http://ansinet.com/itj

ITJ

ISSN 1812-5638

INFORMATION TECHNOLOGY JOURNAL

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Information Technology Journal 13 (12): 2057-2060, 2014
ISSN 1812-5638 / DOI: 10.3923/itj.2014.2057.2060

FPGA Based OM Analysis of User Authentication

[1]N. Bharathi, [2]G.R. Brindha, [2]B. Santhi and [3]P. Neelamegam
[1]Department of Computer Science, School of Computing,
SASTRA University, Thanjavur, Tamil Nadu, India
[2]Department of Information Communication and Technology,
School of Computing, SASTRA University, Thanjavur, Tamil Nadu, India
[3]Department of Electronics and Instrumentation, School of EEE,
SASTRA University, Thanjavur, Tamil Nadu, India

Abstract: Nowadays inter-disciplinary research studies are emerging rapidly to improve the effective usage of individual domains. This study integrates User Authentication, Opinion Mining (OM) and Field programmable Gate Array (FPGA). It is a good practice for any organization to get the opinion of their employees before implementing a new mechanism. This study deals about getting opinions from employees about a variety of entry and exit securities and processing to have decision support information. The user satisfaction opinions and organization's affordability are analyzed for obtaining better authentication mechanism to prevent unauthorized entries. Since opinion mining process involves processing of large corpus, the objective of this study is to combine FPGA and thereby increasing the efficiency and performance of the system speed.

Key words: User authentication, opinion mining, FPGA, dynamic reconfiguration

INTRODUCTION

The Internet is growing at shocking rate in size and in mixture of services and substances offered. Each user is accessing huge quantity of new data, which should be protected from unauthorized access. Secure utilization of these data is becoming a big issue, since many of the researchers working on these data by user authentication, unauthorized access still exists (Madhusudhan and Mittal, 2012). An identity is set of features associated with an individual in order to uniquely identify from rest of the world. When anyone needs to access a valuable resource, a digital identity is examined to approve the source of the request. This mechanism is termed as authentication. Among many user authentication mechanisms, Iris recognition, Face recognition, Fingerprint, Hand geometry and Voice recognition are chosen for this work.

Iris recognition is one of the user authentication mechanisms and is reliable biometric methods which received increasing attention in recent years. Iris can obtain high accuracy due to the rich texture of iris patterns (Mohammed *et al*., 2009). Applications like automatic entry systems, criminal identification in public security systems, credit card verification, Human-machine interface systems and so on, needs face recognition as their user authentication (Wang and Li, 2011). Fingerprint authentication is one among the mainly used biometric mechanisms with a range of government applications. Fingerprint matching is frequently affected by low quality fingerprints and distortions in the acquisition process (Uz *et al*., 2009). In Hand geometry, the image of the hand can be captured in a user friendly way by using conventional CCD cameras and this mechanism is followed by the users with most satisfaction in daily life because it has less association to forensic applications (Amayeh *et al*., 2009).

No two individuals have similar sounds because their vocal cords, vocal tract, larynx and other sound production parts are different. Voice recognition is also biometric user authentication mechanism that refers to the task of identifying persons from their vocal speech (Sarkar and Saha, 2010; Soupionis and Gritzalis, 2010). To determine better authentication mechanism, user opinions are one of the necessary key features (Efron, 2006). From the word 'Opinion Mining' the process of research can be cleared, analyzing the reviews about a system, product or even a person and extracting the quantitative and qualitative data which aids improving the mechanism (Prasannakumari, 2010; Brindha and Santhi, 2012).

This proposed architecture gives the above idea and resolving the issue of large data processing by integrating FPGA in its architecture. General microprocessors are good for normal applications, which have greater I/O to

Corresponding Author: N. Bharathi, Department of Computer Science, School of Computing, SASTRA University, Thanjavur, Tamil Nadu, India

CPU ratio. If the processors were executing only a particular application, then dedicated chip will be better than general microprocessors (Bharathi and Neelamegam, 2011). Application Specific Integrated Circuits (ASIC) can come under this category, but the issue is, ASIC chip is configured at the fabrication site itself. So the end-user cannot reconfigure the chip. FPGA comes into play at the above scenario in order to take the advantage of both cases, such as any kind of application can be configured by the end user (Zerigui *et al*., 2008). FPGA is generally faster for computation intensive applications than general-purpose microprocessors (Du Yatao *et al*., 2010). In this work, the entire opinion mining system is fastened through reconfiguring of required processing. Thus the opinion mining of user authentication mechanism is supported by FPGA to improve the response time.

ARCHITECTURE FRAMEWORK

The proposed framework shown in Fig. 1 includes User Authentication mechanisms, Opinion Mining and FPGA as major components. User authentication mechanisms considered are Finger print, Hand Geometry, Iris scan, Voice Recognition and Face recognition. The opinion mining application accesses the storage, preprocess that information, analyze and finally provides information about optimum mechanism. FPGA is used to reduce response time in which the services are configured as hardware blocks. The hardware includes any one of the blocks such as storage, preprocessing, (Zerigui *et al*., 2008) and classification. Opinion mining system without FPGA is implemented in Matlab 10 under Core 2 Duo processor with frequency 2.10 GHz. The system with FPGA is simulated in Xilinx 9.2 with same platform.

User authentication phase: The users of an organization are asked to carry out one of the user authentication mechanisms that this system is supported. After 10 days they are asked to change the authentication mechanism to another one. This is repeated until all the users are authenticated under different authentication mechanism that this system support. Finally their opinions about the user friendliness, accuracy are collected and stored.

Opinion mining application phase: In this module a corpus with 300 reviews about a security mechanism that had been taken as data set. Raw reviews are taken directly from the organization corpus that contains opinions about five different types of security measurements. Then the reviews are being feed to the pre process where symbols, phrases and words are normalized using stemming, case folding, pruning stop-words etc. Now the fine tuned word vector is given as input to train classifier. After additional filters like tagger and shallow parser, testing makes the entire matrix robust to be an input for classifier such as NB-Naïve Baise or SVM-Support Vector Machine etc., In sentiment lexicon process, ranking, negation detection and sentiment orientation are being done. After this, Summarized report is prepared and then based on review words ranking is posted and calculated in terms acceptability percentage.

The proposed algorithm used in this study is given below. Procedure:

- **Step 1:** Set review-corpus as primary input
- **Step 2:** Preprocess (NLP Tools)
- **Step 3:** Tokenization
- **Step 4:** Lemmatization
- **Step 5:** Stop word removal
- **Step 6:** Ranking process

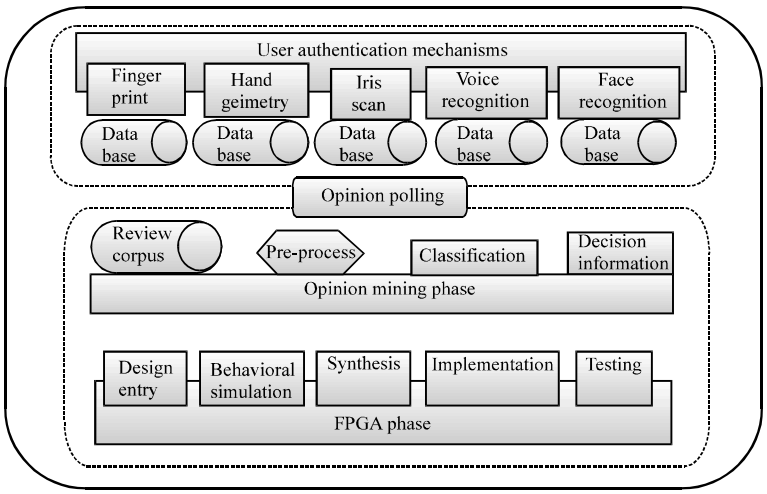

Fig. 1: User authentication, opinion mining and FPGA integrated architecture

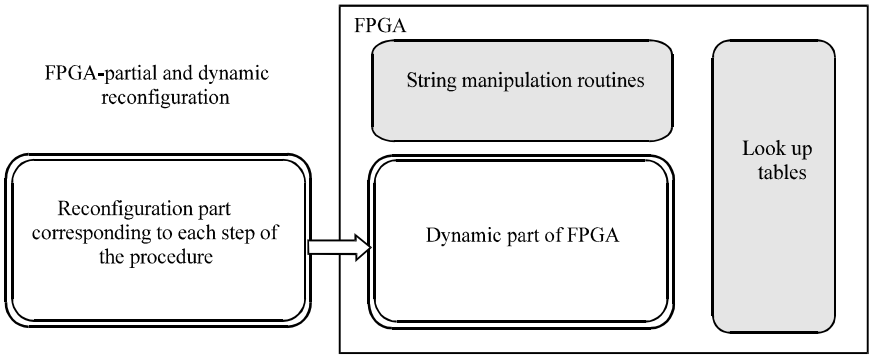

Fig. 2: FPGA reconfiguration structure

- **Step 7:** Classification
- **Step 8:** Summarized Information Display
- **Step 9:** Quantified Display

FPGA phase: The steps in the above procedure are implemented in verilog. Each step is configured as and when it is needed. Reconfiguration is performed when switching from one step to next step. The FPGA can be divided into static and dynamic part. Static part contains the circuits needed for entire process such as look up tables, string manipulations etc. Dynamic part contains the configurations specific to that particular step. The reconfiguration is done partially to the dynamic part alone. The static part is still executed when reconfiguration of dynamic part takes place. Figure 2 shows the reconfiguration structure of FPGA.

RESULTS AND DISCUSSION

To validate the proposed algorithm in terms of its performance based on response time, a corpus contains user authentication review of 300 data from an organization and its users are taken. Using opinion mining with the effective basement of FPGA architecture, a complete decision support system to analyze user authentication mechanism is implemented, which gives the suggestion that the review of particular authentication is 'Best'.

The user satisfaction about the authentication mechanisms considered in this work is shown in Fig. 3. From the user reviews and with opinion mining phase, a scale of five values is generated to form out the user satisfaction graph. The values are Best, Better, Good, Acceptable and Less agreeable.

The organization views the Authentication mechanism in terms of deployment cost and the accuracy of the mechanism. From the organization perspective

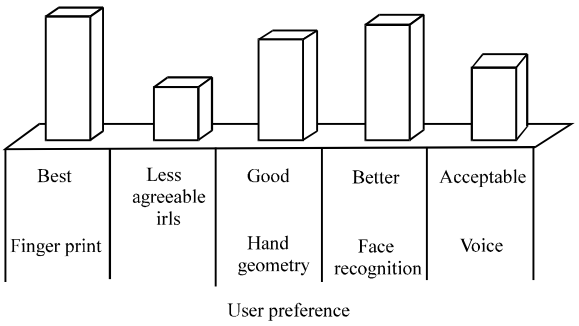

Fig. 3: User satisfaction among user authentication mechanisms tested

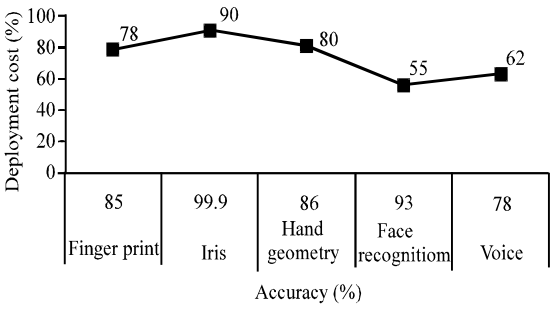

Fig. 4: Optimized user authentication analysis using deployment cost (%) and Accuracy (%)

deployment cost should be less and accuracy should be more. Figure 4 depicts the graph plotted with deployment cost versus accuracy. In that face recognition is having less deployment cost and more accuracy compared to others. In Fig. 3, it is proved that the users also feel comfort with face recognition. Hence Face recognition is an optimized authentication mechanism according to this work.

Opinion mining involves preprocessing, feature extraction, classification and ranking. Those steps are

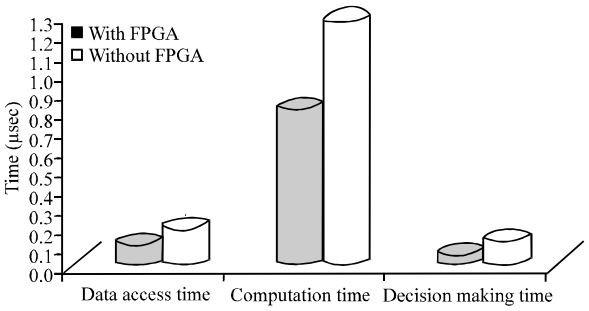

Fig. 5: Time comparison for opinion mining phase: with and without FPGA

executed without FPGA and with FPGA. The data access time, computation time and decision making time for both with FPGA and without FPGA is observed. The time in micro seconds for each processing is measured and plotted in the graph as shown in Fig. 5. Through this study, the function of FPGA, i.e., the improvement of system response time is proved.

CONCLUSION

The proposed ensemble architecture includes three different domains namely user authentication, opinion mining and FPGA. When different domains are integrated, the strength of the entire system and its effective performance can be enhanced is clearly proved in this study. The architecture depicts opinion mining computation and authentication mechanisms clearly with FPGA configuration. The results and discussions part explains the comparative analysis of individual and combination of domains. Though there are many research articles are available on user authentication, mining sentimental reviews and FPGA incorporation, separately, none of them focus on integrating these three areas. In future the readers can develop any such architecture which can be used for customer support and firm support. Besides, if the corpus is a personalized one and needs authorized access, security policies can also be included.

REFERENCES

Amayeh, G., G. Bebis, A. Erol and M. Nicolescu, 2009. Hand-based verification and identification using palm-finger segmentation and fusion. Comput. Vision Image Understand., 113: 477-501.

Bharathi, N. and P. Neelamegam, 2011. FPGA based linear heating system for measurement of thermolumine scence. Meas. Sci. Rev., 11: 207-209.

Brindha, G.R. and B. Santhi, 2012. A novel opinion mining technique for product review based on preferences. Res. J. Applied Sci. Eng. Technol., 4: 5084-5088.

Du Yatao, Z. Zhi, Z. Hailong, G. Fang, R. Guanghui and L. Shulei, 2010. Improved decoding algorithm for BCH code. Inform. Technol. J., 9: 1251-1254.

Efron, M., 2006. Using cocitation information to estimate political orientation in web documents. Knowledge Inform. Syst., 9: 492-511.

Madhusudhan, R. and R.C. Mittal, 2012. Dynamic ID-based remote user password authentication schemes using smart cards: A review. J. Network Comput. Appl., 35: 1235-1248.

Mohammed, G.J., H.B. Rong and A. Al-Kazzaz, 2009. A new localization algorithm for iris recognition. Inform. Technol. J., 8: 226-230.

Prasannakumari, V., 2010. Contextual information retrieval for multi-media databases with learning by feedback using vector space model. Asian J. Inform. Manage., 4: 12-18.

Sarkar, G. and G. Saha, 2010. Real time implementation of speaker identification system with frame picking algorithm. Procedia Comput. Sci., 2: 173-180.

Soupionis, Y. and D. Gritzalis, 2010. Audio CAPTCHA: Existing solutions assessment and a new implementation for VoIP telephony. Comput. Secur., 29: 603-618.

Uz, T., G. Bebis, A. Erol and S. Prabhakar, 2009. Minutiae-based template synthesis and matching for fingerprint authentication. Comput. Vision Image Understand., 113: 979-992.

Wang, Z. and S. Li, 2011. Face recognition using skin color segmentation and template matching algorithms. Inf. Technol. J., 10: 2308-2314.

Zerigui, A., X. Wu and Z.Q. Deng, 2008. Communication of mobile rover based on FPGA, DSP and wireless communication. Inform. Technol. J., 7: 374-377.