upper convective zone[7]. The problems resulted from salt gradient ponds are environmental hazardous of salt handling and turbid discharge[11]. The main limiting factor for salt gradient solar pond is the heat convection taking place at the upper convective zone which results in escape of heat energy and evaporation of the solvent [12]. To avoid such undesirable evaporation loss from pond surface, polymer gels are made to float on the pond surface[2]. These polymer gel layer replaces the UCZ and NCZ in conventional salt gradient solar ponds[13].

II MATERIALS AND METHODOLOGY

2.1 Solar Gel Pond

The Dissolved air in the water increases the buoyancy resulting in the floatation of the gel layer. The gel density is lowered due to the addition of dissolved air, which enables the gel to float over 2 % salt water, or even less[13], the gel should satisfy the following criteria:

- Transparent of solar radiation,
- High viscosity,
- High specific heat and low coefficient of volumetric expansion over the operating temperature range of the pond,
- Nontoxic.

The dirt and debris falling into the pond are retained by the surface and can be cleaned off periodically. There are only two zones, lower zone being the saline water and the gel layer floats above the salt water hence no salt gradient layers need be maintained as in the case of solar pond, leading to low maintenance requirements[2]. If an appropriate gel is developed to float on water, then the environment hazard of salt handling can be eliminated[2]. The salt requirements are less in solar gel pond when compared to salt gradient ponds thereby reducing cost and environmental hazard [13][1].

2.2 Selection of Polymer Gel

Polyethylene glycol has been selected for the experimental investigation. Due to its good radiation absorption properties, low density, High Specific heat and readily soluble in water above 130⁰C[13].

2.3 Construction of Polymer Gel Solar Pond



Fig 1: Polymer Gel Solar Pond

A polymer gel solar pond having top bare surface area of 1m^2 and the bottom surface 0.6m^2 is constructed such that it is trapezoidal with the height of 0.5m. The glass wool and wood are used as an insulating material. The black matted low density polyethylene is used to bottom of the pond to trap the solar radiation[10] [14]. Sodium chloride used as a brine solution[5]. The concentrations of brine in the pond is 20% from total percentage of water[8][10]. The K-type of thermocouple is used to measure the temperature of the pond.

| | |
|-------------------------|----------------------|
| Polymer used | Poly Ethylene Glycol |
| Brine solution | Sodium chloride |
| Insulating medium | glass wool |
| Bottom cover used | LDPE |
| Type of thermocouple | K Type |
| Required level of water | 320 l |
| Salt | 30 kg |

TABLE 1: Specifications of Polymer Gel Solar Pond

The Table 1 gives the specification of polymer gel solar ponds and the instruments used in the investigation.

III. EXPERIMENTAL RESULTS

The experimental analysis of 320 litres capacity polymer gel solar pond was carried out during the month of February 2015 at meteorological conditions (Latitude $11^{\circ}00''\text{N}$, Longitude $77^{\circ}00''\text{E}$) of Coimbatore, India. The temperature of various zones in the pond was measured using k type thermocouples and the solar intensity was recorded using pyranometer with the time intervals of 30 minutes.

| S. No | Time in Hours | Solar Intensity (W/m^2) | Gel Temp($^{\circ}\text{C}$) | LCZ ($^{\circ}\text{C}$) | η_c |
|-------|---------------|--|-----------------------------------|-------------------------------|----------|
| 1 | 10 | 471 | 45 | 53 | 25 |
| 2 | 10:30 | 464 | 47 | 54 | 25 |
| 3 | 11 | 455 | 48 | 54 | 27 |
| 4 | 11:30 | 475 | 50 | 57 | 26 |
| 5 | 12 | 481 | 51 | 61 | 29 |
| 6 | 12:30 | 487 | 59 | 63 | 30 |
| 7 | 1 | 522 | 59 | 67 | 30 |
| 8 | 01:30 | 504 | 60 | 65 | 30 |
| 9 | 2 | 491 | 61 | 63 | 30 |
| 10 | 02:30 | 487 | 61 | 61 | 29 |
| 11 | 3 | 489 | 62 | 62 | 29 |

| | | | | | |
|----|-------|-----|----|----|----|
| 12 | 03:30 | 487 | 58 | 60 | 29 |
| 13 | 4 | 475 | 40 | 60 | 29 |

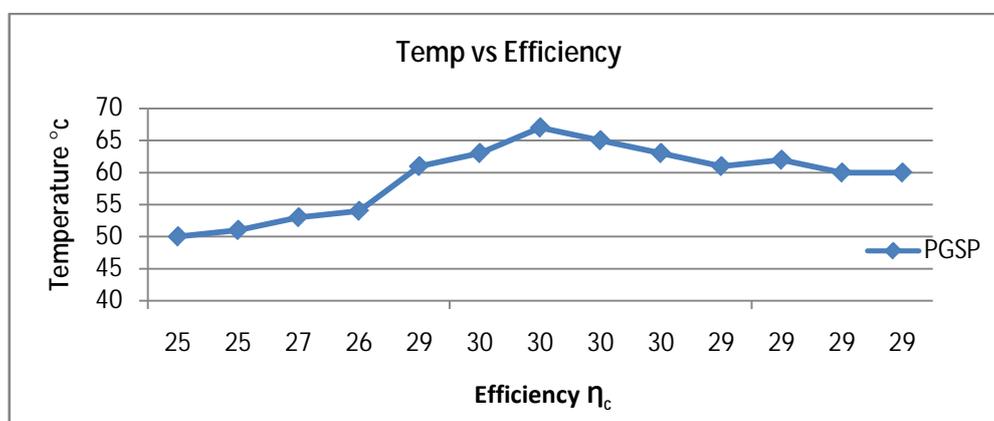
TABLE 2: Experimental observations of Polymer Gel solar pond

| S. No | Time in Hours | Solar Intensity (W/m ²) | UCZ (°C) | NCZ (°C) | LCZ (°C) | η_c |
|-------|---------------|-------------------------------------|----------|----------|----------|----------|
| 1 | 10 | 471 | 30 | 44 | 50 | 17 |
| 2 | 10:30 | 464 | 30 | 44 | 51 | 18 |
| 3 | 11 | 455 | 30 | 46 | 50 | 19 |
| 4 | 11:30 | 475 | 29 | 42 | 51 | 19 |
| 5 | 12 | 481 | 31 | 41 | 51 | 20 |
| 6 | 12:30 | 487 | 30 | 44 | 52 | 21 |
| 7 | 1 | 522 | 31 | 45 | 54 | 21 |
| 8 | 01:30 | 504 | 29 | 43 | 57 | 21 |
| 9 | 2 | 491 | 29 | 41 | 56 | 21 |
| 10 | 02:30 | 487 | 31 | 39 | 54 | 20 |
| 11 | 3 | 489 | 32 | 41 | 54 | 20 |
| 12 | 03:30 | 487 | 30 | 39 | 54 | 20 |
| 13 | 4 | 475 | 31 | 42 | 51 | 20 |

TABLE 3: Experimental observations of Salt Gradient solar pond

IV. DISCUSSION

From the results obtained it is evident that the heat storage capacity of the solar pond has been increased by replacing the UCZ and NCZ of conventional salt gradient pond by the poly ethylene Glycol gel layer.

**Fig 2: Temperature and efficiency comparison of PGSP**

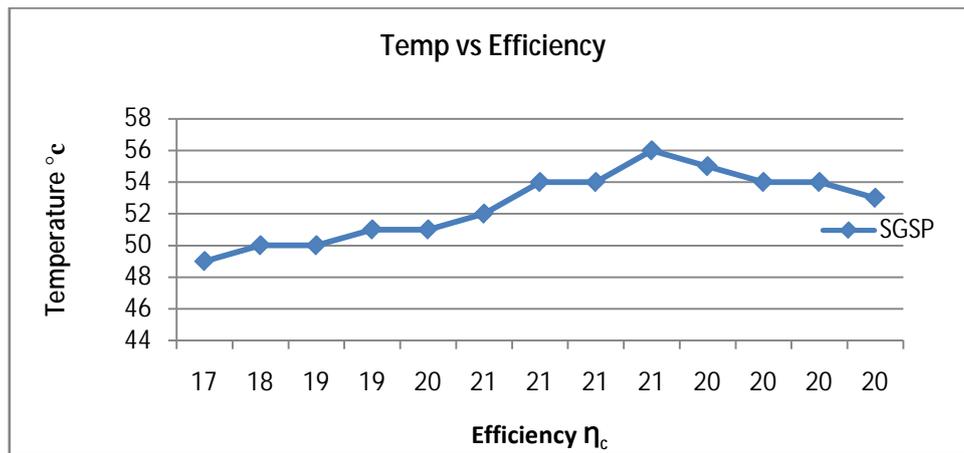


Fig 3: Temperature and efficiency comparison of SGSP

The LCZ temperature of the polymer gel pond reaches up to a temperature of 67°C and it yields a collection efficiency of maximum 30% when compared to conventional salt gradient solar pond's LCZ reaches a maximum temperature of 57°C and yields a collection efficiency of 21 %.

V. CONCLUSION

The experimental observation of 320 litres polymer gel solar pond shows the increase in the collection efficiency of the pond compared to same capacity conventional salt gradient solar pond. The increase in the collection efficiency of the polymer gel pond is due to the opaqueness created by the polymer gel towards the incident solar radiation, which allows the radiant energy to be stored in the pond solvent instead of reflecting it back into the atmosphere. The losses associated with surface evaporation of pond solvent is reduced to a great extent by the floating polymer gel layer which inturn concentrates the temperature inside the pond.

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LOW POWER HIGH PERFORMANCE PULSED FLIP FLOPS BASED ON SIGNAL FEED SCHEME

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ABSTRACT

Flip-flops are critical timing elements in digital circuits which have a large impact on circuit speed and power consumption. The performance of the Flip-Flop is an important element to determine the performance of the whole synchronous circuit. In this paper, a dual-edge triggered flip-flop with high performance is designed. This paper discussed a low-power flip-flop (FF) design features an explicit type pulse-triggered configuration and a customized true single phase clock latch based on a signal feed-through scheme is presented. The proposed design effectively over come on the problem of the long discharging path in conventional explicit type pulse-triggered FF (P-FF) designs and attain better speed and power performance.

Keywords: P-Ff (Pulsed Flip Flop), Low Power, Ff (Flip Flop)

I. INTRODUCTION

In the past few ten years, according Moore's law the VLSI technology continuously increase the transistor densities, there are hundreds millions billions of transistors are fabricated on a chip today, which constantly increase the power consumption of the chip. Flip-Flops are very important circuit elements in all synchronous VLSI circuits. Flip flops consumes a significant portion of the total power of the circuit so they are not only responsible for the correct timing, performance and functionality of the chip, but also on the other clock distribution networks.

Pulse-triggered flip flops are characterized by an uncomplicated structure, negative setup time and soft edge, improved performance over traditional master slave flip flop. There are various types of pulse-triggered flip flops were recently proposed. It includes implicit-pulsed flip flops and explicit-pulsed flip flops. The pulse generator of the explicit-pulsed flip flop can be shared by neighboring identical flip flops, which contribute to less power dissipation than implicit-pulsed ones. The clock frequency can reduce to half in dual-edge flip flops that of the single-edge triggered flip flops while maintaining the same data throughput, consequently power dissipation is decreased.

In this paper, we present a novel low-power and high performance pulsed flip flop design based on a signal feed through method. Observing the delay inconsistency in latching data "1" and "0". This flip flop design manages, how to shorten the longer delay, this will done by feeding the input signal directly to an internal node of the latch design. This will helps to speed up the data transition. This method is implemented by introducing a uncomplicated and a very simple pass transistor which used to drive the extra signal. After combining this circuit method with the pulse generation circuitry, it forms a new pulsed flip flop design with improved speed and power-delay-product(PDP) performances.

II. PROPOSED DESIGN BASED ON SIGNAL FEED THROUGH METHOD

2.1 Conventional Explicit Pulsed Flip Flop

Pulse-triggered flip-flops can be static, or semi-static, or dynamic, or semi-dynamic. Pulse-triggered flip-flops can also be classified into single-edge triggered flip-flops and double-edge triggered flip flops. the pulse triggered flip-flops based on the pulse generators can be categorized into two types: implicit pulsed flip flops and explicit-pulsed flip flop. The pulse is generated inside the flip-flop in implicit-pulse triggered flip flops, or ip-FF. While in explicit-pulse triggered flip-flops, the pulse is generated externally.

To provide a fine comparison there are few existing designs are discussed. A classic explicit P-FF design, named data-close-to- output (ep-DCO). Pulsed flip-flops offer an attractive method of meeting delay and energy requirements of a design while providing the-borrowing capability to mitigate clock skew effects. For high-speed operation, ip-DCO has the fastest delay of any flip-flop considered, along with a large amount of negative setup time. This design ep-DCO suffers from a serious drawback and that is the internal node X is discharged on every rising edge of the clock despite of the presence of a static input “1”. This gives rise to large switching power dissipation.

To overcome the above discussed problem of ep-DCO flip flop there are many remises are introduced such as conditional discharge, conditional precharge, conditional capture etc. A modified version is shown in fig (b) an extra nMOS transistor MN3 controlled by the output signal Q_fdbk is working in CDFF flip flop thus there is no discharge occurs if the input data remains at 1.

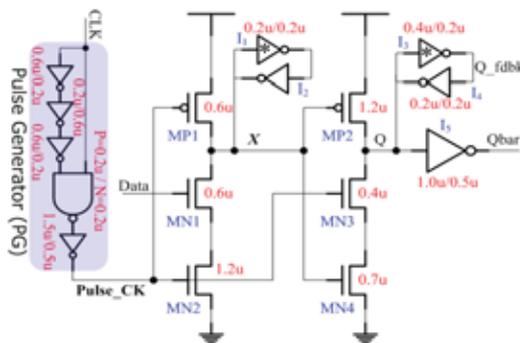


Fig.(a) ep-DCO

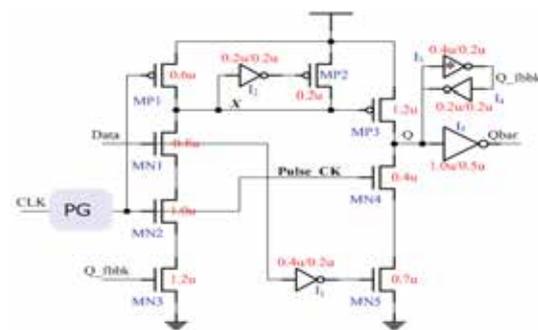


Fig.(b) CDFF

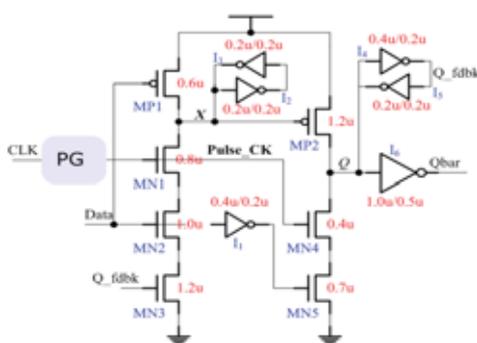


Fig.(c) SCDFF

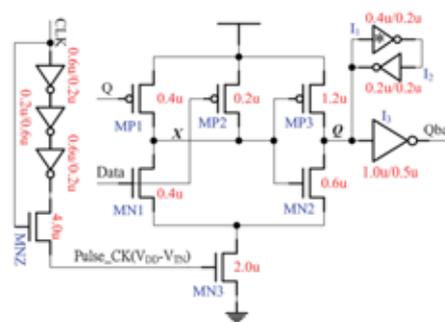


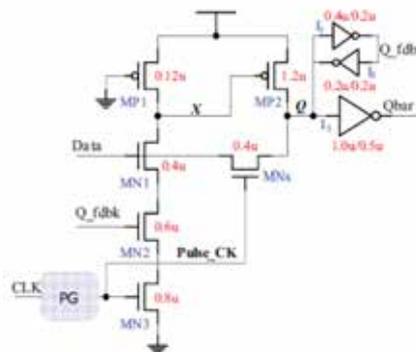
Fig. (d) MHLFF

SCDFF which is shown in fig (c), differs from the CDFF design in using a static latch structure. Node X is thus exempted from periodical precharges. It exhibits a longer data-to- Q (D-to- Q) delay than the CDFF design. Both designs face a worst case delay caused by a discharging path consisting of three stacked transistors, i.e., MN1–MN3. To overcome this drawback modified hybrid latch flip flop is introduced which is shown in fig (d). A powerful pull-down circuitry is needed to increase the speed which causes extra layout area and power consumption. In this flip flop the keeper logic at node X is removed. Although this circuit is simple, but it encounters two drawbacks. First, since node X is not precharged, a delayed 0 to 1 delay is expected. Second, node X becomes floating in certain cases and its value may float causing extra dc power.

2.2 Proposed Pulsed Flip Flop

Recall the four circuits which are reviewed previously, they all are suffers from the same worst case timing problem which is occurring at 0 to 1 data transitions. Referring to the Fig. 2, the proposed design uses a signal feed-through technique to improve this delay. Comparable to the SCDFF design, the proposed design also employs a static latch structure and a conditional discharge scheme to avoid redundant switching at an internal node. On the other hand, there are three main differences that lead to a only one of its kind TSPC latch structure and create the proposed design different from the previous one which are explained above.

In this FF at First, there is a weak pull-up pMOS transistor MP1, the gate of this transistor is connected to the ground which is used in the first stage of the TSPC latch. This method of transistor will give the rise to a pseudo-nMOS logic technique of design, and the charge keeper circuit for the internal node X can be saved. In result to the circuit simplicity, this approach also reduces the load capacitance of node X .

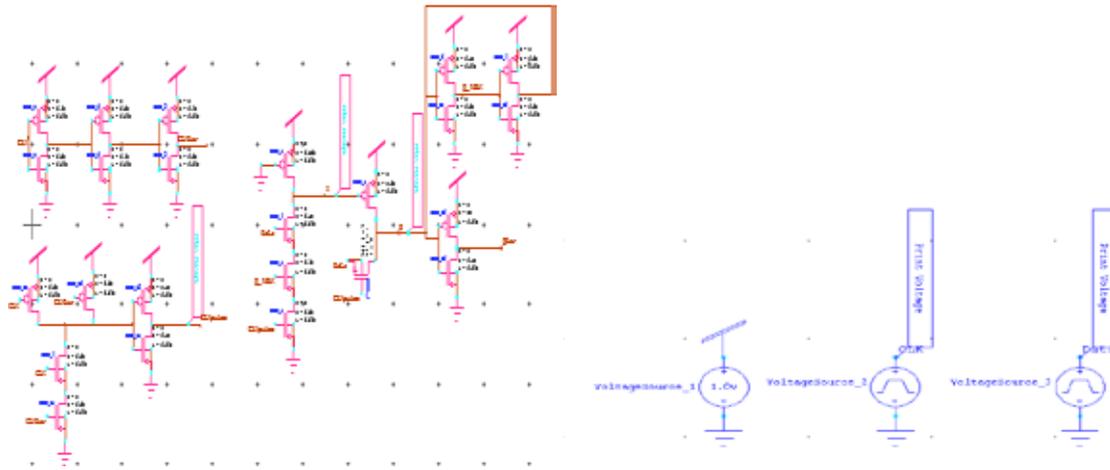


Now the second point is, a pass transistor MN x is included which is controlled by the pulse clock thus the input data can drive node Q of the latch directly through the signal feed-through scheme. Beside with the pull-up transistor MP2 at the second stage inverter of the TSPC latch, this additional passage facilitates supplement the signal driving from the input source to node Q . The node level therefore be a quickly pulled up to shorten the data transition delay.

Now the pull-down network of the second stage inverter is completely removed. As a substitute the newly employed pass transistor MN x provides a discharging path.

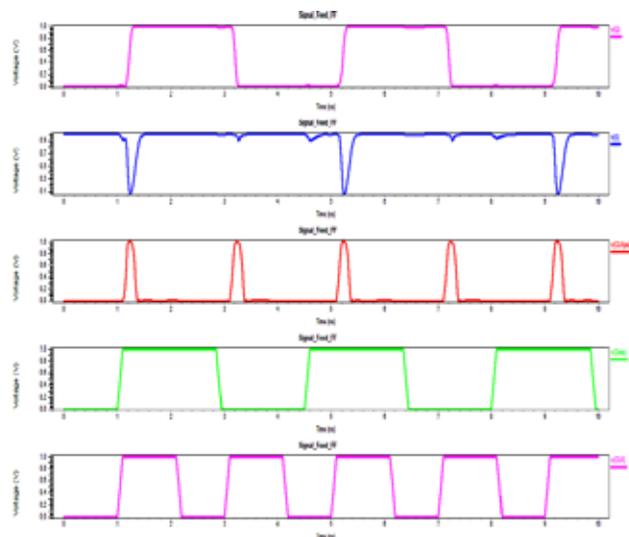
III. SCHEMATIC AND SIMULATION RESULT

3.1 Schematic of Single Edge P-Ff



SOURCES

SIMULATION RESULT



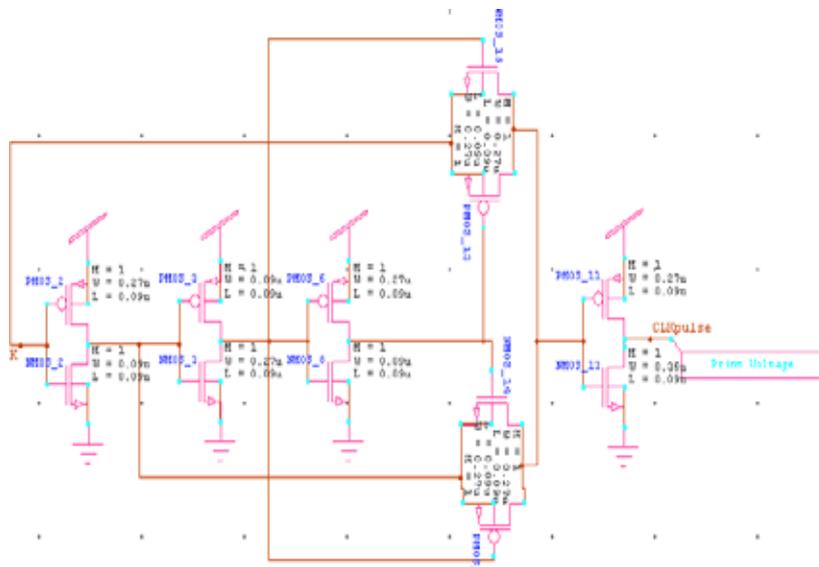
The working principles of the proposed design are explained as follows:

- When a clock pulse arrives, when there is no data transition occurs, the input data and node Q have identical level, when current passes through the pass transistor MNx, which keeps the input stage of the flip flop from. At similar time, the input data and the output feedback Q_fdbk assume opposite signal levels and the pull-down path of node X is turned off. Hence, no signal switching occurs at any internal nodes.
- When “0” to “1”(low to high) data transition occurs, node X will discharge and transistor MP2 will turn on which at that time pulls node Q high this corresponds to the worst case of timing of the flip flop operations as the discharging path conducts no more than for a pulse duration. Though, with the signal feed through scheme, the delay can be greatly shortened by a boost that can be obtained from the input source via the pass transistor MNx . Even though this seems a load to the input source with straight charging/discharging dependability which is a common drawback of all pass transistor logic, the circumstances are different in this case because MNx conducts just for a very short period.

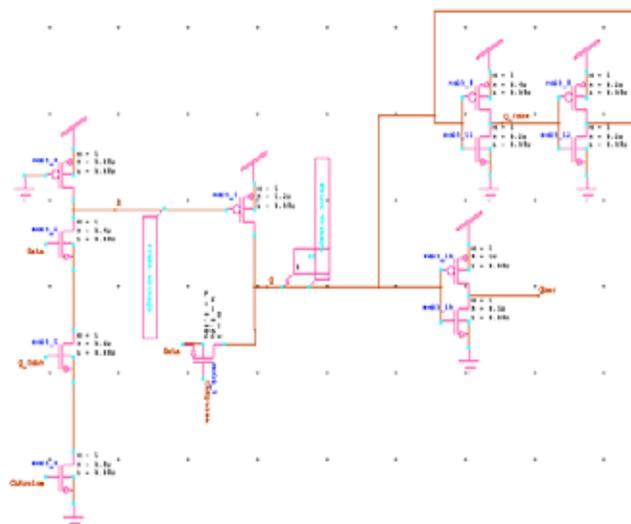
- When “1” to “0”(high to low) data transition occurs, pass transistor MNx is similarly turned by the clock pulse and node Q is discharged by the input stage all the way through this path. Contrasting the case of “0” to “1” data transition, the input source bears the one and only discharging dependability. Because MNx is turned on only for a short time period, the loading consequence to the input source is not considerable. In exacting this discharging does not communicate to the critical path delay and calls for no transistor size change to improve the speed. In calculation because a keeper logic is placed at node Q, the discharging responsibility of the input source is lift once the situation of the keeper logic is inverted.
- Transistor MP1 is permanently ON because gate of the transistor is ground.

3.2 Schematic of Dual Edge P-Ff

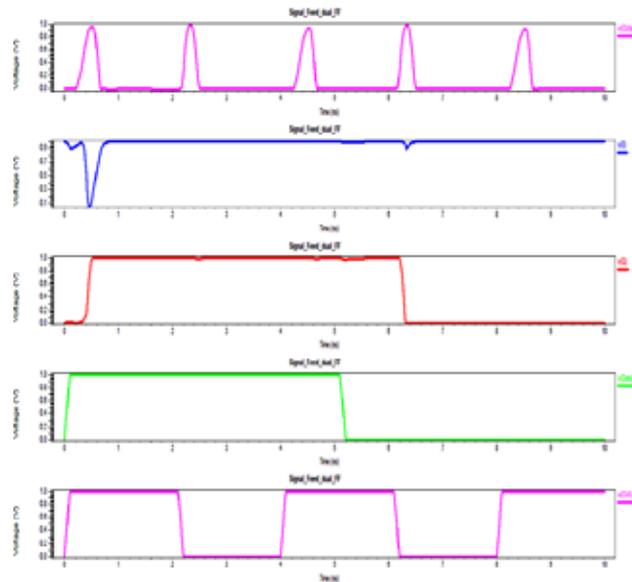
PULSED GENERATOR



LATCHING STAGE



SIMULATION RESULT



IV. RESULT ANALYSIS

Table I shows the comparative analysis of dual edge flip flops using 90 nm technology and supply voltage 1v. The concert of the proposed pulsed flip flop design is evaluated beside existing designs through simulations. The compared designs consist of four explicit type pulsed flip flops designs which are shown above. There is an implicit type pulsed flip flop design named SDFF is also mentioned. All pulsed flip flop designs used a conventional CMOS NAND-logic-based pulse generator design with a three-stage inverter chain excluding the MHLFF design, which employs its own pulse generation circuitry. Because pulse width design is critical to the accuracy of data capture in addition to the power consumption, the transistors of the pulse generator logic are sized for a design of 120 ps in pulse width in the case. In addition the sizing ensures that the pulse generators can perform correctly in each and every process corners. Through consider to the latch structures, every pulsed flip flop design is independently optimized issue to the product of D-to-Q delay and power. To imitate the signal rise and fall time delays, input signals are generated all the way through buffers. While the proposed design requires direct output driving as of the input source, in favor of reasonable comparisons the power consumption of the data input buffer (an inverter) is incorporated.

Table II and table III defines the summarized features of the circuit and the simulation results. In favor of circuit properties, while the proposed design does not utilize the least number of transistors. This is essentially credited to the signal feed-through method which mostly reduces the transistor sizes on the discharging path. In terms of power behavior, the proposed design is the mainly proficient in five out of the six test patterns. The savings differs in different combination of test pattern and flip flop design. It is power saving against ep-DCO, CDFF, SCDF and MHLFF. The ep-DCO design consumes the major portion of power as of the extra internal node discharging problem.

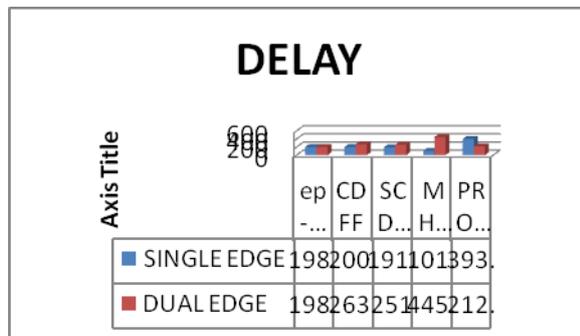
SINGLE EDGE FLIP FLOP TABLE I

| FF | Power(uW) 50% Switching | Delay(ps) | Number of transistors |
|----------------|-------------------------------|-----------|--------------------------|
| epDCO | 23.42541 | 198.81 | 28 |
| CDFF | 22.3876 | 200.74 | 30 |
| MHLLF | 19.66693 | 101.67 | 19 |
| SCDFF | 24.35541 | 191.86 | 31 |
| Signal feed | 25.27361 | 393.46 | 24 |

DUAL EDGE FLIP FLOP TABLE II

| Flip Flops | Power (uW) 100% switching | PDP at 50% switching (pJ) | Delay (ps) | Power (uW) 50% Switching |
|----------------|------------------------------------|------------------------------------|---------------|-----------------------------------|
| epDCO | 30.5368 | 5.39 | 198.25 | 27.2278 |
| CDFF | 28.6858 | 5.64 | 263.53 | 21.42264 |
| SCDFF | 29.6388 | 5.46 | 250.97 | 21.77347 |
| MHLLF | 31.8159 | 8.82 | 445.56 | 19.81702 |
| Signal feed | 24.838 | 4.17 | 212.09 | 19.67952 |

LEAKAGE CURRENT (nW) IN DUAL EDGE P-FF TABLE III



| | epDCO | CDFF | MHLLF | Static CDFF | Signal feed |
|---------------------|-------|-------|-------|----------------|----------------|
| (CLK,Data) (0,0) | 74.11 | 42.04 | 48.78 | 38.68 | 47.24 |
| (CLK,Data) (1,1) | 58.04 | 32.06 | 32.86 | 23.53 | 41.13 |

V. CONCLUSION

In this paper, there are five flip flops are discussed and compared. Both single edge and dual edge flip flops are discussed. The main idea of this signal feed design is to increase power and speed performance. Dual edge triggered flip flop are basically consumed less power. In this thesis, there is a novel pulsed flip flop design by employing a customized TSPC latch structure which incorporate a mixed design style that consist a pass transistor and a pseudo-nMOS logic. The main idea was to supply a signal feed through from input source to the internal node of the latch, which would make possible additional driving to cut down the transition time and improve both power and speed performance. The design was cleverly achieved by employing a uncomplicated pass transistor. General simulations were conducted, and the results did carry the claims of the proposed design in a wide range of performance aspect. By the comparison table I, II, III it is clear that proposed design has least delay, power switching activity, number of transistor and leakage current in comparison with all discussed flip flops.

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THREE-DIMENSIONAL HEAT TRANSFER ANALYSIS OF MICROCHANNEL HEAT SINK USING NANOFLUID

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ABSTRACT

A numerical simulation of three dimensional heat transfers in a silicon based microchannel heat sink has been conducted using nanofluid (TiO_2-H_2O) by SIMPLE method. Model of microchannel consists of trapezoidal channel. Dimensions of trapezoidal microchannel are 10 mm length, 280 μm channel top width, 225 μm channel bottom width, 431 μm channel hypotenuse and 430 μm channel height. Influence of properties of nanofluid on the heat transfer is investigated. Different parameters like heat transfer coefficient, Nusselt number, heat flux, outlet temperature are studied for different pressure drop. Pumping power depends upon pressure difference. So power consumption can be optimized by this study. Result shows that heat transfer coefficient is high in comparison to the water as a coolant in microchannel heat sink. Because of boundary layer, variation of Nusselt number decreases along the flow direction.

Keywords: Heat Sink, Micro Channel Heat Sink, Nanofluid.

I. INTRODUCTION

Cooling of electronic chip is essential for the proper functioning of electronic device, in which it is used. At present time it has become major concern to electronic packaging engineers. Most of the electronic devices face problem of improper cooling of electronic chip, which results failure of device. Microchannel heat sinks were introduced in the early 1980s to be used as a means of cooling integrated circuits. Microchannel heat sinks remove heat 50 times more efficiently than conventional methods. Microchannel heat sinks have attracted special attention because of their ability size. Its coolant requirements are less. Various experimental and numerical studies have been performed by researchers so far. Suspension of nanoparticles such as metal oxides, metals in base fluid such as water, ethylene glycol is called nanofluid.

II. LIERATURE REVIEW

Tuckerman and Pease [1] performed research on microchannel heat sink in 1981 first time. It was concluded that heat transfer rate would increase by decreasing liquid cooling channel dimensions.

G. Hetsroni et al. [2] has performed investigation of a heat sink for cooling of electronic devices, using a dielectric liquid that boils at a lower temperature. The cooling fluid, utilized in this study, made it possible to maintain the temperature on the heated surface in the range 323–333 K. It was found that the temporal behaviour of temperature fluctuations corresponds to that of pressure fluctuations. The maximum values of the pressure fluctuations did not differ significantly from the pressure drop across the channels.

H.Y. Wu and Ping Cheng [3] experimentally investigated the laminar convective heat transfer and pressure drop of water in 13 different trapezoidal silicon microchannels. It was found that the values of Nusselt number and apparent friction constant depend greatly on different geometric parameters. The laminar Nusselt number and apparent friction constant increased with the increase of surface roughness and surface hydrophilic property.

Piyanut Nitiapiruk et al.[4] investigated the performance of a microchannel heat sink using TiO_2 /water nanofluid experimentally. It was concluded that the use of the model which is based on experimental data is very important to estimate the friction factor, while the use of different models to calculate of thermal conductivity has no considerable effect on the prediction of Nusselt number.

Harpole and Eninger [5] suggested manifold microchannel heat sinks first time. Compared to conventional microchannel heat sinks, manifold microchannel heat sinks had many inlet and outlet manifolds, alternating at a periodic distance along the length of the microchannels. . The pressure drop was reduced by a factor equal to the number of manifold inlet/outlet compared with conventional microchannel heat-sink.

Roy W. Knight et al.[6] presented the equations governing the fluid dynamics and combined conduction/convection heat transfer in a heat sink in dimensionless form for both laminar and turbulent flow. This study was useful to determine heat sink's dimensions that displayed the lowest thermal resistance between the hottest portion of the heat sink and the incoming fluid.

Weilin Qu, Issam Mudawar [7] performed numerical investigation the three-dimensional fluid flow and heat transfer in a rectangular micro-channel heat sink are analyzed numerically using water as the cooling fluid. It was found that the temperature rise along the flow direction in the solid and fluid regions can be approximated as linear.

J. Koo, C. Kleinstreuer [8] simulated and analyzed liquid nanofluid flow in microchannels by considering two types of nanofluids, i.e., copper oxide nanospheres at low volume concentrations in water or ethylene glycol. Based on this study, it was recommended for microchannel heat sink, use of large high-Prandtl number carrier fluids, nanoparticles at high volume concentrations of about 4% with elevated thermal conductivities and dielectric constants very close to that of the carrier fluid, microchannels with high aspect ratios, and treated channel walls to avoid nanoparticle accumulation.

X.L Xie et al. [9] performed numerical study of laminar heattransfer and pressure drop characteristics in a water-cooled minichannel heat sink. The results indicate that a narrow and deep channel with thin bottom thickness and relatively thin channel wall thickness results in improved heat transfer performance with a relatively high but acceptable pressure drop.

H.A. Mohammed et al.[10] investigated the effect of using nanofluids on heat transfer and fluid flow characteristics in rectangular shaped microchannel heat sink (MCHS) numerically for Reynolds number range of 100–1000. In this study, the MCHS performance was examined using alumina–water (Al_2O_3 - H_2O) nanofluid as coolant with volume fraction ranged from 1% to 5%. The results revealed that when the volume fraction of nanoparticles was increased under the extreme heat flux, both the heat transfer coefficient and wall shear stress would increase while the thermal resistance of the MCHS would decrease.

H.A Mohammed et al. [11] performed numerical investigations to investigate the laminar flow and heat transfer characteristics of trapezoidal MCHS using various types of base nanofluids. This study considered four types of base fluids including water, ethylene glycol (EG), oil, and glycerin with 2% volume fraction of diamond nanoparticle. It was found that the best uniformities in heat transfer coefficient and temperature

among the four mixture flows could be obtained using glycerin-base nanofluid followed by oil-base nanofluid, EG-base nanofluid, and water-base nanofluid heat sinks.

Mohammad Kalteh et al. [12] examined the laminar convective heat transfer of an alumina-water nanofluid flow inside a wide rectangular microchannel heat sink. A two-phase Eulerian-Eulerian method using the finite volume approach was adopted in this study. The two-phase results show that the velocity and temperature difference between the phases is very small and negligible.

Manay et al. [13] numerically investigated the pressure drop and laminar convection heat transfer characteristics of nanofluids in microchannel heat sink with square duct. Analysis showed that the nanofluids enhance heat transfer while the Reynolds number and the volume fractions were increasing. The best overall enhancement was obtained at $\phi=2\%$ and $Re=100$ for CuO-water nanofluid.

Chander Shekhar Sharma [14] presented a detailed thermo-hydrodynamic analysis of a hot water cooled manifold microchannel heat sink for electronic chip cooling. The hot water cooling enabled efficient recovery of heat dissipated by the even hotter chip by using hot water recovered from a secondary application. This analysis showed that entropy generation due to heat transfer would dominate the net entropy generation in the heat sink for both conditions.

Mostafa Mirzaei and Maziar Dehghan [15] investigated Laminar flow and heat transfer of water- Al_2O_3 nanofluid under constant heat flux have been investigated numerically. Enhancement in heat transfer and increase in friction factor had been obtained by the use of nanofluid.

Ahmed Mohammed Adham et al. [16] did a comprehensive review of available studies regarding non-circular microchannels heat sinks with emphasis on rectangular microchannels. Methodologies used to analyze and optimize overall performance of microchannel systems along with channel geometries, flow conditions, the coolants used, structural materials, optimization tools and finally form in which final outcome of each study was presented. The review showed that earlier studies (from 1981 to 1999) were largely conducted using experimental or analytical approaches while more recent studies (from 2000 to the end of 2012) showed a dependency on numerical simulations and evolutionary algorithms.

III. FORMULATION OF THE PROBLEM

Through this extensive literature survey it is found that numerical analysis of fluid flow and heat transfer through microchannel heat sink having trapezoidal microchannel using nanofluid TiO_2-H_2O has not been performed yet. It is also clear from literature review that water was used previously in microchannels as a coolant. But due to heat dissipation limitations of water, other coolants are introduced. In recent times, nanofluids are developed. It is important to check performance of microchannel heat sink using nanofluid as coolant. So in this paper, numerical analysis of fluid flow and heat transfer through microchannel heat sink having trapezoidal channel is investigated by using TiO_2 nanofluid which has not been done yet.

3.1 Model Description

Fig.1 shows the model of micro channel heat sink having trapezoidal channel. Dimensions of trapezoidal channel are listed in Table 1. Heat is supplied at the bottom of the sink which is carried away by nanofluid flowing through channel. Properties of sink's material silicon are listed in Table 2.

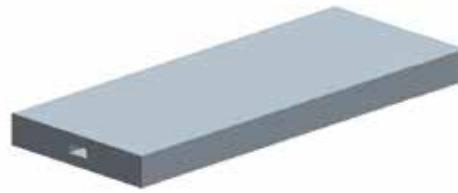


Fig.1 Schematic diagram of microchannel heat sink with single channel

Table1. Dimensions of trapezoidal cross section MCHS

| a (μm) | b (μm) | c (μm) | h (μm) | L_c (μm) | S (μm) | D_h (μm) |
|------------------------|------------------------|------------------------|------------------------|----------------------------|------------------------|----------------------------|
| 280 | 225 | 431 | 430 | 10000 | 500 | 318 |

Table2. Properties of silicon

| Material | Density(ρ_s) (kg/m^3) | Thermal Conductivity k_s (w/m-k) | Specific Heat c_{ps} (J/kg-k) |
|----------|--|--|------------------------------------|
| Silicon | 2330 | 148 | 712 |

The thermophysical properties of nanofluid ($\text{TiO}_2\text{-H}_2\text{O}$) are calculated using correlations given by P. Gunnasegaran, N.H. Shuaib, H.A. Mohammed [17] for volume fraction 2%. These are properties are listed in table 3.

Table 3.Properties of nanofluid

| Fluid | (ρ_{nf}) Kg/m^3 | (k_{nf}) W/m-K | (μ_{nf}) kg/m-s | (c_p) J/kg-K |
|-----------------------------------|------------------------------------|--------------------------------|-----------------------------------|------------------------------|
| $\text{TiO}_2\text{-H}_2\text{O}$ | 1063.236 | 0.64364 | 0.00105315 | 3902.53 |

3.2 Governing Equations

To study three dimensional heat transfer and two dimensional fluid flow through trapezoidal channel, few assumptions are made. These are: Flow is laminar and steady; Solid and fluid properties are constant; Heat Flux at the bottom surface is uniform; Fluid is incompressible; Radiation heat transfer is negligible; every surface of heat sink is insulated except bottom surface at which amount of heat is specified for simulation.

Continuity, momentum and energy equations can be written as given below [18];

Continuity equation:

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = 0 \quad (1)$$

Momentum equation:

X- Momentum equation

$$\rho \left(u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} + w \frac{\partial u}{\partial z} \right) = -\frac{\partial p}{\partial x} + \mu \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} + \frac{\partial^2 u}{\partial z^2} \right) \quad (2a)$$

Y- Momentum equation

$$\rho \left(u \frac{\partial v}{\partial x} + v \frac{\partial v}{\partial y} + w \frac{\partial v}{\partial z} \right) = -\frac{\partial p}{\partial y} + \mu \left(\frac{\partial^2 v}{\partial x^2} + \frac{\partial^2 v}{\partial y^2} + \frac{\partial^2 v}{\partial z^2} \right) \quad (2b)$$

Z- Momentum equation

$$\rho \left(u \frac{\partial w}{\partial x} + v \frac{\partial w}{\partial y} + w \frac{\partial w}{\partial z} \right) = -\frac{\partial p}{\partial z} + \mu \left(\frac{\partial^2 w}{\partial x^2} + \frac{\partial^2 w}{\partial y^2} + \frac{\partial^2 w}{\partial z^2} \right) \quad (2c)$$

Energy equation:

$$u \frac{\partial T}{\partial x} + v \frac{\partial T}{\partial y} + w \frac{\partial T}{\partial z} = \frac{1}{\alpha} \left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} \right) \quad (3)$$

3.3 Boundary Conditions

Different boundary conditions are imposed on MCHS model. Flow is along z-axis. Constant heat flux is applied at the bottom surface of heat sink. Following boundary conditions are imposed on MCHS-

Pressure at inlet,

At $z = 0$ and $t < x < t + b, S_b < y < S_b + h,$

$$P_1 = P_{in}$$

Velocity in y and z direction is zero, so

$$v = 0, w = 0$$

Pressure at outlet,

At, $t < x < t + b, S_b < y < S_b + h$ and $z = L_c$

$$P_1 = P_{out}$$

At the bottom surface, constant heat flux is applied,

At, $y = 0, 0 < z < L_c$ and $0 < x < W,$

$$q'' = -k_z \frac{\partial T}{\partial y}$$

Inlet Temperature,

At, $z = 0, t < c < t + b$ and $S_b < S_b + h$

$$T = T_{in}$$

IV. NUMERICAL METHOD

The numerical analysis was done by solving continuity, momentum and energy equations along with specified boundary conditions. Pressure based segregated solver is used to solve equations. This solver solve three momentum equations and continuity equation separately and the solve energy equation. Semi implicit method for pressure linked equation algorithm is used which is relevant for pressure based solvers. It describes how continuity and momentum equations are coupled. Iterations are performed until solution is converged. For convergence graph of residuals vs iterations was checked. When a converged solution is obtained for flow field, energy equation was solved for temperature field.

V. RESULT AND DISCUSSION

5.1 Temperature Contours

Fluid entered at 293K and its temperature was increased along the flow direction. It is shown in Fig. 2. Temperature was increased to 375K. Temperature contour at inlet and outlet is shown in Fig. 3.

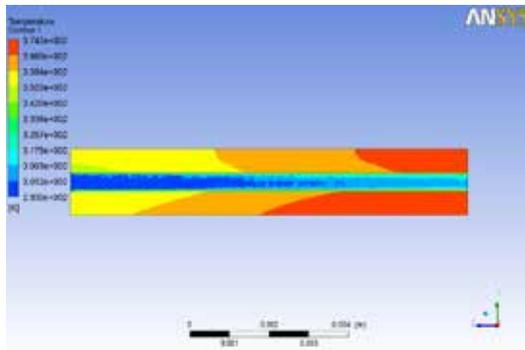


Fig.2. Temperature Distribution Along The Channel

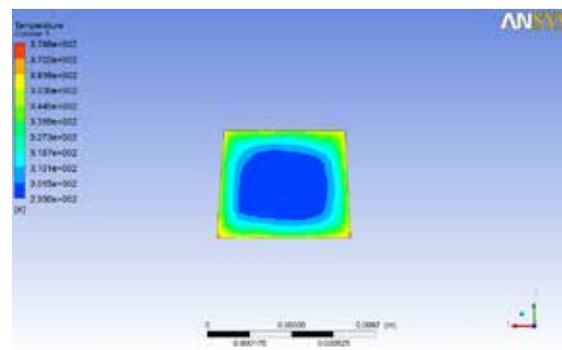


Fig.3. Temperature Distribution At Outlet

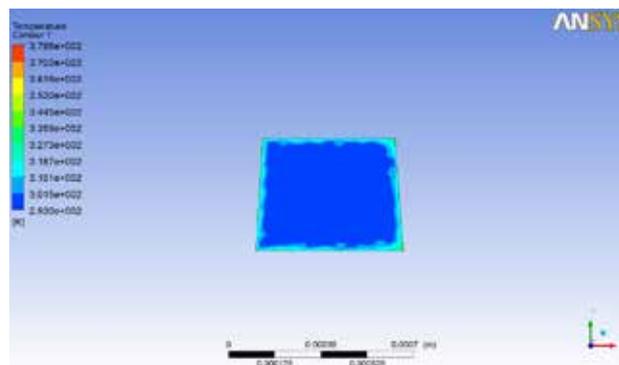


Fig.4. Temperature Distribution At Inlet

5.2 Pressure Contours

At 293K and 50000 Pa, fluid entered in channel. Fluid came out at outlet at atmospheric pressure. Pressure contour inside the in y-z plane is shown in Fig. Heat flux of 900000 W/m² is applied at bottom surface of heat sink.

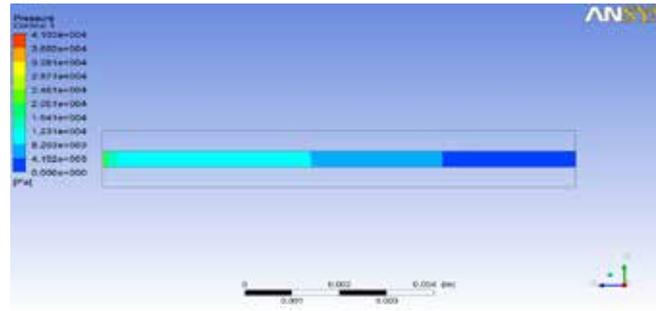


Fig. 5. Pressure Distribution Inside The Channel

Outlet temperature for constant heat flux and different pressure drop was calculated in this study, it is shown in Table 4.

Table 4. Outlet temperature at different pressure drop

| Pressure drop (KPa) | T _{in} (K) | T _{out} (K) |
|---------------------|---------------------|----------------------|
| 10 | 293 | 429 |
| 20 | 293 | 402 |
| 35 | 293 | 387 |
| 50 | 293 | 378 |
| 65 | 293 | 374 |

5.3 Heat Transfer Coefficient

Average heat transfer coefficient was calculated. Variation of average heat transfer coefficient with flow direction is shown in Fig. 6. From figure it is clear that value of average heat transfer coefficient is very high at inlet. Because of increasing boundary layer average heat transfer coefficient decreases in direction of flow. It is calculated using following expression:

$$q'' = h\Delta T$$

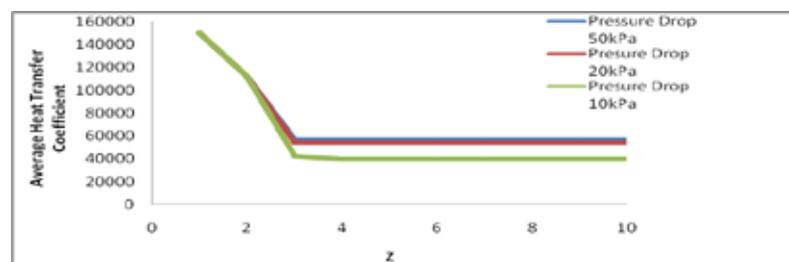


Fig.6. Variation of Average Heat Transfer Coefficient In Direction Of Flow

5.4 Nusselt Number

Variation of average Nusselt number along the flow direction for different pressure drop is shown in Fig.7.

Nusselt number is defined as :

$$Nu = \frac{hL}{k}$$

Where, L = hydraulic diameter of trapezoidal channel and k is thermal conductivity of nanofluid.

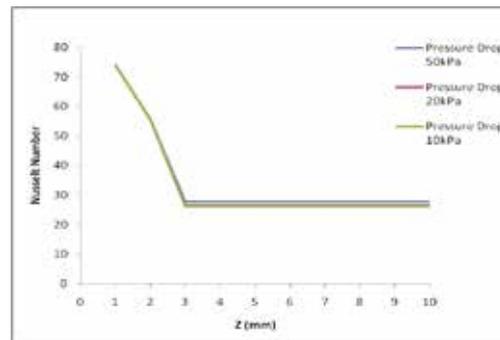


Fig.7. Variation of Average Nusselt Number In Direction of Flow

Value of average Nusselt number for 50000 Pa is obtained which is 74. Because of boundary layer formation, average Nusselt number is decreasing along the direction of fluid flow. At entrance, values of average Nusselt numbers for 20000 Pa and 10000 Pa are approximately same. Nusselt number decreases sharply for each value of pressure drop. in channel, after some distance from inlet Nusselt number does not change. It remains constant.

5.5 Comparison of Current Research With Previous Research

Fig. 8. shows variation of average heat transfer coefficient in present research and study performed by J. Li , G.P. Peterson, P. Cheng[19]. It is clear from the figure that value of average heat transfer coefficient is more in comparison to Li et al. study. In that study, water was used as coolant in rectangular microchannel heat sink. On other side, nanofluid ($\text{TiO}_2\text{-H}_2\text{O}$) is used in trapezoidal microchannel heat sink. Average heat transfer coefficient is high due to use of nanofluid.

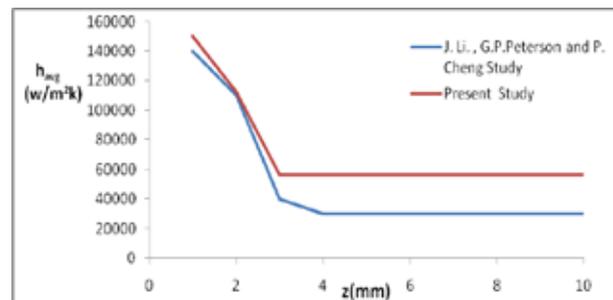


Fig.8. Comparison of Present Study and Previous Study

VI. CONCLUSION

In this study, numerical simulations on two dimensional fluid flow and three dimension heat transfer are performed. Effect of nanofluid ($\text{TiO}_2\text{-H}_2\text{O}$) on different parameters is studied. On the basis of presented results following conclusions can be described:

- Because of low fluid velocity, maximum temperature occurs below the channel outlet.
- Outlet temperature is maximum for 10000 Pa pressure drop and 900000 W/m^2 heat flux.
- Comparison of heat transfer coefficient is done for water and $\text{TiO}_2\text{-H}_2\text{O}$.
- In comparison to water as coolant, heat transfer coefficient is increased on using nanofluid.

- Average Nusselt number and heat transfer coefficient are maximum at inlet region and decreases along the direction of flow. Nusselt number is high on using nanofluid (TiO₂-H₂O).
- Multiphase analysis can also be performed as temperature of coolant is very high few times.

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