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Aims and Scope

Journal of Mobile Communication and Networking welcomes the original research papers, review papers, experimental investigations,surveys and notes in all areas relating to software engineering and its applications. The following list of sample - topics is by no means to be understood as restricting contributions to the topics mentioned.

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Contents

A Facial Recognition Technique using Principal Component Analysis

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ABSTRACT

This paper describes an efficient face recognition system in order to overcome many of the limitations found in existing facial recognition systems. In this paper the dimensional reduction has been done in order to reduce the dimensions of the image using principal component analysis. To do this first the eigen values and then the eigenvectors was found and then the recognition process was started. The test image was compared with the database images. A threshold value was set in order to find if there is a match of the test image in the database. If there was a match, it displayed the details i.e., name, course and enrollment number of the person in the test image. If no match founds it showed no match found.

Keywords - Principal component analysis, Threshold value, Euclidean distance, Threshold value, Mutiplication Factor

1. INTRODUCTION

The human face is an important part that give people‟s identity. Face recognition is a task that humans perform routinely and effortlessly in our daily lives. As compared with other biometrics systems that uses fingerprint and iris, face recognition has a lot of benefits because of its non- touching process. Face images can be clicked from a distance without contacting the person being identified, and the identification does not require interacting with the person. In addition, face recognition serves the crime detection purpose because face images that have been recorded can later help identify a person. Wide availability of powerful and low-cost desktop and embedded computing systems has created a huge interest in automatic processing of digital images in a variety of applications, including biometric authentication, surveillance, human-computer interaction, and multimedia management. Face recognition has become increasingly important owing to rapid advances in image capture devices (surveillance cameras, camera in mobile phones), availability of huge amounts of face images on the web, and increased demands for higher security. As a biometric system, a face recognition system operates in either or both of two modes: (1) face verification (or authentication), and (2) face identification (or recognition). Face verification involves a one-to-one match that compares a query face image against an enrolled face image whose identity is being claimed. Person verification for self-serviced immigration clearance using E-passport is one typical application. Face identification

involves one-to-many matching that compares a query face against multiple faces in the enrollment database to associate the identity of the query face to one of those in the database. In some identification applications, one just needs to find the most similar face.

II. LITERATURE SURVEY

Several algorithms and techniques for face recognition have been developed in the past by researchers. Some of them are discussed briefly in this section.

A popular and robust face detection algorithm uses an object detector developed at MIT by Viola and Jones [1] in 2001. They presented a face detection technique that is able to process a number of images very fastly that achieved high detection rates. There are three key contributions. In the first one a new image representation called the "Integral Image" was introduced. It allows the features to be computed very quickly that are used by their detector. The second one is a robust classifier that was made using the Adaboost learning algorithm. It was built to select a small number of critical visual features from a very large set of potential features. The method for combining classifiers in a "cascade" which discards the background regions of the image very quickly while spending more computation on promising face-like regions is the third and final contribution. The system was an efficient face detection performance comparable to the best previous systems. The computation time was minimized because of this technique and high detection accuracy was achieved. The approach was used to build a face detection system that is around 15 times faster than any previous approach.

Taranpreet Singh Ruprah et al. 2010 [2] presented a face recognition system using PCA with neural networks for face verification and face recognition using photometric normalization for comparison. In this paper a feature was extracted using principal component analysis and was then classified by creation of back propagation neural network. She ran her algorithm for face recognition application using principal component analysis, neural network and the performance by using the photometric normalization technique: Histogram Equalization was calculated and was compared with Euclidean Distance and Normalized correlation classifiers. The system produces good results for face verification and recognition. The experimental results showed the N.N. Euclidean distance rules using PCA for overall performance for verification. However, for recognition, E.D. classifier gives the highest accuracy using the original face image. Thus, applying histogram equalization techniques on the face image did not give much impact to the performance of the system if conducted under controlled environment. Gunjan Dashore et al 2012 proposed [3] a hybrid solution to frontal face detection using facial features and Eigen faces theory . They proposed an algorithm for real-time human face tracking. The system worked by projecting face image onto a feature space that spans the significant variations

among known face images. The projection operation characterize an individual face by a weighted sum of the Eigen faces features and so to recognize a particular face it was necessary only to compare these weights to the individuals. While collecting the database they faced two problems. The first one was the image size and lightening of the room. To avoid this problem they focused a white light on the face of the person while taking picture. The second problem was the picture‟s background that results in low accuracy. The solution they used was to use only face detection.

Kavita Shelke presented a technique [4] for recognizing a person in a group photograph in the year 2013. She proposed a face recognition system that recognizes individuals from the group photograph containing multiple people. The paper presents an interactive algorithm to automatically segment out and recognize a person‟s face from a group photograph. The method involves a fast, reliable, and effective algorithm that exploits the spatial distribution characteristics of human skin color. She took a colored group photograph. Skin detection algorithm was applied and face portion in the given image was extracted. After this morphological operations were applied to fill the blobs in the extracted region. To find out the bounding box limits for the extracted image Binary distance was used. Then the limits were marked and projected with a square so as to show the tracked face portion in the original image. The marked up region was extracted and the GLCM (Gray Level Co- occurrence Matrix) features which are named after there were found out. Finally the GLCM features were compared against the stored ones whenever the same face was appeared for the next time and the best matched name was displayed on the tracked portion and hence the faces were identified from the group photograph.

A. S. Syed Nawaz [5] et al 2013 proposed a face recognition system based on PCA that efficiently identifies input face images of a person which differ from the set of images of the person already stored in the database thus serving as a reliable method of recognizing new face images. The system consisted of a database of a set of faces for each person. The characteristic features called „eigenfaces‟ were extracted from the database using which the system is trained for further recognition of new images. The base code for training face images using Back Propagation Neural Network was also completed. Hence whenever a new image was fed into the system for recognition purpose the system extracts and computes the main features to find the distance between the input image and the stored images i.e., the database images. Thus, some variations in the new face image that is to be recognized was accepted. When the new image of a person differs from the images of that person stored in the database, the system was able to recognize the new face and identify who the person was and prints his name. The accuracy and discriminatory power was better. Computational cost was less as smaller images (main features) require less processing to train the PCA. The system can be used as an effective means of authentication because of the use of dominant features.

Jaishree Tawaniya et al 2014 [6] implemented an efficient system to recognize faces from images with some near real-time variations. Their approach essentially was to implement and verify the algorithm. Their method was made on weighting the difference between a given face image and a mean image, which is obtained by averaging a predefined set of faces. The training set was a group of face images from which the mean face was calculated. Face detection took place by linearly projecting the image to a low dimensional image space and weighting the difference with respect to a set of eigenvectors. This method utilized the inherently elliptical nature of the human head and fits an ellipse to the head. The resultant information about the ellipse was then used to mask out unwanted feature points in the recognition phase of the identification system.

III. METHODOLOGY

The previous section described the different techniques and methods of face detection and recognition. Keeping in view our aim first we took some group images. From those group photos we detected faces, cropped them and saved them in a folder. From those faces we made our database. We have n number of people. So we made n folders from S1 to Sn putting those n person in each folder. Then we took some test images of some known and unknown person. To classify them as known and unknown in the recognition process we found a threshold value. Calculation of threshold value is given in the subsections. So, by applying principal component analysis technique we were able to recognize the test image whether it is in database or not. If it was present in the database then her detail was displayed i.e., name, course and enrollment number. If it was not present in the database then "no match found" was displayed. The main steps used are as follows:

A. Image Acquisition: We took some group images. Then face detection technique i.e., Viola-Jones method was applied in order to detect faces in them. We cropped the faces, converted the face images into grayscale and saved them in the database. The size of all the images was same i.e., 92*112 pixels.

B. Threshold Value: The value that is used to classify the test image as known or unknown is termed as the threshold value. After image acquisition, it was calculated by noting down the minimum Euclidean distance of all the test images. Out of them, the maximum value of minimum Euclidean distance was selected and was multiplied by any number between 0.1 to 0.9. The multiplication was done to reduce the value of selected Euclidean distance in order to increase the recognition rate. The value that will give maximum recognition rate was taken to be multiplied with our maximum value of minimum threshold value. The threshold value in this experiment was 0.2*34862344 i.e., 6972468.8.

C. Principal Component Analysis: Principal Component Analysis was done for the recognition

process. The main steps of PCA are as follows:

- Subtract the mean of the data from each variable (adjusted data)

$$\phi_i = T_i - U \qquad (1)$$

where U is the average face vector and T_i is the value of image converted to vector and ϕ_i is the normalized face vector.

- Calculate and form a covariance matrix C.

$$C = A.A^T \qquad (2)$$

where $A=[\emptyset_1, \emptyset_2, \emptyset_3, \ldots \emptyset_M]$ and A^T is the transpose matrix of A.

- Calculate the eigenvalues and eigenvectors from the covariance matrix.

$$\text{Eigenvalues: } |C-\lambda I|=0 \qquad (3)$$

$$\text{Eigenvectors: } [C-\lambda nI]\phi i=0 \qquad (4)$$

where I is the identity matrix and λ is the eigenvalue.

- Calculate the feature vector: As the eigenvectors were found from the covariance matrix, the next step was to order them by Eigenvalue, in decreasing order. This gave us the components in order of significance. Here the data was compressed and the weaker vectors were removed.
- Multiply the transposed feature vector by the transposed adjusted data.

D. Output: After applying the PCA for recognition process the image was recognized properly if the minimum euclidean distance is less than the calculated threshold value and its details were displayed. If the minimum euclidean distance was greater than the threshold value then it displayed "No Match Found".

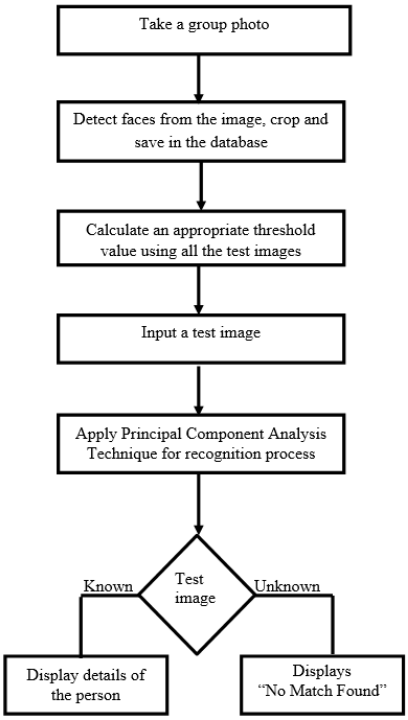

Fig 1: Methodology flow chart

IV. EXPERIMENTAL ANALYSIS

First of all we have performed face detection using Viola-Jones Technique and cropped the faces out of the group photo and saved them. Image size of the group photo was 3264*1836 pixels. After cropping only the faces the image size of the faces was 92*112 pixels. All have the same size. They were then converted into grayscale images. Then Principal Component Analysis was applied forprocess. We took 25 test images in our experiment consisting of known and unknowns.

Figure 2 shows when there was a match. Figure 3 shows when no match was found means our test image was not in our database. Figure 4 shows the case of false detection the recognition

Fig. 2: When a match was found

Fig. 3: When no match was found

Fig. 4: False detection

V. RESULT

Out of 25 test images, 22 images were correctly recognized as known and unknown.1 image was falsely detected and 2 were missed detection. Falsely detected means it showed another person recognized instead of correct person. Missed detection means the image was present in our database but it showed no match found. It is because of the threshold value. The recognition rate was 88%.

VI. CONCLUSION

The face recognition using Principal Component Analysis has been performed which can be used in

criminal identification, human identification in surveillance system and attendance records etc. As this technique has recognition rate 88%, it is better than other techniques which have been used for the security purpose because in this technique only the concern factors are the facial expressions. In future we also can work on the facial expression to increase the accuracy of the system.

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Quality of Life Among Information Technology Professionals

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A B S T R A C T

Information technology (IT) profession is an extremely stressful occupation and often requires great deal of traveling, high intellectual demand, long working hours, rapid technical process and tight working schedules continual education and constant up gradation of skills in the competitive business market. As a consequence strain is placed on family life.

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The majority of the work force is in IT profession is young (between the ages of 20 to 45 years) and they have to perform multiple responsibilities of family life (e.g. rearing children). Hence, they are placed consistently at the risk of suffering from work-family conflict.

Software organizations are increasingly becoming more important for developed as well as developing economies. Indian software organizations had a phenomenal growth in the last decade and are expected to play a much bigger role in the next millennium in the growth of Indian economy. This growth has been due to availability of highly competent and cost competitive software professionals in India.

The emergence of computers and information systems has been perhaps the single biggest factor impacting organizations during the past three decades. The proliferation of computers and information systems in organizations has generated an increased demand for information systems professionals to implement this technology. Unfortunately, little is known about the consequences of work-family conflict on IT professionals. During the last several decades, the contemporary developing countries of the world have been shifting from industrial-based national economies to information-based global economies.

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IT PROFESSIONAL: AN EMPIRICAL DEFINITION

Ghazzawi, 2008 IT professional‖ is defined as any employee who is involved in technical service and support, IT management, IT networks, system integration and development, application development, web design, project management, IT procurement, technical end-user support, IT solutions implementation, IT infrastructure, Internet Protocol, or IT solutions sales and support.

Ghazzawi, I. A. (2008). Job Satisfaction Among Information Technology Professionals in the U.S.: An Empirical Study. Journal of American Academy of Business, Cambridge, 13(1), 1-15. Retrieved April 22, 2009, from ABI/INFORM Global database. (Document ID: 1413743691).

Citing DeMarco and Lister(1999) Most software development projects fail because of failures with the team running them‖.

T. DeMarco, T. Lister, Peopleware: Productive Projects and Teams, second ed., Dorset House, New York, 1999.

REVIEW OF LITERATURE

Tuckman(1965)

Cohesion, conflict, cooperation, communication, etc., as significant group processes. These processes act as mediating variables in team formation.

Guna Seelan and Maimunah Ismail (2008)

The study brings out quality of work life among information and technology professionals in Malaysia. The study discusses constructs of qwl as health and well being, job security, job satisfaction, competency development, work and non-work life balance in IT professionals and concludes by saying that qwl from the perspective of IT professionals is challenging both to the individuals and organizations.

Davis (1983)

The author defines quality of work life as "the quality of the relationship between employees and the total working environment, with human dimensions added to the usual technical and economic considerations".

Sinha and Sayeed (1980).

Quality of Work Life cannot be attained unless all needs arising in organizational settings are taken care of.

Dolan, L.S, Garcia, S., Cabezas, C. and Tzafrir, S.S (2008)

As organizations are struggling to survive and become more efficient, an accrued interest has evolved around the concept of professionals working life.

Straw and Heckscher(1984)

Quality of Work Life should be viewed as a two way process, from organizational perspective it should consider, employee as the most important resource as they are trustworthy, responsible and capable of making valuable contribution and they should be treated with dignity and respect.

Feuer(1989)

From the employee's perspective, quality of work life should be conceived as a set of methods, such as autonomous work groups, job enrichment, high-involvement aimed at boosting the satisfaction and productivity of workers.

Loscocco and Roschelle (1991)

The authors pointed out that the most common assessment of quality of work life is the individual attitudes. This is because individual work attitudes are important indicators of qulity of work life.

Heskett Sasser and Schlesinger (1997)

They proposed that Quality of Work Life, which is measured by the feelings that employees have towards their jobs, colleagues, and organizations, would ignite a chain effect leading to an organization's growth and profitability.

Robbins (1989)

Quality of work life is a process by which an organization responds to
employee needs by developing mechanisms to allow them to share fully in making the decisions that design their lives at work‖.

Lau & Bruce (1998)

Quality of Work Life is the workplace strategies, operations and environment that promote and maintain employee satisfaction with an aim to improving working conditions for employees and organizational effectiveness for employers.

Sekharan (1985)

The author observes that, historically the concept of quality of work life had originally included only

the issues of wages, working hours, and working conditions. However, the concept has now been expanded to include such factors as the extent of workers' involvement in the job, their levels of satisfaction with various aspects in the work environment, their perceived job competence, accomplishment on the job etc.

Lim and Teo (1996)

Authors examined gender differences in occupational stress and coping strategies among Information Technology (IT) professionals in Singapore. It was found that the female IT personnel reported significantly higher scores on sources of stress originating from _factors intrinsic to the job',_managerial role', _career and achievement', _organizational structure and climate' and _relationships with others'. Contrary to initial prediction, no significant gender difference was found for stress originating from _home-work interface'. With respect to coping strategies it was found that female IT personnel tend to suppress their emotions and deal with problems in a logical and unemotional manner.

McGee(2003)

While extended work demands are not the exclusive domain of IT professionals, mounting evidence indicates that workers in the IT sector are experiencing longer work hours, more work-life conflict, and higher indices of burnout than their coworkers in other functional areas.

CIO Research Reports(2001)

Here, a survey of technology workers indicated that 50% of respondents felt that they achieved less work-life balance than their counterparts in other functions, and 58.3% of IT workers report that they do not feel they have an appropriate balance between their work lives and their personal lives.

Leyden(2003)

Study indicates that 71% of IT managers feel that IT employee burnout is a significant issue facing organizations.

Fischer(1998).

The study reveals that, 94% of networking professionals work in crisis mode at least some of the time.

Longenecker, C. O., Schaffer, C. J., & Scazzero, J. A. (1999)

While work-life conflict touches every occupational area, IT workers may be more prone to its effects than other groups of employees. IT workers frequently face extended work schedules and often are asked to meet unrealistic deadlines without the necessary resources.

Jiang & Klein(1999)

The study estimated a 25–35% turnover rate for IT professionals in Fortune 500 firms.

Boh, W. F., Slaughter, S., & Ang, S. (2001)

The study found that the IT sector has characteristics of both a boundary less profession and an occupational labor market. These characteristics mean that compared to other occupations, IT professionals are better able to move to different companies within the same occupation and also to change occupations with relative ease.

Agarwal & Ferratt (2001)

The IT professionals get overloaded works due to the lack of manpower and resources to complete projects in combination with unrealistic deadlines for the implementation or completion of IT-related initiatives.

Engler, 1996; Perlow, 1998

Role overload comes in the form of frequently extended work schedules that often require IT projects to be staffed on a 24/7 schedule.

Moore (2000)

He examined the lives of IT professionals and found that work overload was associated with work exhaustion, a significant predictor of turnover intentions. The study of IT workers found an 18% burnout rate, with much of this burnout being attributed to overload.

Sethi, Barrier, and King (1999)

The study found that work overload was associated with emotional exhaustion among IT workers.

Moore & Love (2005).

IT workers generally were much less likely to engage in organizational citizenship behaviors than their non-IT counterparts .Organizational citizenship behaviors (OCBs) are discretionary behaviors that are not part of the job description, but often are invaluable to the organization (e.g., helping other employees learn a new software system, providing informal mentoring to new employees).

One of the most common factors creating both physical and psychological strain based conflict for IT workers is the availability of technology that allows work to be completed from nearly anywhere at any time.

Higgins & Duxbury (2005).

The study found that 68% of employees sampled felt that technology had increased their stress level and 70% felt that it had increased their overall workload.

Batt and Valcour (2003)

The study found that technology use was significantly associated with work-life conflict.

IT workers often feel exhausted, sleep-deprived, and worn down by the constant mental presence of work.

Stokes(1996)

One of the most common factors creating both physical and psychological strain based conflict for IT workers is the availability of technology that allows work to be completed from nearly anywhere at any time. The study suggest that IT professionals should draw clear lines between their work lives and their personal lives, and that they should take whatever steps necessary to maintain those boundaries.

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Batt and Valcour (2003)

The study found that technology use was significantly associated with work-life conflict.

Igbaria, Parasuraman, and Badawy (1994)

The study found IT employees with high job involvement demonstrated more boundary- spanning activities and higher levels of role stress, but also demonstrated higher levels of commitment to the organization.

Hyman, J., Baldry, C., Scholarios, D., & Bunzel, D. (2003)

It is a study of software developers and call-center employees in Britain. The study found that IT workers in firms with more supportive and family-friendly policies reported lower levels of work intrusion into family time.

King, R. C., Weidong, X., Campbell Quick, J., & Sethi, V. (2005)

The study examined the nature of IT worker socialization and how various investiture socialization tactics help to reduce feelings of role ambiguity and role conflict. Investiture tactics are those that tend

to build up newcomers and affirm confidence in their own skills and abilities. This approach contrasts sharply with those designed to ―tear down‖ new hires in order to rid them of their previous behaviors and attitudes. He pointed out; aving a clear understanding of one's role eliminates wasted time and energy spent trying to figure out the tasks that need to be completed and the internal and external customers with whom the new employee is expected to communicate. In doing so, IT workers feel less role conflict and therefore are more likely to be committed to the organization and have higher levels of job satisfaction.

Pratt and Rosa's (2003)

The study also reveals that network marketing organizations alleviate the burden of work-family conflict by attempting to merge family with work. The authors discuss specific strategies used by these organizations, which include a socialization process that explicitly encourages employees to spend time with their families and to prioritize their family lives over their career success. These organizations also frequently recognize and discuss the ambivalence caused by work- family conflict and attempt to bring this issue to the forefront of employees' minds.

Pratt and Rosa note that by explicitly recognizing and discussing the work-family conflictexperienced by distributors, these organizations are able to transform work ambivalence into positive and proactive strategies that merge work with family. Specifically, these organizations encourage employees to align personal goals with career-related goals and to include family members in career related goal striving.

Tam & Mangalindan(2005)

This Wall Street Journal article highlighted that, a number of high-tech firms that are bringing in service providers for employees. Such services include everything from car washes to massages. demonstrate that a number of organizations are bringing back such perks, not simply as recruitment tools, but as a means to improve productivity and reduce the work-life conflict experienced by their high-tech workers. In fact, many organizations implementing these strategies are actually requiring employees to pay for the service; yet, by bringing these services to the office, organizations improve productivity and provide employees with a powerful way to reduce time-based conflict.

Jiang and Klein (1999)

The study revealed that opportunities for career development and enhancement resulted in greater career satisfaction in a group of information systems professionals.

Cougar(1988)

This study about IT professionals found that the second and third greatest motivators for IT personnel (behind the work itself) were opportunities for achievement and advancement, respectively.

Paré & Tremblay (2000).

IT professionals will willingly remain in organizations where work is stimulating and challenging, chances for advancement are high and if they feel reasonably well paid.

The study also point out that, Effective IT retention strategy will focus on four key categories of HR practices, namely, 1) distributive justice, 2) competence development and career paths; 3) recognition of performance, and 4) empowerment.

Gorla and Lam (2004)

They identified several team-related factors that affect software development project performance. The factors include the personality composition of members, team leadership, and intra-team communication and coordination.

Sumner, Bock, and Giamartino (2006)

They suggested that the psychological orientation of IT professionals tends to influence their project leadership effectiveness. They pointed out that the IT professionals have traditionally lacked soft skills, such as the ability to manage people and communicate effectively.

Boyar & Mosley(2007)

The work-family interface is defined as the interconnected relationship between work and family; specifically, these two areas affect one another.

Greenhaus & Beutell (1985)

Workfamily conflict is defined as a form of interrole conflict in which demands of work and family roles are incompatible in some respect, so that participation in one role is more difficult because of the participation in the another role.

Madsen, S. R., John, C. R., and Miller, D. (2005)

The study reported that work-family conflict is related with lower level of mental health.

Frone (2003)

The study examined that both the directions of work-family conflict are related to the mental health, physical health and health related behaviour of employees.

Netemeyer, R., Boles, J., and McMurrian, R. (1996)

The study have reported that work-family conflict is negatively related to job performance.

Lambert, Claire, Kass, Stenven, J., Piotrowski, Chiris, and Vodanovich, Stephen, J. (2006)

Work-family balance is an important organizational issue in the IT industry.

Ahuja, Manju, K., Harrison, D., McKnight, Kathrine, M., Chudoba, Joey, F., George, and Charls, J., Kacmar (2007)

Work-family conflict is a major source of stress among IT professionals because they have to juggle continuously between the demands of job and family life .

Greenhaus & Beutell,(1985) defined work family conflict as a form of

Inter-role conflict in which demand of work and family roles are incompatible in some respect so that participation in one role is more difficult because of participation in another role. identified three different types of work-family conflict: time-based, strainbased and behaviour-based conflict. According to this categorization, time-based conflict occurs when multiple roles compete for a person's limited time. This kind of conflict can take two forms: physical and mental. Demands may be unmet when person is eitherphysically absent from a domain or mentally preoccupied with other domain. A second form of work-family conflict is strain-based conflict. It occurs when strain from one domain is incompatible with meeting the demands of other domain and made it difficult to comply with the demands needed for the role responsibilities. Finally, Behaviourbased conflict occurs when behaviour developed in one domain incompatible with role demand in the other domain, and the person can't adjust behaviour between domains.

Netemeyer, R., Boles, J., and McMurrian, R. (1996) have reported that work-family conflict is negatively related to job performance. Several researchers have demonstrated that work family conflict is related to reduced concentration and attention on the job, absenteeism, low job involvement, and reduced organizations citizenship which in turn reduced overall performance.

Ahuja(2007) pointed out that, work-family conflict is a major source of stress among IT professionals because theyhave to juggle continuously between the demands of job and family life .

Kossek and Ozeki, (1998) have found a negative relationship between work-family conflict and marital satisfaction, family satisfaction and life satisfaction.

Acharya and Mahanty (2007) pointed out that; software industry in India is experiencing exponential growth. This has created a pressing need for a large number of skilled engineers, computer scientists and science graduates. The software organizations rely heavily on the newly minted engineers to meet this demand. And yet, an average home-grown organization appears to be lagging behind in its hiring and retention goals as it competes with multinationals (such as IBM, Dell and Microsoft) or other better known domestic organizations.

Ng and Feldman (2009).

Turnover is particularly high among the young newcomers, who are more mobile than their older counterparts, and have fewer family responsibilities.

Ravishankar and Pan (2008)

Employee attachment becomes vulnerable in this IT industry because the software professionals work on projects for extended time periods located in client sites. Here they interact more with clients' employees than with their co-workers and supervisor or are otherwise physically removed from the central offices.

Budhwar, Luthar and Bhatnagar (2006)

Even when the employees are located within the organizational premises, the work intensity requires long hours, especially when project deadlines are short or urgent. Unless the employees perceive the need to go above and beyond the normal work hours to get their jobs done, these projects may well be lost. _Employee buy-in' has, therefore, become a buzz word in the industry as the software organizations measure and compare attraction and retention rates with industry averages.

Chadee and Raman (2009).

organizational identification becomes a particularly important issue in the Indian IT and software sectors as they face extensive competitive pressures.

Karasek & Teorell (1990).

The study highlights that fficient use of IT systems demands competent users with certain kind and amount of knowledge. Persons lacking necessary knowledge feel that they cannot satisfactorily handlework demands and control theirwork situation, and lack of control is a well- known stress factor.

Arnetz and Wiholm (1997) carried out research in high technology industries suggest the psychosomatic symptoms are related in part to high perceived mental demands in combination with lack of sufficient skills.

DeMarco and Lister

Most software development projects fail because of failures with the team running them‖.

Cone (2007)

It is no secret that the number of women working in the field of information technology has declined since 2000.

IT World Canada Salary Survey (2008), job satisfaction among IT professionals in Canada seems to be high.

Network World (2007) reported that only 22 % of their IT respondents were dissatisfied with their jobs overall. In the same survey, IT professionals rated family friendliness (i.e. work environment) as the most important factor in their satisfaction, followed by job security, flexible work schedule, proximity to home, and leave (vacation, holidays, etc.). In the same study, Information Technology professionals' least important factors were: (1) annual raises, (2) performance incentives/bonuses, (3) advancement potential, and (4) stock options (Network World, 2007).

Murphy (2007) indicated that job stability and security are not a major concern for IT pros. In Murphy's study, 40% of IT managers and 34% of IT staff indicated that creating innovative IT solutions is a most important factor.

Ghazzawi (2008), concluded IT pros are generally satisfied. Their top satisfactions factors were: ability to keep busy all the time; ability to do things that don't go against their conscience; employment security; the chance to work alone on the job; the chance to try their own methods of doing the job; supportive co-workers; working conditions; chances to do things for other people; opportunities to do different things from time to time; and the chance to do something that makes use of abilities. On the contrary, their key sources of job dissatisfaction were: company policies and practices; opportunities for advancement; pay, and amount of work.

Ghazzawi defined IT professional‖ as any employee who is involved in technical service and support, IT management, IT networks, system integration and development, application development, web design, project management, IT procurement, technical end-user support, IT solutions implementation, IT infrastructure, Internet Protocol, or IT solutions sales and support.

Cummings (2007) indicated that working conditions/ work environment, the corporate culture, IT

peers, and the challenge derived from the job itself are the top rated factors in job satisfaction. found that the greatest source of frustration for IT pros stemmed from two factors: working long hours to resolve technical issues or to complete an implementation, or being placed on call to take care of any technical issues at anytime; and dealing with politics and red tape when a decision needs to be made quickly.

Huarng (2001)

The author found that IT professionals reported higher levels of emotional exhaustion than police and nurses. In particular, their emotional exhaustion was found to be lower than that of teachers, welfare managers and hospitality employees.

Lim and Teo (1996)

The studyexamined stress and coping strategies among IT personnel in Singapore. Their research found that women more likely to seek social support than their male counterparts when dealing with stress. Male IT personnel, on the other hand, were likely to engage in _logic' i.e., suppress their emotions and deal with stress in an objective and unemotional manner.

Pare & Tremblay (2000)

IT professionals will willingly remain in organizations where work is stimulating and challenging, chances for advancement are high and if they feel reasonably well paid.

Lee & Hui (1999) had pointed out, ―work interference with family may be an indicator of how much devotion one has for work.‖

Chelte (1983).

Quality of work life is the quality of relationship between employees and the total working environment, with human dimensions, technical and economic consideration.

Saraji and Dargahi (2006)

Quality of work life is a dynamic multi-dimensional construct that includes concepts such as job security, reward systems, training and career advancements opportunities and participation in decision making.

Drobnic and Prag (2010)

Emp loyees that have secured jobs and pay would fee l co mfo rtable at the work place and this affects their quality of life.

Davis & Trist (1974).

Quality of Work Life was first developed in the United States and UK, then spread to Norway, the Netherlands, India and Japan.

Newstorm and Davis (1997) defined Quality of Work Life(QWL) as the degree which employees meet their important personal needs through work. According to this, QWL covers all topics related to workplace, not only favorable subjects as job satisfaction, development of employee skills, wages, health, safety and the improvement of the physical conditions but also issues such as stress, burnout which are unfavorable for employees.

Robbins (1989) defined QWL as "a process by which an organization responds to employee needs by developing mechanisms to allow them to share fully in making the decisions that design their lives at work‖.

The European Foundation for the Improvement of Living and Working Conditions (2002) related QWL to job satisfaction, job acceptance, motivation, health, security, safety, productivity, job security, skill development, well-being and balance between work and non-work life.

MODEL OF QUALITY OF WORK LIFE

Richard E Walton proposed 8 major conceptual variables which contribute to quality of work life. They are:

1. Adequate and fair compensation
2. A safe and healthy working environment
3. Immediate opportunity to use and develop human capacities
4. Opportunity for continued growth and security
5. Social integration in the work organization
6. Constitutionalism in the work organization
7. Balanced role of work and total life space
8. The social relevance of the work life treatment

Thus QWL covers all aspects of an employee's life with special reference to their work and their working environment. The researcher has used this model to study the quality of work life among IT professionals. Within each variable stated above the researcher has further sub divided and chosen the following indicators of quality of work life. Adequate and fair compensation would include Pay and Benefits, Safe and healthy working environment would include risk free, pollution free working

environment. Immediate opportunity to use and develop human capacities will include autonomy, multiple skills, information and perspective, whole tasks. Opportunity for continued growth and security will include development and advancement opportunities. Social integration in the work organization will include freedom from prejudice, egalitarianism.

Constitutionalism of the work organization is privacy and freedom of speech. Balanced role of work and total life space will mean an equitable balance between work and family life. Social relevance of the organization will include concern for welfare of the society in which the organization exists.

Work is an integral part of our everyday life, as it is our livelihood or career or business. On an average we spend around twelve hours daily in the work place, that is one third of our entire life; it does influence the overall quality of our life.

As organizations continue to emphasize information technology (IT) to help them compete, IT professionals are being asked to overcome a growing list of challenges. This unrelenting emphasis on IT initiatives often results in longer working hours and around-the-clock support, placing IT workers at risk of suffering from work-life conflict. Human resource managers must skillfully manage this issue, with a particular focus on mitigating the consequences associated with work-life conflict.

Work-Life Conflict in the IT Profession

With information technology (IT) workers being increasingly stretched by extensive projects and aggressive timelines, this fictional example illustrates a problem faced by many organizations.

Earlier studies have reported that work-family conflict is one-dimensional construct. But recently empirical and theoretical research has reported reciprocal relationship of work- family conflict. More specifically work-family conflict occurs in both the directions i.e. work-to- family and family-to-work conflict.

A substantial body of evidence related to work-family conflict has shown that workfamily conflict is associated with various work (job satisfaction, commitment etc.), nonwork (Family satisfaction etc) and stress related (depression, burnout, stress etc.) outcomes.

Work-to-family conflict has also generally been negatively associated with various satisfaction measures such as life satisfaction, marital satisfaction, family satisfaction and leisure satisfaction.

Within the field of organizational psychology and health psychology work-family conflict has been

studied from the perspective of role-strain theory (Frone, 2003). According to role theory, role conflict is defined as, ―simultaneous occurrence of two (or more) sets of pressures such that compliance with one would make more difficult compliance with the other‖ (Kahn, Wolfe, Snoek, & Rosenthal, 1964, p. 19).

Researchers pointed out that work-to-family conflict is related to ineffective performance at family domain and family-to-work conflict is associated with ineffective performance at work domain.

Work-life conflict is a construct referring to the general interference that work life tends to have on an employee's personal life. It is a more general form of work-family conflict, which is defined as ―a form of interrole conflict in which the role pressures from the work and family domains are mutually incompatible in some respect‖ (Greenhaus & Beutell, 1985, p. 77).

Greenhaus, J. H., & Beutell, N. J. (1985). Sources of conflict between work and family roles. Academy of Management Review, 10, 76–88.

Work-life conflict can come in many forms and may represent intrusions of work into family time, leisure activities, or a general inability to mentally leave the work world behind when physically moving from one's workspace to one's home and personal space. For example, work- life conflict is experienced when meetings run long and family dinners are missed, pagers interrupt movie night with friends, or thoughts wander to work problems during a round of golf.

IT professionals are those professionals working directly with the development, testing, implementation, or support of information systems solutions.

Role overload among IT professionals may have dramatic effects on several organizational outcomes.

This is of particular concern to IT workers because their jobs may require them to plug into the office more regularly than their co-workers. For instance, most IT workers engaging in any type of project-related work or general support are likely to carry pagers, mobile phones, and laptop computers home on a nightly basis. While these tools allow for greater flexibility, they can also create both time- and strainbased conflict. Time-based conflict occurs as the employee is forced to spend additional time working from home instead of attending to other nonwork responsibilities. The psychological burden of disengaging from family or other nonwork activities in order to perform work duties creates additional strain-based conflict.

Greenhaus and Beutell (1985) identify three main factors that lead to work-life conflict. The three factors discussed are behavior-based conflict, time-based conflict, and strain-based conflict (Greenhaus & Beutell, 1985). Behavior-based conflict refers to the notion that patterns or behaviors expected in one role may be in opposition with the desired characteristics of another role. In other words, behavior-based conflict exists when an individual is expected to behave one way in a certain context and an opposite way in another context.

Behavior-based conflict can be a problem for IT professionals who may be asked to work in a logical and assertive manner as they work on troubleshooting problems or developing new programs, and are then expected to be less analytical and more open to the needs of their loved ones once they transition into nonwork roles. While this general phenomenon certainly does occur in the lives of IT workers, it is not a unique problem, as many other professionals face similar difficulties.

Time-based conflict occurs as the employee is forced to spend additional time working from home instead of attending to other nonwork responsibilities.

Time-based conflict refers to the simple idea that additional time spent in one domain (i.e., work) precludes individuals from investing that time in another domain (i.e., personal relationships), while strain-based conflict suggests that one domain is affected by the stress created in another role (Greenhaus & Beutell, 1985). Thus, strain-based conflict is considered a psychological factor that is actualized when employees have difficulty leaving the pressures of work behind when transitioning to their personal roles.

Research indicates that work stressors are likely to spillover into family and nonwork life, making it more difficult to effectively meet nonwork demands.

IT workers frequently have changing schedules that require them to work shifts late into the evening. By offering on-site child care, the employer can dictate the hours of operation for the day-care facility and may be able to provide care during hours that off-site providers are unwilling or unable to staff. For instance, toward the end of major upgrades or releases that may need to be staffed 24/7, the organization may be able to make arrangements with their daycare facilities to provide staff during the evening or nighttime hours to watch children while IT workers push to complete the project.

In conclusion, work-life conflict is an important issue in the IT profession. Given the project- based nature of the work, the frequent use of extended schedules, the heavy reliance upon technology, and the

accelerated timelines of IT implementations, IT workers in particular are subject to both time- and strain-based conflict. To combat dissatisfaction and turnover among IT professionals, organizations must understand how work-life conflict can feed into these undesirable consequences. Beyond understanding, however, they must take positive, practical steps to confront the issue of worklife conflict. Hopefully, the discussion and solutions offered in this article will assist HR managers in building tangible and effective strategies for managing work-life conflict among IT professionals.

The term quality of work life was first introduced in 1972 during an International Labor Relations conference. Quality of Work Life is a dynamic multidimensional construct that

currently includes such concepts as job security, reward systems, training and career advancement opportunities, and participation in decision making.

CONCLUSION

Information technology personnel are active agents who respond to changes in the environment within which they work. This results in a transactional relationship between the individual and their environment, involving several processes. The most regulating process in the stress-related transaction is cognitive, involving several factors such as personal beliefs, individual differences, appraisals, and affect, all of which give direction towards the adoption of specific coping strategies. The hierarchical regression analysis has demonstrated that specific individual demographics influenced the psychological adjustment among the IT personnel sampled. Those IT personnel who engaged in a more problem-focused style of coping, such as active coping were better adjusted than those who engaged in more emotion-focused styles of coping such as cognitive avoidance coping, social coping, accepting responsibility, and self-controlling coping. In addition, it was revealed that increased adjustment of IT personnel was associated with positive affect. So it can be concluded that the psychological adjustment of male IT personnel is influenced by the types of coping strategies they use, specific individual demographics and their affect state. The increasing demands being imposed on firms by customers to deliver services and products more efficiently and effectively is often reliant on IT personnel being able to be adaptive and responsive to the environment within which they work. In addition, IT personnel are also confronted with the demands of users, and increasingly the stakeholders who are reliant on the information system and the data produced. If IT personnel are not able to manage and cope with the job strain that they are confronted with then there is a danger of that customers could be lost to competitors, which are considered more reliable. Consequently, if firms are to improve their performance, then they need to provide their IT personnel with an environment that encourages problem-focused coping through improved training and skills development. As there has been limited

has addressed psychological adjustment and coping of IT personnel the findings reported in this paper provide the impetus for future research in this area. For example, determining whether personality and gender type influence the coping strategy and subsequently the psychological adjustment of IT personnel to work-related stress. The degree and pace of change being imposed on businesses by globalization and developments in information and communication technologies will increase the levels of work-related stress among IT personnel. As businesses seek to improve their competitive positioning within their respective marketplaces, they are creating an environment that fosters change, much of which adds to the everyday pressure and stress on employees. It would appear that stress has become anintrinsic feature of the workplace, especially among IT personnel, but how they cope with the pressures of technological change imposed on their work environment will ultimately influence overall business performance.

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Resolving Communication Concerns and Exploring The Emergence of Social Networks in Collaborative Software Development

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ABSTRACT

Collaborative software development is very important as the developers in a team might be located in various geographical areas. There are groupware products that accommodate the needs of the developers who collaborate. Formal and technical communication among the team members is crucial for the success of the endeavor in this regard.Towards this end Treude and Storey explored work item tagging in which they consider a scenario where multipleparties or developers can involve in technical communication. Tagging a work item and updating it as the work progresses can provide useful knowledge to team members so that they can avoid lengthy technical discussions. Here Developa prototype application is designed and built in order to facilitate multiple users of the development team who collaborate from different geographical regions. The users involved include tag authors, work item authors and work item owners.Technical communication among the three users is provided by the prototype besides allowingthem to have informal communication. The experimental result reveals that the prototype is useful to support communications among the members of collaborative software development team.

INTRODUCTION

Software development has gone through many phases over a period of time. From the initial "trial and error" kind of development, it went to the software process models that can help in systematic software development. The latest development is that the team members need not be located in particular geographical area. It is possible to have collaborative software development that helps team members to work a software product without time and geographical restrictions. With these provisions in place, humans can solve very complex problems as well [1]. Computer Aided Software Engineering (CASE) is the discipline that helps developers to utilize the computerized software development which increases the productivity. With the help of CASE tools available, it is possible to achieve smooth communication across the stakeholders of a project. Though individuals are involved in software development, an individual is not doing it alone. It is the combined effort of many users and now it is also possible for a team of members to collaborate from various geographical locations across the globe.

The tools that are existed for collaborative software development include Jazz [2] and INCOME /START

The former is from IBM. These tools help the communication process of the team members. However, these tools do not have any communication procedures with respect to social aspects [4]. Thus there is possible necessity for such tools to have communication provisions for social networking as well among the software team members. The formal and informal communications can help to built relationships among the team members besides solving problem in technical communication. The Jazz tool is used to have light weight communication in the form of tagging. Tagging work items help in communication scenarios of projects being done in collaborative fashion. In [5] the Jazz tool was explored in collaborative environment. Here built a prototype application with web interface that helps people from many geographical locations to have collaborative effort in technical communications of software development. A prototype application is built in order to facilitate multiple users of the development team who collaborate from different geographical regions. The users involved include tag authors, work item authors and work item owners. Technical communication among the three users is provided by the prototype besides allowing them to have informal communication.

The rest of this paper is designed as charts. Section 2 analysesrelatedworks. Section 3 focuses on Jazz tool as described in [5]. Section 4 provides information about the proposed design and implementation of web based prototype. Section 5 presents the experimental results while the section 6 concludes this paper.

RELATED WORKS

This section reviews literature on prior works pertaining to collaborative computing and work item tagging. Human beings saw the software development as a challenging task for many years [1]. Traditionally the software development is carried out by group of people forming a team. As part of software engineering there are many process models came into existence. As the task of software development is not simply writing some programs, a systematic approach and systematic communication process is required in the development process [6]. There are necessary mechanisms to bring about coordination among the members of a team [7]. There are many challenges and cultural issues involved in the team which is made up of people with diverse skills [8]. When colleagues are there in different countries, they might be facing difficulties to have collaborative access to software being developed [9]. In this case there should a tool to achieve this kind of communication among team members.

The success of projects in collaborative environment depends on the proper communication facilities provided by tools [10], [11]. Configuration management tools are also in place that help in providing communication and resolve communication conflicts as explored in [12]. The CASE tools such as

Bugzilla can help developer to work faster and improve productivity in software development [13]. A light weight social computing phenomenon such as tagging can be used with social dimension. Many software tools used tagging for supporting technical communication among the software development team members. With tagging in place, developers can have control technical communication that helps in collaborative computing scenarios [14]. Another technique is annotations [15] which can be used for additional and important communication in software development. Recent tool named Tag SEA [16] is used for tagging in collaborative software development environment. Other tools which are in use include concern Graphs [17] etc. Here build a tool that helps collaborative members to have formal and informal communications.

JAZZ TOOL EI CASE STUDIES

In this section two tools which are already existed are studied. They are Jazz and EI. They provided collaborative software development provisions and also resolve communication problems among the team members. The Jazz tool supports integration of various phases in the software development. Work items of various categories can be organized in it. Jazz has merit in having tool support for collaborative software development. On the other hand EI is another tool that also supports collaboration. It also helps the teams in using work item tagging.

Table 1 shows the data extracted from various sources.

Case	Data Object	Amount
Jazz	Work Item	65,268
	Tag Instance applied to work item	27,252
	Tag instance removed from work item	2,452
	Numbers of unique tag keywords	1,184

As shown in table 1, the data related to Jazz tool is taken from repositories. The count of work items, the work item tagging used for work items and the instances of tags, number of keywords used for tagging is shown in table 1.

Table 2 - frequency of tag instance of Jazz tool

Tag Keyword	# instances
Polish	966
Svt	870
Ux	668
Tvt	636
Testing	565
Globalization	442
Usability	441
Maintaincecanditate	436
Error handling	431
Must fix	421

As seen in table 2, the frequency of tag instances of Jazz tool is presented in descending order by the count of tag instances. Table 3 provides tag keywords that are most frequently shared in Jazz tool.

Table 3- Most Frequently Shared Tag Keywords in Jazz

Tag Keyword	#instances	#distinct users
Performance	413	46
Globalization	442	45
Tvt	636	45
Polish	966	43
Maintaincecanditate	436	40
No code	197	40
Error handling	431	38
Usability	441	38
Beta2candidate	308	35
Rc4candidate	133	33
Ux	688	33

As seen in table 3, it shows tag keywords, the number of instances and the number of users who used those tag instances.

PROPOSED SYSTEM

The proposed system is modeled after the concepts provided in [5]. The aim of the proposed system is to support collaborative software development in terms of work item tagging which provides technical communication possible among various users of the system. The users includework item owner, work item author and tag author. Each user has specific role to play in the application. All users can have collaborative communication with little effort. There will be no lengthy discussions required as the tags can carry sufficient meaning that can be understood by the team members. The communication concerns are taken care of by the tool that helps smooth communication among the team members. The proposed tool is also compared with other tools such as Jazz. The proposed application also supports limited social networking among the team members to have informal communications. Thus the tool proposed can support both formal and informal communications among the team members. Figure 1 shows the schematic overview of the proposed application.

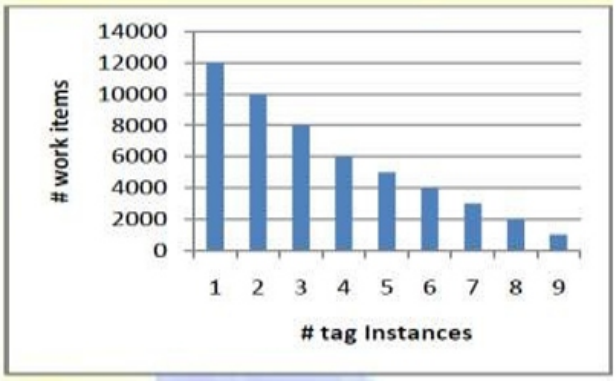
Fig. 1 – Schematic Overview of the Proposed System

As shown in Figure 1, it is evident that the application has many provisions. They include sharing of work, tagging the work items, collaborative communication and limited social networking for informal communications among the team members.

EXPERIMENTAL RESULTS

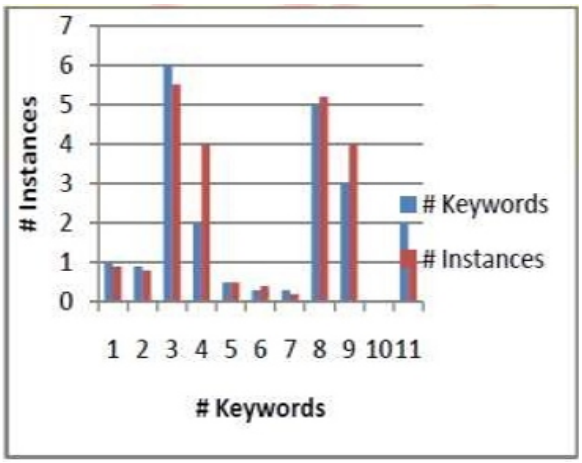
The environment used for the tool implementation includes a PC with 2GB of RAM and Core 2 Dual processor. JDK 1.7 and Tomcat 7.0 and Net Beans are used for the development of the tool. First of all Jazz and EI tools were studied before implementing the proposed application. The results of observations exist in fig. 2, 3 and 4.

Fig. 2 – Distribution of Tag Instances to Work Items with respect to Jazz



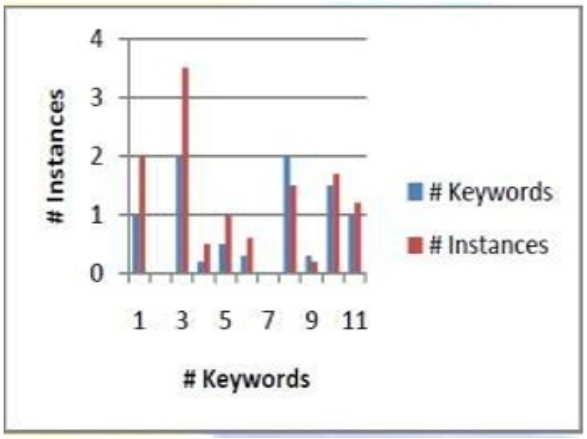
As can be seen in fig. 2, it is evident that the horizontal axis represents tag instances while the vertical axis represents number of work items. As the work items are increased the tag instances are also increased.

Fig. 3 – Number of instances and tag keywords (Jazz)



As Figure 3 shows there are number keywords and number of instances represented by horizontal and vertical axes. The tag keywords include tooling, unclassified, testing, planning, environment, documentation, cross cutting, collaboration, component, architecture etc.

Fig. 4 – Number of Instances and tag keywords (EI)



As Figure 4 shows there are number keywords and number of instances represented by horizontal and vertical axes. The tag keywords include tooling, unclassified, testing, planning, environment, documentation, cross cutting, collaboration, component, architecture etc.

CONCLUSION

This paper focuses on studying the need for collaborative software development and the tools available for the same. Here build a prototype application or a tool that can help a group of people to collaborate and have technical communication among them. The users who use this application include work item owners, work item authors and tag authors. The tagging concept helps them to have purely technical communication among them. The tagging eliminates the need for complex interactions unnecessarily. Moreover the tool also facilitates to have informal communication among the team members in order to have limited social networking capabilities. Thus the tool became important communication medium for both formal and information communications among the team members who participate in collaborative software development. The empirical results are encouraging.

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Performance Evaluation of Printed Character Recognition System

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ABSTRACT

In spite of today's powerful computer systems and intensive research for last five decades, it might be surprising to note that the machines are still far from the final frontier i.e. human's performance in case of reading.

The character recognition systems for various applications are classified based upon two major criteria (i) according to the data acquisition process as, on-line or off-line (ii) according to the text type, as machine-printed or hand-written character recognition.

Although there are numerous elaborated and mature recognition techniques, only few systems for restricted applications are working quite satisfactorily. However, machine's recognition performance is still considerably lower than that of humans especially for unconstrained on-line and off-line handwriting. This inspired researchers to focus not only on the development of novel recognition algorithms, but also on the improvement of other aspects of recognition systems.

In the present paper we have made experiments to evaluate the recognition rate of printed character. The performance evaluation of printed character recognition has been made to assess how well the recognizer performed on the particular page. In the experiment the average recognition rate 94.97 has been obtained.

1. INTRODUCTION

Character Recognition or Optical Character Recognition (OCR) is the process of converting scanned image of machine printed or handwritten text into a computer processable format, such as, ASCII. In the last decade researchers have made significant efforts, both in terms of technological supports and in software products to make available computerized document analysis systems. Character recognition (OCR) contributes to this progress by providing techniques to convert large volumes of data automatically. With survey of the literature in this field we find that there are so many papers and patents advertising and claiming recognition rates very high. The claimed recognition rates gives the impression that automation problems in this field seem to have been solved. However, in real life the failure of some real applications show that performance problems subsist on composite and degraded documents (i.e., noisy characters, tilt, mixing of fonts, etc.) and that there is still need for progress in this area. To increase the accuracy of optical character recognizers, researchers have proposed various

methods. There is a parallel analogy between the various stages of evolution of OCR systems and those of pattern recognition. The classical approach focusing on isolated characters, to overcome the recognition deficiency. To improve the recognition rate researchers are exploring and using contextual techniques The opening of OCR domain to document recognition leads to combination of many strategies such as document layout handling , font identification , dictionary checking , word recognition , integration of several recognition approaches etc.

Intensive research has made OCR an efficient means of entering data directly into the computer and capturing information from data sheets, books and other machine printed or handwritten materials. Such capabilities greatly widen the applications of computers in areas like automatic reading of texts and data, man-computer communications, language processing and machine translation. OCR has been a subject of great interest to many computer scientists, engineers and people from other disciplines. A block diagram of typical OCR system is shown in Fig. 1.

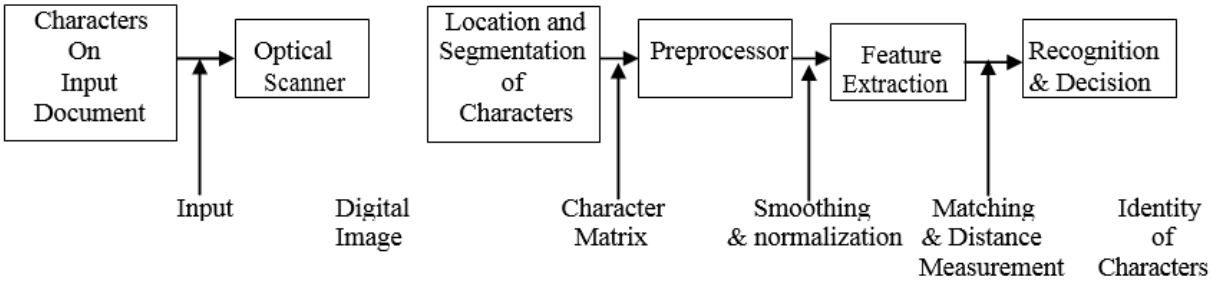


Figure 1 : Block diagram of a typical OCR system

There exists hundreds of type fonts and thousands of print fonts in the world, each having its own distinctive style and peculiarities such as serifs, shapes, curvatures, sizes, pitch, line, thickness etc. Due to the great variety of fonts, machine recognition of multifont and handwritten characters, have many problems.

Variations in handwritten characters are even greater than those in type fonts because they can be written in an immensely different number of ways. Since each person has his/her own ways and styles of writing and character samples written by the same hand are never identical in shape orientation and in size, there are an infinite number of possible character shapes. Actually, the problem of handprint recognition is of great interest and challenge to researchers because even human beings, who possess the best trained optical readers (their eyes) and interpreters (their minds) would make about 4% mistakes when reading hand printing in the absence of context. Due to the similar topological structures, the characters 6/G. D/O, I/1, S/5, 2/Z and U/V are the most confusing pairs, especially when they are written sloppily.

The great variability in hand printing may be attributed to writing habits, style and ease in writing,

education, region of origin, mood, health and other conditions of the writer. Apart from these human factors, writing instruments, writing surfaces and scanning equipment and methods, as well as machine recognition algorithms also play an important role in explaining the recognition rate. In their paper [SS13] have given an overview of OCR and reviewed advantages and limitations of Character Recognition.

2. HANDWRITING RECOGNITION

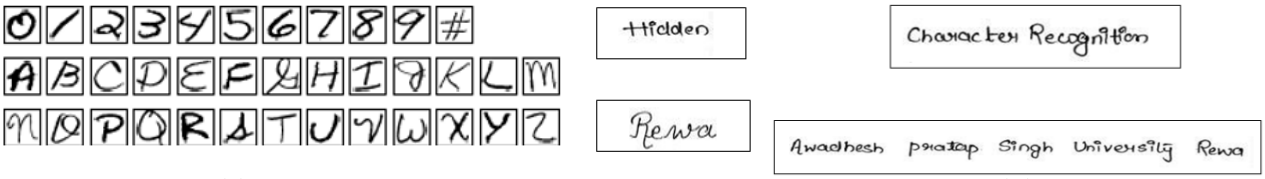
The final endeavor of handwriting recognition research is to make computers able to read human written texts, with a performance comparable to or even better than that of humans[L99]. The use of handwriting is involved in many of our day-to-day activities, such as note taking, form filling and letter addressing. During the past two decades, there have been increasing demands for the applications to automatically process the content of these handwritten documents with the recent advent of many hand-held devices that accept handwriting inputs.

The performance of handwriting recognition systems has improved dramatically over the past decade, especially in some specific tasks, such as handwritten address reading and the recognition of amounts on bank cheques [B03]. However, the performance of general handwritten word and sentence recognition is rather low and still not comparable to that achieved by humans.

Researchers divide the field of handwriting recognition into off-line and on-line recognition. The off-line recognition systems recognize the characters after they are written on a piece of paper, scanned using the computer and stored in the image format. Whereas, the on-line systems can access dynamic information of handwriting strokes while the characters are being written on a tablet or a digitizer.
Although, the recognition processes of both systems are different, the four fundamental sequential stages are (i) pre-processing (ii) feature extraction (iii) classification and (iv) post- processing.

In pre-processing handwriting inputs are prepared to be suitable for later recognition stages. The goal of the feature extraction stage is to obtain a compact description (a feature vector) that can be used to uniquely represent the character. The main decision making stage is classification in which the extracted features are classified into one of several categories. Modern handwriting recognition research is dominated by the use of statistical methods for classification, i.e. statistical classifiers, as seen in a recent survey [VBB04]. Post-processing typically forms a verification step, such as the use of language models and contextual information to verify the recognized characters or words.

Here we describe some important terminology. Units of meaningful handwriting can be categorized into the four types : character, word, phrase and sentence [S93]. (See Figure 2.1).



(a) (b) (c)

Figure 2.1 : Example of handwritten (a) characters (b) words, and (c) phrases

3. NON-DISCRIMINATIVE AND DISCRIMINATIVE METHODS

In order to classify the unseen samples efficiently, some training algorithms are required to train the classifiers according to the presence of the training samples. Broadly classifiers are divided into two groups based on their training approaches: non-discriminative and discriminative classifiers.Non-discriminative classifiers, sometimes referred to as generative or informative classifiers, aim at building a model to represent the training samples in each class. Given the unseen character, classification is done by choosing the model that best explains the data. Examples of non-discriminative classifiers are Hidden Markov Models (HMMs) and Gaussian Mixture Models. These classifiers usually rely on non-discriminative training methods such as Maximum Likelihood (ML) estimation in which the model of each class is trained separately by using the samples that belong to the class. Discriminative classifiers, on the other hand, only centre on the classification decisions, and hence do not attempt to construct a model over the training samples. They focus directly on determining the class decision boundaries, which is equivalent to learning a direct mapping from the training samples to their class labels. Examples include neural networks and Support Vector Machines (SVMs). The training process requires simultaneous considerations of the training samples of all competing classes through the use of discriminative training methods, which involve the optimization of some discriminative training criteria.

4. NOVEL TRENDS OF DEVELOPMENT

Despite the existence of the numerous elaborated and mature recognition techniques, machine's reading performance is still considerably lower than that of humans. This inspired researchers to focus not only on the development of novel recognition algorithms, but also on the improvement of other aspects of handwriting recognition systems. To overcome the difficulties and inherent limitations of collecting a large number of human written samples, the researchers are investigating the possibility of generating synthetic handwriting.

Another approach which has become a very active and popular research area is the combination of classifiers [KHDM98]. The basic idea is to use several different classifiers (experts) to classify an input pattern. The advantage of the approach is that errors made by an individual classifier can be corrected by the others, for example if we decide for the pattern class which is suggested by the majority of the recognizers. For further details see [K04].

Nowadays it seems that human reading performance at general unconstrained texts cannot be achieved by using merely the information extracted from the ink pattern. There is a demand for shifting from the pattern recognition framework to a paradigm that emphasizes the utilization of much more a-priori knowledge [L99]. According to the new framework described in [L99], ambiguities occurring in difficult handwriting would be resolved mainly by applying the available linguistic knowledge, while using only general knowledge about the handwriting ink, namely its invariants common to a large variety of handwriting styles. This way the operation of the system would be transparent, so its errors could be analyzed and corrected more efficiently.

5. HIDDEN MARKOV MODELS

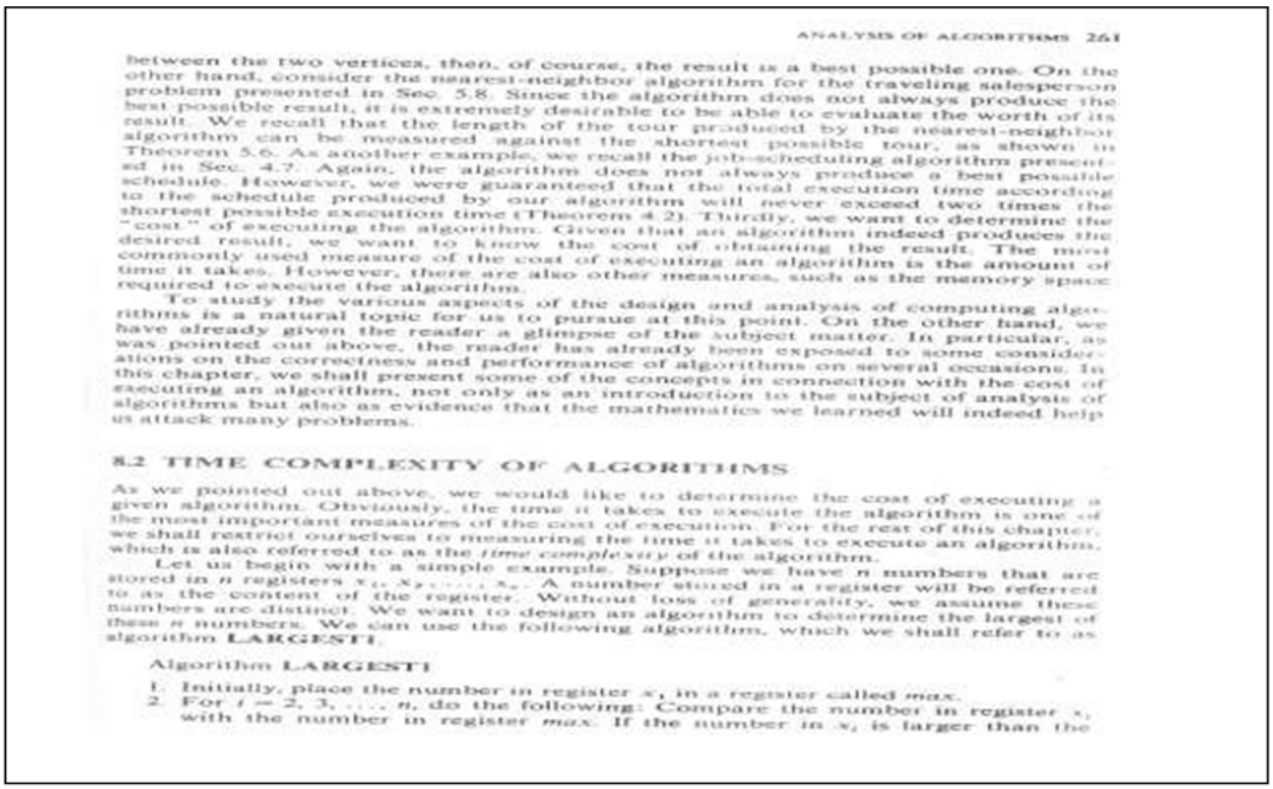
For a wide spectrum of applications in many fields of pattern recognition the Hidden Markov Modeling (HMM) methods have been found to be extremely useful. Earlier the HMM technique was applied in the field of speech recognition later on the HMM have been used for hand-writing recognition application. Researchers have shown, the benefits of their application to different forms of OCR, in particular is that of handwriting recognition. In case of On-line handwriting recognition, the temporal information of how characters or words are constructed by the writer is available to recognizer, is a very good example of the use of HMM approach. Rabiner and Juang results [RJ86], [R89] have shown promising results for off-line handwriting using HMM recognition.

6. PERFORMANCE EVALUATION OF PRINTED CHARACTER RECOGNITION

For performance evaluation of printed character recognition, we scanned 11 simple printed pages of different books and magazines. We used three different scanners and recognized these pages with the commercially available recognition software bundled with the scanners (HP Scanjet 1150 (sc1) , Canon Lide 25 (sc2), and HP Scanjet 8350 (sc3)). Considering one page only, the output of the recognizer is a sequence of words, which has to be compared with the correct transcription of the page image to assess the quality of the recognition result, that is, to assess how well the recognizer performed on that particular page. Then, certain related statistics are calculated, such as number of words of both the correct transcription and the recognition result. From this statistics, the recognition rate, which is the percentage of the correctly recognized words of the page are calculated as –

Recognition Rate = (Correct Words/Number of words) * 100

The statistics related to this experiment is summarised in the Table-6.1. One of the sample printed page is given in Figure -6.1. The recognition result pages are shown in Figure 6.2 for sc1, Figure 6.3 for sc2 and Figure 6.4 for sc3. Recognition rate of printed page and overall recognition rates are shown in Figure 6.5 and Figure 6.6.



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between the two vertices, then, of course, the result is a best possible one. On the other hand, consider the nearest-neighbor algorithm for the traveling salesperson problem presented in Sec. 5.8. Since the algorithm does not always produce the best possible result, it is extremely desirable to be able to evaluate the worth of its result. We recall that the length of the tour produced by the nearest-neighbor algorithm can be measured against the shortest possible tour, as shown in Theorem 5.6. As another example, we recall the job-scheduling algorithm presented in Sec. 4.7. Again, the algorithm does not always produce a best possible schedule. However, we were guaranteed that the total execution time according to the schedule produced by our algorithm will never exceed two times the shortest possible execution time (Theorem 4.2). Thirdly, we want to determine the "cost" of executing the algorithm. Given that an algorithm indeed produces the desired result, we want to know the cost of obtaining the result. The most commonly used measure of the cost of executing an algorithm is the amount of time it takes. However, there are also other measures, such as the memory space required to execute the algorithm.

To study the various aspects of the design and analysis of computing algorithms is a natural topic for us to pursue at this point. On the other hand, we have already given the reader a glimpse of the subject matter. In particular, as was pointed out above, the reader has already been exposed to some considerations on the correctness and performance of algorithms on several occasions. In this chapter, we shall present some of the concepts in connection with the cost of executing an algorithm, not only as an introduction to the subject of analysis of algorithms but also as evidence that the mathematics we learned will indeed help us attack many problems.

8.2 TIME COMPLEXITY OF ALGORITHMS

As we pointed out above, we would like to determine the cost of executing a given algorithm. Obviously, the time it takes to execute the algorithm is one of the most important measures of the cost of execution. For the rest of this chapter, we shall restrict ourselves to measuring the time it takes to execute an algorithm, which is also referred to as the *time complexity* of the algorithm.

Let us begin with a simple example. Suppose we have n numbers that are stored in n registers $x_1, x_2, \ldots, x_n$. A number stored in a register will be referred to as the content of the register. Without loss of generality, we assume these numbers are distinct. We want to design an algorithm to determine the largest of these n numbers. We can use the following algorithm, which we shall refer to as algorithm LARGESTI.

Algorithm **LARGESTI**

1. Initially, place the number in register x_1 in a register called *max*.
2. For $i = 2, 3, \ldots, n$, do the following: Compare the number in register x_i with the number in register *max*. If the number in x_i is larger than the

Figure 6.1 : Sample scanned printed page

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between the two vertices, then, of course, the result is a best possible one. On the other hand, consider the nearest-neighbor !ilgorithm for the traveling salesperson problem presented in Sec. 5.8. Since the algorithm does not always produce the best possible result, it is extremely desirable to be able to evaluate the worth of its result. We recall that the length of the tour pr:>duced by the nearest-neighbor algorithm can be measured against the shortest possible tour, as shown in Theorem 5.6. As another example, we recall the job-scheduling algorithm present- ed in Sec. 4.7. Again, the algorithm does not always produce a best possible schedule. However, we were guaranteed that the total execution time according to the schedule produced by our algorithm will never exceed two times the shortest possible execution time (Theorem 4.2). Thirdly, we want to determine the .. cost" of executing the algorithm. Given that an algorithm indeed produces the desired result, we want to know the cost of obtaining the result. The most commonly used measure of the cost of executing an algorithm is the amount of time it takes. However, there are also other measures, such as the memory space required to execute the algorithm.

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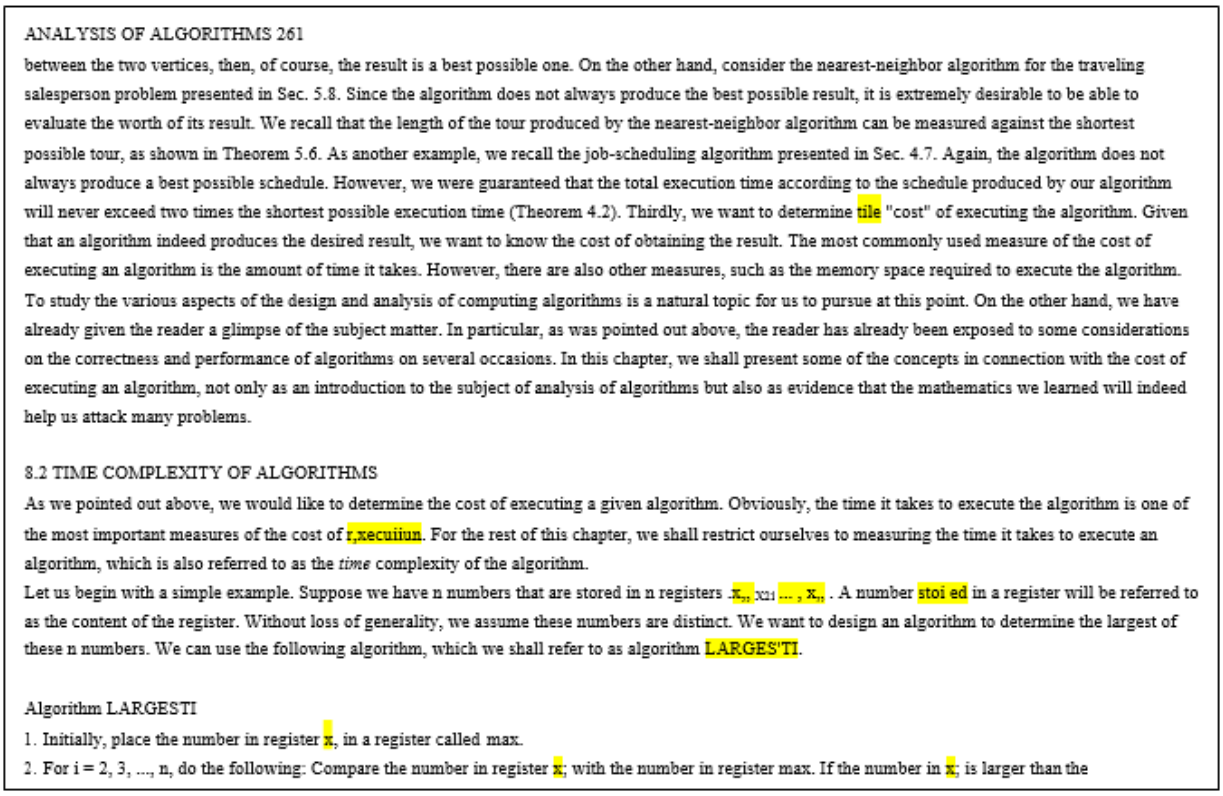
Algorithm **LARGESTI**

1. Initially, place the number in register *XI* in a register called *max.*

2. For $i = 2, 3, \ldots, n$, do the following: Compare the number in register *Xi* with the number in register *max.* If the number in *Xi* is larger than the -

Figure 6.2 : Recognition Result of printed page using sc1



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8.2 TIME COMPLEXITY OF ALGORITHMS

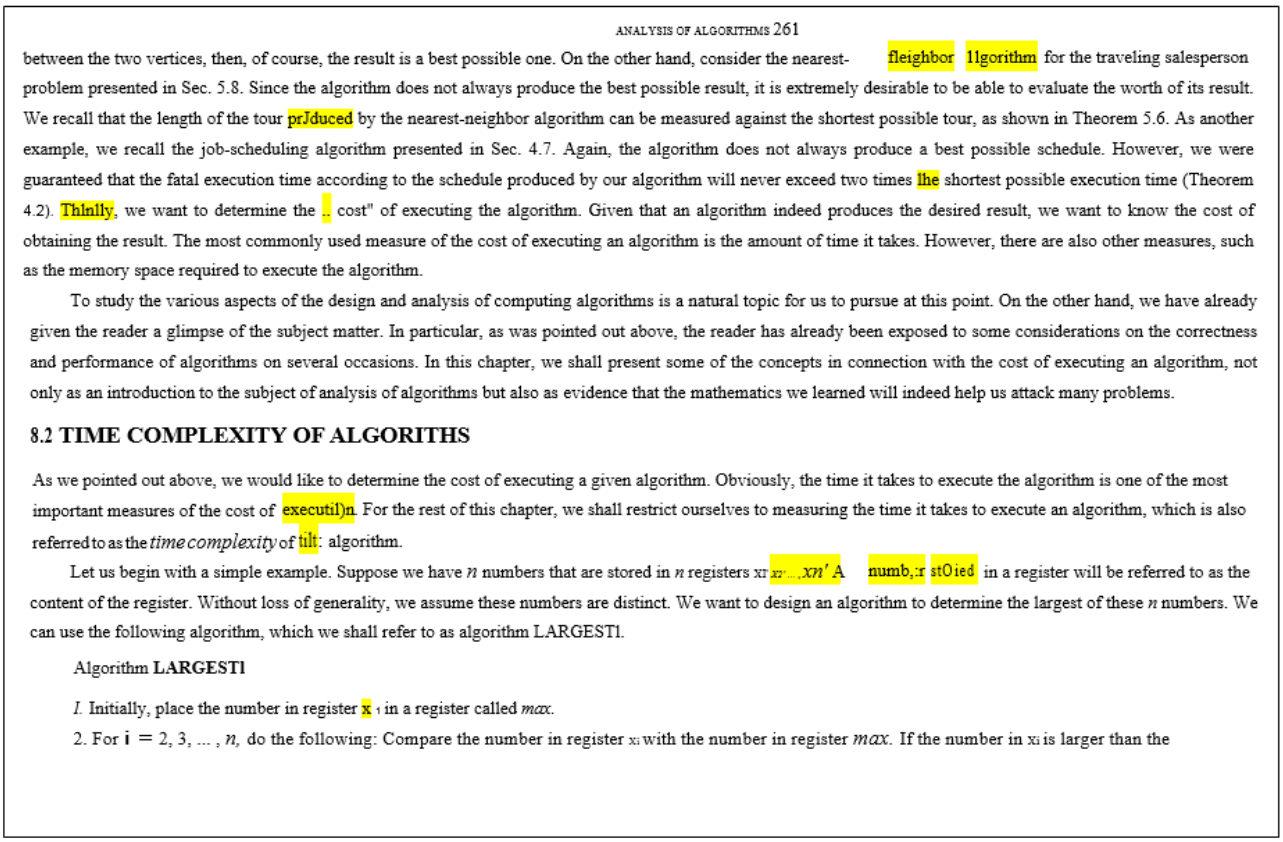
As we pointed out above, we would like to determine the cost of executing a given algorithm. Obviously, the time it takes to execute the algorithm is one of the most important measures of the cost of r,xecuiiun. For the rest of this chapter, we shall restrict ourselves to measuring the time it takes to execute an algorithm, which is also referred to as the *time* complexity of the algorithm.

Let us begin with a simple example. Suppose we have n numbers that are stored in n registers $x_1, x_2, \ldots, x_n$. A number stoi ed in a register will be referred to as the content of the register. Without loss of generality, we assume these numbers are distinct. We want to design an algorithm to determine the largest of these n numbers. We can use the following algorithm, which we shall refer to as algorithm LARGES'TI.

Algorithm LARGESTI

1. Initially, place the number in register x, in a register called max.
2. For i = 2, 3, ..., n, do the following: Compare the number in register x; with the number in register max. If the number in x; is larger than the

Figure 6.3 : Recognition Result of printed page using sc2



ANALYSIS OF ALGORITHMS 261

between the two vertices, then, of course, the result is a best possible one. On the other hand, consider the nearest- fleighbor 11gorithm for the traveling salesperson problem presented in Sec. 5.8. Since the algorithm does not always produce the best possible result, it is extremely desirable to be able to evaluate the worth of its result. We recall that the length of the tour prJduced by the nearest-neighbor algorithm can be measured against the shortest possible tour, as shown in Theorem 5.6. As another example, we recall the job-scheduling algorithm presented in Sec. 4.7. Again, the algorithm does not always produce a best possible schedule. However, we were guaranteed that the fatal execution time according to the schedule produced by our algorithm will never exceed two times lhe shortest possible execution time (Theorem 4.2). Thlnlly, we want to determine the .. cost" of executing the algorithm. Given that an algorithm indeed produces the desired result, we want to know the cost of obtaining the result. The most commonly used measure of the cost of executing an algorithm is the amount of time it takes. However, there are also other measures, such as the memory space required to execute the algorithm.

To study the various aspects of the design and analysis of computing algorithms is a natural topic for us to pursue at this point. On the other hand, we have already given the reader a glimpse of the subject matter. In particular, as was pointed out above, the reader has already been exposed to some considerations on the correctness and performance of algorithms on several occasions. In this chapter, we shall present some of the concepts in connection with the cost of executing an algorithm, not only as an introduction to the subject of analysis of algorithms but also as evidence that the mathematics we learned will indeed help us attack many problems.

8.2 TIME COMPLEXITY OF ALGORITHS

As we pointed out above, we would like to determine the cost of executing a given algorithm. Obviously, the time it takes to execute the algorithm is one of the most important measures of the cost of executil)n. For the rest of this chapter, we shall restrict ourselves to measuring the time it takes to execute an algorithm, which is also referred to as the *time complexity* of tilt: algorithm.

Let us begin with a simple example. Suppose we have n numbers that are stored in n registers $x_1, x_2, \ldots, x_n$. A numb,:r stOied in a register will be referred to as the content of the register. Without loss of generality, we assume these numbers are distinct. We want to design an algorithm to determine the largest of these n numbers. We can use the following algorithm, which we shall refer to as algorithm LARGESTI.

Algorithm **LARGESTI**

1. Initially, place the number in register x_1 in a register called *max*.

2. For $i = 2, 3, \ldots, n$, do the following: Compare the number in register x_i with the number in register *max*. If the number in x_i is larger than the

Figure 6.4 : Recognition Result of printed page using sc3

Page	Total words	Correctly recognised words by sc1	Correctly recognised words by sc2	Correctly recognised words by sc3	Recognition Rate sc1	Recognition Rate sc2	Recognition Rate sc3
1	369	361	364	354	97.8	98.6	95.9
2	493	475	474	457	96.3	96.1	92.7
3	345	322	324	293	93.3	93.9	84.9
4	524	510	504	502	97.3	96.2	95.8
5	400	357	363	334	89.3	90.8	83.5
6	305	300	304	297	98.4	99.7	97.4
7	439	416	427	418	94.8	97.3	95.2
8	509	502	501	497	98.6	98.4	97.6
9	268	255	259	239	95.1	96.6	89.2
10	460	454	458	452	98.7	99.6	98.3
11	621	560	585	567	90.2	94.2	91.3
overall	4733	4512	4563	4410	95.3	96.4	93.2

Table 6.1 : Statistics of printed page recognition

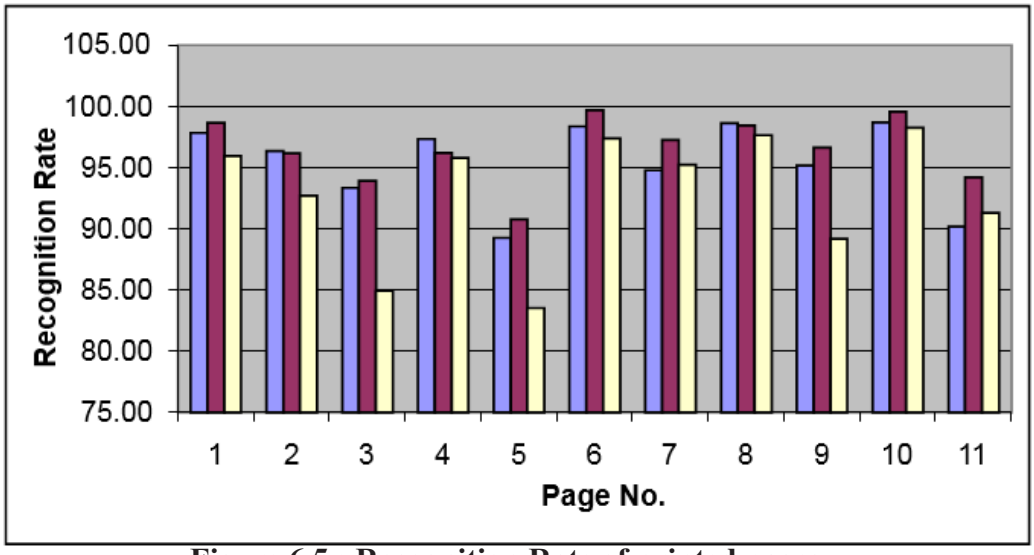


Figure 6.5 : Recognition Rate of printed pages

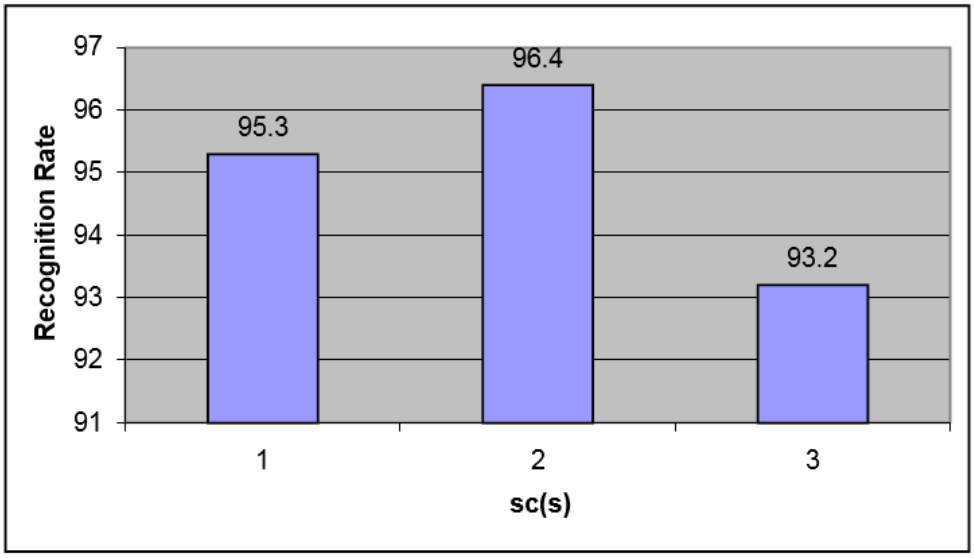


Figure 6.6 : Overall Recognition Rates

In the experiment on printed page recognition using commercial recognition systems, the average recognition rate have been obtained 94.97%. The sc1 could not recognize text printed in columns, correctly. The recognition system was not able to detect properly, the table data and the mathematical symbols.

The experiment clearly shows that the impression created by many papers and patents that recognition problems in case of printed matter recognition have been solved is not fully correct. There is still enough room for progress and further research for improvement in the character recognition is required, particularly in the public domain.

7. SUMMARY AND CONCLUSIONS

The experiment clearly shows that the impression created by many papers and patents that the recognition problem in case of printed character recognition have been solved is not fully correct. There is still enough room for progress and further research for improvement in the character recognition is required, particularly in the public domain.In the field of CR several interesting issues still remain open and can be the subject of further research. In future, the focus of researchers will be on the recognition of texts rather than the recognition of single words. The use of language modeling, that has been neglected in the field of offline character recognition, still leaves open many possibilities for further improvement, with particular emphasis through a large body of public research institutions.

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A Study of E-Banking and its Impact in Today's World.

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A B S T R A C T

E-banking has become the necessity these days. Many studies focused on usage of internet banking but many factors on non-usage were overlooked. This research was carried out to validate the conceptual model of internet banking. The technology and security standards are of prime importance as the entire base of Internet banking rests on it. Also the competition has increased to such an extent that the one who is not compatible with the changing environment is not able to survive for long. E-banking comprises of Internet Banking, Smart Cards, Debit Cards, Credit Cards, Automated Teller Machines, and Charge Cards etc. Now-a-days, foreign banks are also entering into the Indian Banking Market. They are serving a hard and severe competition to nationalize and private sector banks. The study revealed that education, gender, and income play an important role in usage of internet banking. Introduction of these techniques have made the transactions and activities of businesses very effective and smooth. Many people are having access to Internet and Mobile Connections. But everything has two aspects – good and bad. The adoption and switch over to Electronic banking will also raise certain legal issues and disputes in the future which have to be anticipated and remedial measures for the same need to be adopted. Further, these issues should also be compatible with the existing laws, particularly the Information Technology Act, 2000. Further, all these e-banking transactions are being supervised and regulated by the guidelines of RBI. Such as, all banks that are providing Internet Banking are required to have prior approval from RBI.

Keywords - E-commerce; Privacy; Security; World Wide Web

INTRODUCTION

Banking

Bank is a financial institution that performs several functions like accepting deposits, lending loans, agriculture and rural development etc. Bank plays an important role in the economic development of the country.

It is necessary to encourage people to deposit their surplus funds with the banks. These funds are used - for providing loans to the industries thereby making productive investments.

A bank is a financial intermediary that accepts deposits and channels those deposits into lending activities. They are the active players in financial market. The essential role of a bank is to connect those who have capital with those who seek capital. After the post economic liberalization and globalization, there has been a significant impact on the banking industry.

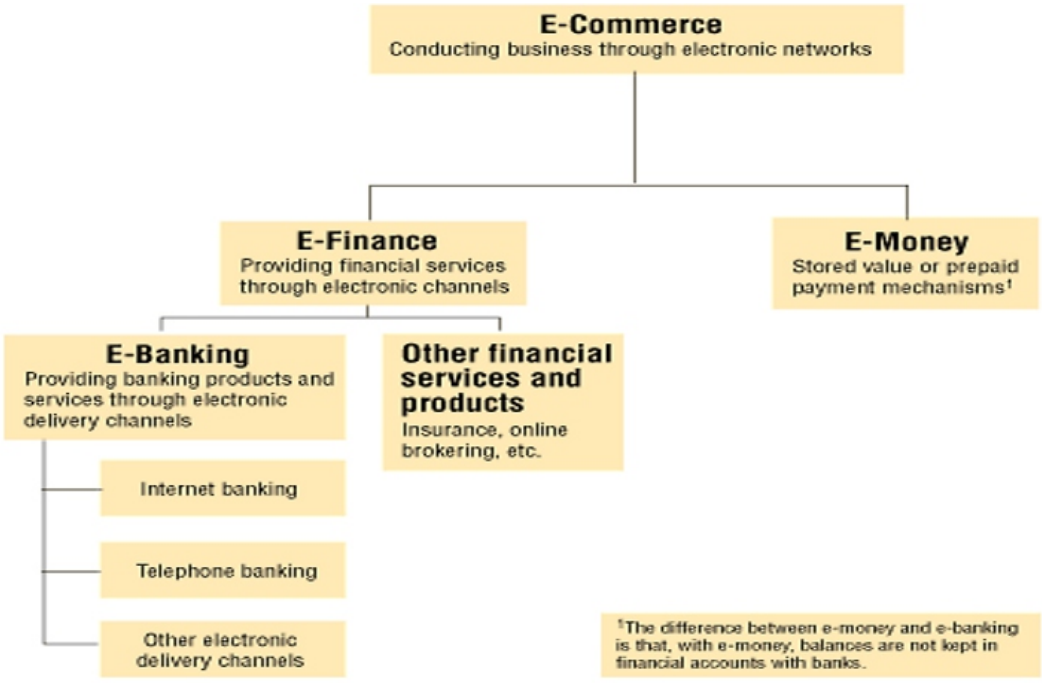
Banking in India originated in the 18th century. The oldest bank in existence in India is the State Bank of India, a government-owned bank in 1806. SBI is the largest commercial bank in the country.

After the independence, Reserve Bank of India was nationalized and given wide powers. Currently, India has 96 Scheduled Commercial Banks, 27 public sector banks, 31 private banks and 38 foreign banks.

Today, banks have diversified their activities and are getting into new products and services that include opportunities in credit cards, consumer finance, wealth management, life and general insurance, investment banking, mutual funds, pension fund regulation, stock broking services, etc.

Further, most of the leading Indian banks are going global, setting up offices in foreign countries, by themselves or through their subsidiaries.

E-Banking



Electronic banking is an umbrella term for the process by which a customer may perform banking transactions electronically without visiting a brick-and-mortar institution. Therefore transactions related to bank activities via Electronic Mean and medium is called electronic Banking.

E – Banking is the modern topic in the era of Science & Technology. Though e – banking started in 80's but the revolution has taken place in 20th century. Since then E – banking concept is flourished with populous model, theory and practical concept (like innovation technology acceptance, affluence in

internet business). So, before going to discuss any core content of E – banking, it is good to memorize the fundamental concept of E–banking which helps to realize basic concepts of E – banking. And this chapter is going to discuss these fundamental topics of E–banking.

E-banking can be offered in two main ways. First, an existing bank with physical offices can also establish an online site and offer e-banking services to its customers in addition to the regular channel. For example, Citibank is a leader in e-banking, offering walk-in, face-to-face banking at its branches throughout many parts of the world as well as e-banking services through the World Wide Web.

customers can access their bank accounts through the Internet, and in addition to the core e-banking services such as account balance inquiry, funds transfer, and electronic bill payment, bank also provides premium services including financial calculators, online stock quotes, brokerage services, and insurance.

Generally, e-banking is provided without extra cost to customers. Customers are attracted by the convenience of e-banking through the Internet, and in turn, banks can operate more efficiently when customers perform transactions by themselves rather than going to a branch and dealing with a branch representative.

The range of e-banking services is likely to increase in the future. Some banks plan to introduce electronic money and electronic checks. Electronic money can be stored in computers or smart cards and consumers can use the electronic money to purchase small value items over the Internet. Electronic checks will look similar to paper checks, but they can be sent from buyers to sellers over the Internet, electronically endorsed by the seller, and forwarded to the seller's bank for electronic collection from the buyer's bank. Further, banks seek to offer their customers more products and services such as insurance, mortgage, financial planning, and brokerage. This will not only deliver more value to the customers but also help banks to grow business and revenues.

Features Of Electronic Banking:-

1. Easy Electronic Fund transfer facility
2. Better efficiency in Customer relationship management.
3. Making the Payments of bills like electricity, telephone bills, and mobile recharge.
4. It introduces virgin & innovative banking products & services.
5. It can view of balance of accounts and statements
6. E-banking can bring doorstep services.

7. Balance and transaction history search.
8. Transaction history export .
9. Order mini statements .
10. Mobile banking.
11. Pay Anyone payments Multi Payments .
12. SMS banking services.

Impact of It on Banking System:-

The banking system is slowly shifting from the Traditional Banking towards relationship banking. Traditionally the relationship between the bank and its customers has been on a o ne tone level via the branch network. This was put into operation with clearing and decision making responsibilities concentrated at the individual branch level. The head office had responsibility fort he overall clearing network, the size of the branch network and the training of staff in the branch network. The bank monitored the organization's performance and set the decision making parameters, but the information available to both branch staff and their customers was limited to one geographical location.

Advantages of E-Banking

E-banking, which includes any transaction you perform using the Internet or a mobile device, is becoming more common. Making electronic payments, paying bills and transferring money between accounts are all elements of e-banking, which can be done from your cell phone or computer. Despite potential risks of identity theft and account hacking and less personal contact with the bank, e-banking presents a number of advantages to customers.

1) Convenience:-

The ability to do banking from home at any hour is one of the most common benefits of online, or e-banking. You can move money from checking to savings or make electronic payments 24/7, even when the bank is closed. Some customers also appreciate the real-time banking information to check balances in checking and savings accounts.

2) Portability:-

Electronic banking also creates a more mobile bank for customers. Mobile apps allow customers to check balances and perform routine bank transactions from anywhere they can get phone reception. Alerts to low balances are offered by some bank apps.

3) Cost Savings:-

E-banking offers some cost-savings opportunities for customers. By paying bills online, you reduce the number of checks you have to write. This saves you on buying new check pads and paying for stamps and envelopes. Also, with broader access to banks operating online, you can price shop and find lower fees and more favorable interest rates.

4) Track Spending:-

Some bank customers who previously did little to no budgeting now monitor basic spending habits using spending trackers provided by online banks. When you make purchases with a debit card or pay bills online, programs update your spending chart by cataloging the expense as utility, car payment or another type of bill. These trackers are somewhat limited because they can't directly monitor cash spending. However, some bank apps allow you to manually record grocery expenses or other cash outflows to fill those gaps.

5) Industry Benefits:-

Banks can minimize labor and supply costs by allowing customers to self-service certain types of transactions, and save money on paper and postage by sending statements over the Internet. While some people believe ATMs and e-banking go against traditional, personalized banking, others point to the increased efficiency and flexibility.

Disadvantages of E-Banking:-

Nowadays, almost every banking transaction---that once had to be done in person---can be done over the Internet. Despite the advantages of online banking, such as saving trips to a local bank and avoiding long lines, a considerable number of people still prefer the more traditional form of banking in person. Often, the reasons stem from disadvantages that are incurred when banking online.

1) Internet Connection:-

Not everyone enjoys the luxury of having a stable and fast Internet connection at home. Aside from having a personal computer or laptop, having stable Internet access at home is a basic prerequisite to performing electronic banking. Of course, people can always use a public computer with Internet access; however, the security of public computers is always a concern.

2) Computer Know-How:-

Conducting a successful electronic banking transaction, like paying bills online, requires basic computer skills and knowing your way around the Internet. Being computer-literate is not common to

everyone--- especially seniors who might not have grown up using computers---and this is a major disadvantage to electronic banking.

3) Delayed Statements:-

When performing online banking there is not a standard at which payments made will show up on your online bank statements; they might show up two to three days later, depending upon the bank. When banking in person, you can generally get the exact status of your bank account.

4) Security Concerns:-

One of the biggest disadvantages of doing electronic banking is the question of security. With the prevalence of keyloggers, phishing emails, trojans and other online threats, it is natural for people to be concerned with the security of their identity, funds and electronic banking transactions. Using antivirus and similar programs is not full-proof. People worry that their bank accounts can be hacked and accessed without their knowledge or that the funds they transfer may not reach the intended recipients. Although it is rare nowadays with enhanced security measures, these threats still exist.

5) Loss of Human Touch:-

Some people still value talking and interacting with bank tellers, managers and other bank clients. Electronic banking takes the majority of these "human interactions" away, leaving the banking experience as a very hands-off, impersonal process.

Types of E-Banking:-

In the viewpoint of use and access media, E-Banking can be classified into three narrow (sometimes broad) sections:

1) Telephone Banking (The Oldest one)
2) Internet Banking (or Online Banking)
3) Mobile Banking (Including SMS Banking)

I) Telephone Banking

Telebanking refers to banking on phone services. A customer can access information about his/her account through a telephone call and by giving the coded Personal Identification Number (PIN) to the bank. Telebanking is extensively user friendly and effective in nature.

Telephone banking is a service provided by a financial institution, that enables customers of the financial institution to perform transactions over the telephone, without the need to visit a bank branch or automated teller machine. Telephone banking times can be longer than branch opening times, and some financial institutions offer the service on a 24 hour basis. From the bank's point of view, telephone banking reduces the cost of handling transactions by reducing the need for customers to visit a bank branch for non-cash withdrawal and deposit transactions.

Advantages of Telephone Banking:-

1. It is convenient because you can pay your bills on time and do not have to go to the utility company during the business hours.
2. It saves time as it eliminates waiting in line at the utility company.
3. It is safer because you do not have to walk around with cash to pay your utility bills.
4. It is cheaper since the transaction cost is less than transportation cost to and from the utility company.

Disadvantages of Telephone Banking :-

1. First time users may find the system slightly difficult to use.
2. Instead of a receipt you will receive a transaction reference number as proof that the payment was made.

Condition & Regulation:

To use or take the benefits of telephone banking the common condition & Regulation are:

a. Customer must first register with the institution for the service
b. Set up some password for customer verification.
c. Process of Servicing: To access telephone banking,
d. The customer would call the special phone number set up by the financial institution
e. Enter on the keypad the customer number and password.
f. There could be more steps for security and or automated systems to secure customer accounts or specific question to answer pre-determined by customer.

II) Internet Banking:-

Internet banking involves use of internet for delivery of banking products and services. Banking is no longer confined to the branches where one has to approach the branch in person, to withdraw cash or deposits a cheque or request a statement of accounts. In internet banking, any inquiry or transaction is processed online without any reference to the branch (anywhere banking) at any time. Online banking (or Internet banking) allows customers of a financial institution to conduct financial transactions on a secure website operated by the institution, which can be a retail or virtual bank, credit union or society. It may include of any transactions related to online usage.

Advantages of Internet Banking :-

Internet Banking has several advantages over traditional one which makes operating an account simple and convenient. It allows you to conduct various transactions using the bank's website and offers several advantages. Some of the advantages of internet banking are:

1) Online account is simple to open and easy to operate.
2) It is quite convenient as you can easily pay your bills, can transfer funds between accounts, etc. Now you do not have to stand in a queue to pay off your bills; also you do not have to keep receipts of all the bills as you can now easily view your transactions.
3) It is available all the time, i.e. 24x7. You can perform your tasks from anywhere and at any time; even in night when the bank is closed or on holidays. The only thing you need to have is an active internet connection.
4) It is fast and efficient. Funds get transferred from one account to the other very fast. You can also manage several accounts easily through internet banking.
5) Through Internet banking, you can keep an eye on your transactions and account balance all the time. This facility also keeps your account safe. This means that by the ease of monitoring your account at anytime, you can get to know about any fraudulent activity or threat to your account before it can pose your account to severe damage.
6) It also acts as a great medium for the banks to endorse their products and services. The services include loans, investment options, and many others.

Disadvantages of Internet Banking:-

Though there are many advantages of internet banking, but nothing comes without disadvantages and everything has its pros and cons; same is with internet banking. It also has some disadvantages which must be taken care of. The disadvantages of online banking include the following:

1) Understanding the usage of internet banking might be difficult for a beginner at the first go. Though there are some sites which offer a demo on how to access online accounts, but not all banks offer this facility. So, a person who is new, might face some difficulty.

2) You cannot have access to online banking if you don't have an internet connection; thus without the availability of internet access, it may not be useful.

3) Security of transactions is a big issue. Your account information might get hacked by unauthorized people over the internet.

4) Password security is a must. After receiving your password, do change it and memorize it otherwise your account may be misused by someone who gets to know your password inadvertently.

5) You cannot use it, in case, the bank's server is down.

6) Another issue is that sometimes it becomes difficult to note whether your transaction was successful or not. It may be due to the loss of net connectivity in between, or due to a slow connection, or the bank's server is down.

Brief Timeline of Establishment & Development

Time	Description
'80s	Start of The precursor for modern home online banking services
'80s_Late	online became popular
1981	Online services started in New York; Citibank, Manhattan, Chemical and Manufacturers Hanover offered home banking services using the VIDEOTEX system.; Commercial failure of VIDEOTEX, make e-banking unpopular UK started the use of the Prestel system for online system
1983	Bank of Scotland started online services for customers of theNottingham Building Society (NBS)
1992-93	First ATM point set up by Grind lays bank in Bangladesh.
1994	Stanford Federal Credit Union was the first financial institution to offer online internet banking services to all of its members First Online Bank in Bangladesh
1995	First Pure online banking started by Standard Chartered Bank in Bangladesh. HSBC, Citi Crop, Credit Agricole and Hanvit Bank Limited are pioneer of online bank in Bangladesh Now more than 40 banks out of 53 banks in Bangladesh are under Electronic Banking.

Condition & Regulation:

To access a financial institution's online banking facility:

a) Personal Computer or Online Banking Services Compatible Handset

b) Personal Internet access

c) Registration with the institution for the service,

d) Set up some password for customer verification.

e) Process: To access online banking,

f) Enter financial institution's website,

g) Enter the online banking facility using the customer number and password.

h) There may be additional security steps for access

III) Mobile Banking:-

Mobile banking (also known as M-Banking) is a term used for performing balance checks, account transactions, payments, credit applications and other banking transactions through a mobile device such as mobile or Personal Digital Assistant (PDA).

A new revolution in the realm of e-banking is the emergence of mobile banking. On-line banking is now moving to the mobile world, giving everybody with a mobile phone access to real-time banking services, regardless of their location. It provides a new way to pick up information and interact with the banks to carry out the relevant banking business. The potential of mobile banking is limitless and is expected to be a big success. Booking and paying for travel and even tickets is also expected to be a growth area. This is a very flexible way of transacting banking business.

SMS banking is a type of mobile banking, a technology-enabled service offering from banks to its customers, permitting them to operate selected banking services over their mobile phones using SMS messaging.

Advantages of Mobile Banking :-

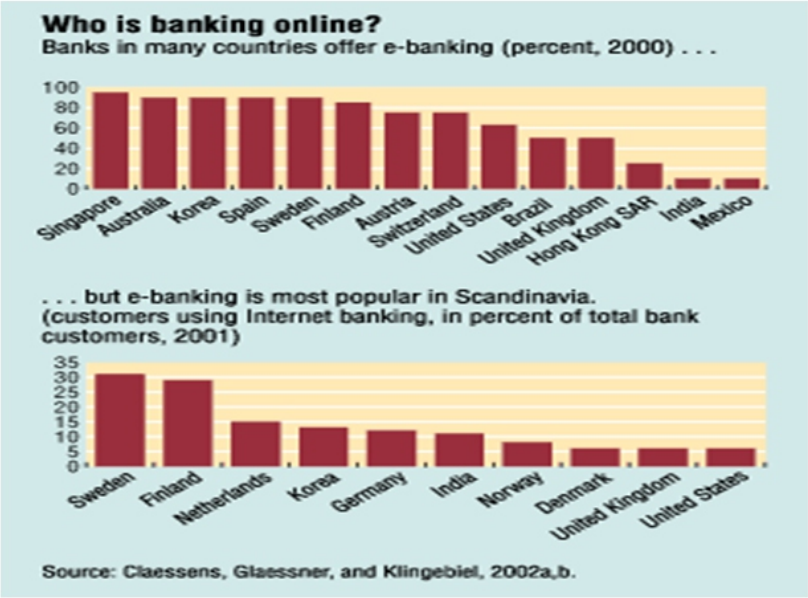
1) **Anytime Banking:** Mobile Banking gives you the privilege of anytime and anywhere banking. One can do most of the banking transaction after banking hours from anywhere, irrespective of whether you are traveling in bus or auto. Whereas this ease will not be possible if you are connected to a PC or Lap top, especially when traveling.
2) **Mobile Banking is Free:** The service provided by bank is free of charge, there is no limit for number of times you can access your account. Various banking services provided include Account Balance Inquiry , Credit/Debit Alerts, Bill Payment Alerts, Transaction History, Fund Transfer Facilities, Minimum Balance Alerts etc. can be accessed from your mobile. You can transfer money instantly to another account in the same bank using mobile banking.
3) **Secure Banking:** Some banks assure that, by downloading the app directly from the server, the data wont be stored in your mobile as well as SIM card. The app comes with advanced encryption technologies making it safe and secure as Internet Banking.

Disadvantages of Mobile Banking:-

1) To make maximum benefit of mobile banking one should have smart phone.
2) Some banks have specific software for specific mobile such as iphone and Blackberry people should download different apps based on the smart phone they own.
3) You must also update your anti-virus on the mobile if you are a frequent user of mobile banking. Many experts believe that mobile banking is more secure then internet banking as very few virus or Trojans can exist in phone. However, that does not mean that they are immune to any kind of threats.. There are also very limited anti -virus software options for mobile devices.

Growing Trends in Electronic Banking

Internet banking is gaining ground. Banks increasingly operate websites through which customers are able not only to inquire about account balances and interest and exchange rates but also to conduct a range of transactions. Unfortunately, data on Internet banking are scarce, and differences in definitions make cross-country comparisons difficult. Even so, one finds that Internet banking is particularly widespread in Austria, Korea, the Scandinavian countries, Singapore, Spain, and Switzerland, where more than 75 percent of all banks offer such services (see chart). The Scandinavian countries have the largest number of Internet users, with up to one-third of bank customers in Finland and Sweden taking advantage of e-banking.



In the United States, Internet banking is still concentrated in the largest banks. In mid-2001, 44 percent of national banks maintained transactional websites, almost double the number in the third quarter of 1999. These banks account for over 90 percent of national banking system assets. The larger banks tend to offer a wider array of electronic banking services, including loan applications and brokerage services. While most U.S. consumers have accounts with banks that offer Internet services, only about 6 percent of them use these services.

To date, most banks have combined the new electronic delivery channels with traditional brick and mortar branches ("brick and click" banks), but a small number have emerged that offer their products and services predominantly, or only, through electronic distribution channels. These "virtual" or Internet-only banks do not have a branch network but might have a physical presence, for example, an administrative office or non branch facilities like kiosks or automatic teller machines. The United States has about 30 virtual banks; Asia has 2, launched in 2000 and 2001; and the European Union has several—either as separately licensed entities or as subsidiaries or branches of brick and mortar banks.

CONCLUSION :-

While electronic banking can provide a number of benefits for customers and new business opportunities for banks, it exacerbates traditional banking risks. Even though considerable work has been done in some countries in adapting banking and supervision regulations, continuous vigilance and revisions will be essential as the scope of e-banking increases.

E-Banking Enable Better Business Anywhere, Anytime. E-Banking represents a tremendous opportunity in India. The main aim of e-banking is to making transactions through online poses and make costumer more beneficial.

The strategy of bank is to provide value added services and products to the customers, Utilizing the internet extensively. However, Factors such as illiteracy in India, availability of cheaper labor force, reluctance to change by the existing staff of banks and slow growth of technology in India are responsible for slow growth of e-banking in India.

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