

IMPLEMENTATION OF INTELLIGENT IMAGING TECHNOLOGY AS A PREVENTION OF TERRORISM IN THE BUSINESS SECTOR I N THE 21ST CENTURY USING COMPUTER VISION & VIOLA JO NES ALGORITHM WITH SVM (SUPPORT VECTOR MACHINE) METHOD

^a Bob Foster, ^b Muhamad Deni Johansyah

^a Business and Economics Faculty, University of Informatics and Business Indonesia, Soekarno-Hatta
No.643, Sukapura, Kiaracondong, Bandung City, West Java 40285

^b Departemen Matematika, Fakultas MIPA, Universitas Padjajaran, Jalan Raya Bandung Sumedang Km
21, Hegarmanah, Kec. Jatinangor, Kabupaten Sumedang, Jawa Barat 45361

E-mail: bobriset@unibi.ac.id

Abstract

Terrorism is a very dangerous thing and has become a threat both on a national and international scale, the nation of terrorism itself is an attempt to instill the seeds of hostility against a government group and the state, before entering the 21st century terror attacks are still nature and physical in the business sector, this sector was chosen because it had effect and large losses and made the country's economy unstable. As a precautionary measure by registering the identities of visitors to tourist attractions, identity retrieved from KTP (Resident Card) data, Driver licence, PASSPORT and other identifying identities, prevention of terrorist attacks is by using by the installation of surveillance cameras or CCTV , where every data of people entering a tourist area or business sector will be recorded properly without having to do with manual check. The recognition method using vision techniques with the Viola-Jones algorithm, this algorithm have high accuracy until 98 % in recognizing one's face, while actors are camouflaged by changing their physical appearance the system able to identified using the template matching algorithm (SVM Algorithm), this combination of algorithms is able to recognize self-identity and can increase the level of security and supervision of an the business sector in general is getting better

Key words: Terrorism, Computer vision, Intelligent Imaging, Viola Jones, SVM Algorithm

INTRODUCTION

Terrorist is a picture of the problem in every country and has a negative value and connotation, this understanding of terrorism does not have clear rules and definitions visual from universal values, the meaning of terrorism is known as an act of genocide and has existed in ancient Roman historical times, where terrorist acts were carried out to spread a fear, chaos and panic, in two-decade period terrorism has risen and given a bad impact not only on security but also on the economies in the ASEAN region, example Indonesia, Thailand and Myanmar, based on that analysis of the problem, The government does not remain silent in the fight against terrorism and continues to take preventative action to measures and aimed to protecting the place and strategic place as supporting business and tourism and minimizing the impact for the national economy [1].

Research on terrorism has been conducted for a very long time from 1994 to 2017 which aims to analyze the impact and objectives of terrorism that can affect economic development, one of the issues that is very influential is the issue of investment, especially from foreign country, terrorism attacks will be affected to economic stability so that an appropriate prevention process and mechanism is needed. [2]

Terrorism attacks had shaken Europe with an attack on the city of Paris in January 2015 which attacked the police headquarters, from then on terrorism has certainly reached the European Union, based on previous data terrorism attacks have more than 300 people throughout Europe and some country have argued that terrorism attacks could have happened because of a wave of migration that tried to enter Europe which was infiltrated by terrorists [3].

The terrorism attack itself has a huge impact on the tourism sector and business, this has been discussed by the European Union countries which declare a plan to carry out a program to improve and control terrorist attacks that affect the arrival of tourists in very large numbers, terrorism attacks are generally aimed at tourist destinations countries [4].

Terrorism attacks are currently not limited in space and time and move clandestinely and organized with different types of attacks, so it needs to be done with computer engineering technique, one of the technologies used is using artificial intelligence methods, this method can read and recognize data taken by collecting on a device then analyzed and monitored [5].

In the past few years this artificial technology has been able to collect and analyze data with an algorithm system with the help of computerized techniques, advancing technology has become a major key and industry, especially in European countries, so that a supporting infrastructure is made and European countries in terms of security business, with the help of computerization will become more secure, especially in the areas of agriculture and transportation so that the rotation in the economic field increases [6].

THEORETICAL BASIS

1. Information and Technology

The development of information technology has developed very rapidly over the past two decades and has been a change in IT development and progress, advancing data transmission lines and data storage capacity data becoming more mobile or easy to use and integrated, on a broader scale IT development must be balanced with the addition of features that support data security, while good and bad data security support depends on economic conditions and computer networks or infrastructure used. the infrastructure equipped with IT security networks to target of attacks where the issue of international terrorist networks, where international terrorism networks have become global issues and challenges, phenomena become a major factor in the use of more advanced IT technologies which will later be used as decision-making tools and ensure state security [6].

2. Terrorism

A concept of counter terrorism has just begun to be developed with the help of computers that have evolved to become smart or better known as artificial intelligence. AI brings significant

changes to the security and intelligence fields, AI can be used to read and monitor very large amounts of data, but AI itself takes a number of debates on several countries to the analysis for implementation. AI technology should be applied regularly and on a large scale, needs to be considered by not eliminating values and privacy and requiring community to be accepted and implemented [7].

Computer technology has a significant role and value that can be used as a tool for counter terrorism activities, even computers have an ability to make model a terrorist attack that will rise again, attack terrorism is divided into several parts: terrorists who operate individually and in groups, for example suicide bomb attacks using remote control and the last is terrorism attacks using weapons the purpose of damaging and killing, all physical objects such as vehicles, publicity the people and weapons that exist and environment around us will material and can be used as a weapon with different types of attacks, while the use of computer technology to predict an attack now feels able to help the field of security and intelligence in reading and predicting when an attack will come again [8].

3. Deep machine learning

Deep learning plays an important role for the analysis and prediction of a data process, some of the deep learning applications itself can be used to identification: voice recognition, images recognition and others, this machine learning becomes an interesting method and able to in various fields for classify an object such as object detection for disease identification and machine learning algorithm has a high accuracy value with accuracy above 70.5% [9].

Authentication technology or the recognition is unique patterns of the characteristics of our own body and become a security system is a unique and difficult way to hack, this technology is widely implemented in the field of biometric identification system security, currently can be add fingerprint identification, iris recognition, finger vein, face detection, voice identification and surface shape identification of the hand, our own body has a unique shape and characteristics,

the unique data is read by a device which will become an information, biometric data is currently divided into two parts namely physical characteristics and behavioral characteristics, this identification is used for changes in body shape that will not change much as in the eye, fingerprints and eye retina, while the biometric is specific to the identification of the body shape can changes like sound or a signature, the biggest advantage use of this biometric data is able to improve a security system, for example fingerprint data and the shape of a person's face cannot be stolen or replaced, for example, Irish recognition technology, this technology is the most widely used and security system that cannot be eliminated and engineered through and record use camera or the video is then processed using the image processing algorithm using the wavelet method [10].

While the safest biometric technology is use face recognition data, where this security system has two part: verification and identification, which means that face data will be identified and verified by comparing existing data in the database, face data itself is very complicated for identified by a computer, several studies have developed a face identification system with variations in the position of the angle of the face and from different distances [11].

4. Image Processing

Another challenge of using face recognition is how an algorithm or device can be used to identify and recognize areas of the face with different conditions and facial conditions, face detection taken in realtime has several disadvantages such as blurred or clear shots and due to weather conditions and camera placement, the image data is then re-sharpened using the machine learning method so that the image taken before it is identification and verified [12].

Machine learning will have a high accuracy value combined with cnn (convolutional neural network) algorithm, while image processing techniques are also widely used to detect images from medical data, where the readable data

images will be divided into several partitions [13].

5. Computer Vision

For decades several years face recognition method plays an important role for biometry identification, biometric data it self is a process to match a data pattern recognition with a data base that contains a lot of data, biometric data can now be used to secure additional data passwords or PINs credit card or token from an ATM machine with generally a person's biometric data cannot be destroyed or lost [14].

Face detection technology itself is very attached to a security system and support many applications, currently has been developed or better known as smart environment, while identification systems are usually used in an area or a security system work with individual, basically every movement will translate into information that is recorded systematically through a video camera that is used as a tool to improve security [15].

The use of face recognition technology is generally used to speed up and simplify an activity in our daily activities, so that many applications are made and connected to the security system that connects with the outside world, for example we can find out the person is lying or not through changes in the look on one's face that will be easily read and recognized by the algorithm method [16].

Face recognition technology is divided into a number of broader areas including eyes, nose and mouth, identification of that area can read an image change seen through changes in pixel, the algorithm used is pca algorithm and has a level and accuracy of reading more data high up to 95,211% [17].

6. Add boost Algorithm

The method used for face detection systems is addboost algorithm but not all algorithms have the same accuracy and reading level of data, as one example of the algorithm used to process data is support vector machine (svm), this algorithm is suitable for most applications addboost will combine the workings of an object and then classify the data ($h_i(x)$) and the value

of $h_i(x)$ as a representation of the classification value, the second stage is the use of training data that will be used as a sample and each data sample has a weighting value different data - addboost different algorithms will calculate the data by weighting the values carried out in single file.

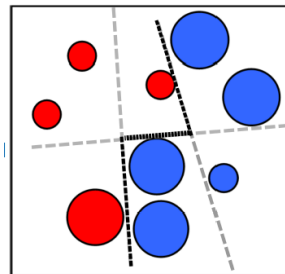


Fig 1. SVM classification method on a face detection system

The Add boost algorithm itself has been introduced since 1995, this algorithm works is to take a data input with pixel values with parameter values $(x_1, y_1), \dots, (x_m, y_m)$, for example, value (x_i) is classified as legal or broad value and value (y_i) as an object class, it is assumed we have the pixel value of an object with the value $Y = \{-1, 1\}$. The concept of how the algorithm works is to use a probability theory of weighting data stored on a data training, this stage is known as the weighting process linear with the value $t = 1, \dots, T$, each data blocking will be distributed and modified according to the classification requirements [18]

$$\varepsilon_t = \sum_{i=1}^I \text{weight}(h_t(i)) \begin{cases} \text{if } (h_t(i) \neq y_i) \\ \text{else}(0) \end{cases}$$

On the classification value that has a smaller value will be attributed to the classification value $h_t = x \rightarrow \{1, +1\}$, the function is used to minimize errors in data distribution and reading.

7. Viola Jones Algorithm

Face detection system using viola jones algorithm began to be developed since 2001, this algorithm has fast in reading an object and is often combined with addboost and machine learning methods, stages of the viola jones algorithm include: reading an input data image in an integral form, reading method the value of

an image by reading the pixel position and calculating it with the help of a computer the second method is a combination with an adaboost algorithm that is efficient in classifying a data and extracting an object into visual form and appearance, while using adaboost in this application must have a fast requirement in reading a data during the classification process, an application's data will can't affected by the background this technique known as the region of interest method and it is very fast to read a data if it is used in realtime

Viola jones algorithm is used to measure a pixel value symmetrically from an object that is vertically and horizontally balanced, the technique of creating a symmetry line in the viola-jones algorithm is very complex which is divided into three stages, that is the image line in the middle and the right and left of the object, for example, the line bound parameter value is Z1, Z2 and the middle of Z3, with the formula value as follows.

$$\begin{aligned} Diff_1 &= |Area(Z_1^A) - Area(Z_1^B)| \\ Diff_2 &= |Area(Z_2^A) - Area(Z_2^B)| \\ Diff_3 &= |Area(Z_3^A) - Area(Z_3^B)| \end{aligned}$$

with the value of pixel position conditions:
condition 1:

$$(Diff_1 > Threshold(Z_1))$$

condition 2 :

$$(Diff_2 > Threshold(Z_2))$$

condition 3 :

$$(Diff_3 > Threshold(Z_3))$$

Based on the picture above we can see three different classification methods, the process is used to process the threshold mode on the viola Jones algorithm, the threshold value in the second formula above shows how to read symmetrical data in an image, can be seen if the image is taken asymmetrically, the field of computer vision is still being developed today, closely related to the computer field, neuroscience and biometric data security systems, computer vision techniques are widely

used to identify someone and have reliable work methods and capability, as we know everyone has its own uniqueness or what is called the character of biometric data [19].

A face recognition system on this system will store a lot of face data, so that this system can run optimally needs to be combined with an algorithm that is suitable for identification, this face recognition method is widely used and implemented in fields, criminals, terrorists and child search cases are missing, this system is used on a global scale so identification data for someone who is used globally is also needed, the identification data can use national identification data or Personal Identification, Passport ID, and SIM (driving license) this system can be used to monitoring a country's border area automatically and real-time

The use of a face identification system with face recognition technology itself is still found several obstacles, these constraints are the object identification is unclear or blurred, and the dictated object has a change in position or head rotation that can change the point of view and slope of one's face, to overcome the problem using several combinations of algorithms, the algorithm is used to measure the symmetrical position of the position between the nose and ears, this system is combined with the temple matching technique, in 1973 a facial pattern recognition program was implemented on a computer with an accuracy of 45-75% [20].

RESEARCH METHODOLOGY

In this intelligence imaging method, the researcher uses two algorithm methods, viola Jones and SVM algorithm, Viola Jones is an algorithm that is used for face detection and has high ability and accuracy, this algorithm is able to recognize faces in an upright position facing to main camera with maximum distance between 4 to 8 meters, another combination with face recongition is combined with the adabost algorithm where this method can recognize the face area even when it is not stand on front the camera, with the addition of adabost algorithm, it is detected not only to detect vehicle objects or people who can detect running in realtime

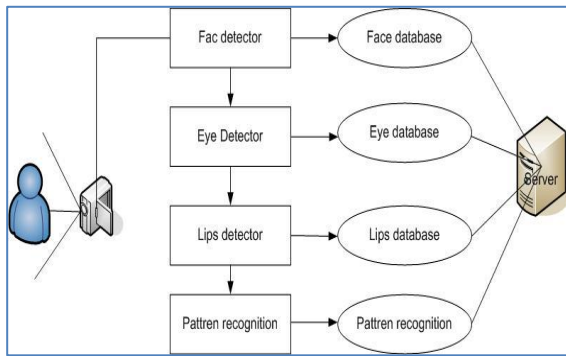


Fig 2. Imaging implementation technique requires support for hardware and software support, the system is connected to the internet network on a server, the server here functions as a data storage place

The data stored is in the form of image data from people who have been previously registered or image data is taken random. At the initial stage, face recognition algorithm is reading and recognizing a face area, the system of reading this algorithm can be realtime or read images that have been stored previously, Face data taken from an output in the form of a camera or cctv and is take randomly position and different locations will be taken only in the face, the data is then stored in the database and compared with training data on the server If there is a criminal track record, the system will give a response in the form of a warning to police officers or business owners. The second method is retrieving biometric data taken on face data, the system will automatically take features in the eye area, the data is changed and compared to the eye recognition system this system is useful if face data is not recognized by the system will be compared by the system.

The third part is the templete matching technique, this technique is used to recognize facial features that have many changes, for example the change is starting from the haircut using the lens of the glasses and clothing worn, this algorithm is able to recognize and compare it with patterns the original, the templete machine recognition pattern will be different for each person and can be implemented to recognize other objects such as vehicle types and building object.

SYSTEM IMPLEMENTATION

In system we try to test a pattern of data taken from photo objects and video cameras, input data can be taken from a CCTV camera that is spread in business centers or in government agencies.

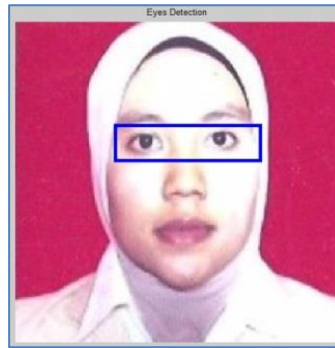


Fig 3. The process of reading eye recognition

In Figure 3 is a trial method using computer vision algorithms, test data retrieving data from images automatically separates eye objects, dataeveryone's eyes are very unique and different data is then stored on the server and converted into matrix.

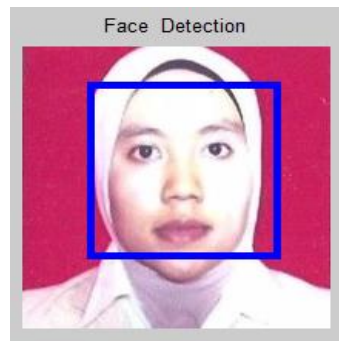


Fig 4. Face recognition code as the identity of that person

In Figure 4 is data processing using the computer vision method, introduction of features and shapes of the nose and mouth, where the data are taken has unique properties, because the smile mouth data of people and the shape of teeth the data can be used for processing forensic data. the computer will automatically scan face objects and store them in a database, this system is called the introduction of face recognition features, this system is very useful for detecting people in large numbers.

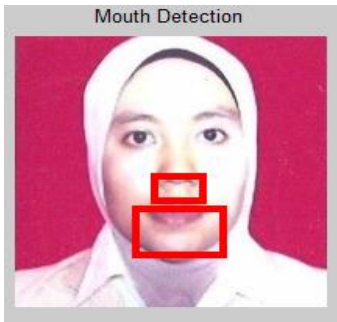


Fig 5. Nouse and outh recognition process

In Figure 5 above is a process of mouth recognition and noise recognition, this method is used to read symmetric patterns and identity of one's face, symmetrical data will be taken in the form of pixel size, where symmetrical data is entered into the biometric system and stored in the database.



Fig 6. Template and pattern matching

In Figure 6 above is processing data by taking all the features or the specific data available from the start of face shape, the color of clothing and other unique properties. Each feature will be stored on a server as someone's identity data.



Fig 7. Is the process of providing identification numbers

In Figure 7 above is the final process of testing the face detection system and selecting

patterns will produce unique data on each image object taken, face recognition will recognize the unique texture of the face, while pattern recognition will read unique change such as color or use sweaters and jackets that are worn by someone in different conditions, after complete data, we can add data marking as a differentiator of objects or photos taken by adding unique self-identity data that can use the KTP (identity number), SIM or passport, the number will appear if someone caught on camera, the system automatically raises the identity data. For example, picture 1.7 uses the KTP data ID as a unique code of the KTP with a unique number "3001992546", the code will be different for each person and depending on which ID data is used..

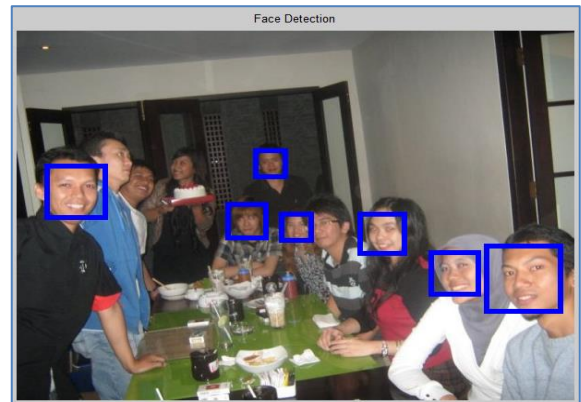


Fig 8. Pattern recognition system at Café visitors

In figure 8 is the process of implementing intelligent imaging technology in café visitors, this system will read data automatically on face features, data then unknown to visitors of the café will be directly stored in a database and converted into digital numbers in binary form.

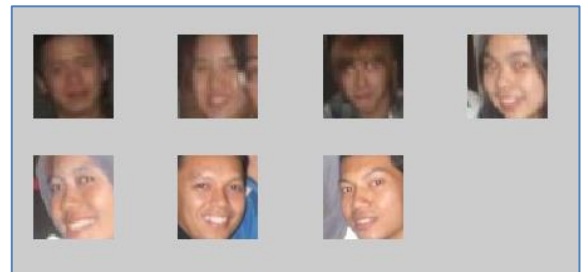


Fig 9. Pattern recognition system single file.

Imaging system will automatically retrieve on the server, the data on the server will read automatically every time the person ends at a

café or other place, people's data those who are grouped automatically will be separated and the identification process will be take out in single file.



Fig 10. Measurement of accuracy

In Figure 10 the picture above is the result of testing the classification process and image data reading which is indicated by identification card or ID Password, the application represents a person with ID 3001992546 with the results of matching face sketches reaching an accuracy of 98% and in the scenario as person indicated as a terrorist so that wherever the person goes and is caught by the security camera the identity and ID of that person will appear automatically with visual data.

Table 1. Using different identities

NO	Kode ID card	Information
1	ID 100125540	Detected
2	ID 100125541	Detected
3	PASS 3400567	Detected
...
500	ID 550025599	Detected

In table 1 test table uses different identities use a resident identification card or use password identification data with the number of dataset reaching 500 image data and using randomly retrieved data. in the test the precision recall value of 100%, the results of the rain using the testing data and training data reached 98% and the error reached 2% of the total testing.



Fig 11. Intelligence imaging testing with the ID card / SIM ID numbering feature.

In Figure 11 is a system test on people who are sitting in groups, face recognition using Viola-Jones is able to detect facial features and separate them one by one, the system then displays the data ID, retrieving the identity of the data has been stored in a database, in the picture above shows that people have a different color circle, each green circle shows people who have no problem with police or security officers and appear only with ordinary identity ID numbers, while the person sought is displayed with red marking and the system displays all self-identification data in accordance with the data stored in the database.

CONCLUSION

Intelligence imaging implementation can be implemented to improve a security system in the, this system does not replace the role of security officers, but as a tool to prevent unexpected attacks and for responsible for different data and locations. This security system will provide additional security for visitors and managers of business premises both cafes, restaurants or hotels, the system allows the occurrence of data sharing with other security system combination due to integration data with a server and the accuracy system for detection is 98 % for identify face recognition.

SUGGESTION

Suggestions for further research are the existence of a maintenance, the maintenance process both in terms of hardware or software so

that the system is used for a long time, and added security features and rapid response must be made a distributed data access system with data sharing, so the data can able to share and

related security system, so that an emergency situation will be responded to quickly by either the business manager or the security officer.

REFERENCES

- [1] E T Pratiwi1, L O D Abdullah; R Abdullah ; Wardana ; R Muhammad, "Impact of criminal act of terrorism on economy," *Earth and Environmental Science*235 (2019), 2019.
- [2] Malik Shahzad Shabbir, "Impact of Terrorism on Exclusive Indian Economy," *Journal of Indian Studies*, vol. 5, no. 1, pp. 29-45, 2019.
- [3] Mathias Humenberger, "Dynamics and root causes of recent major terrorist attacks in Europe," <https://www.researchgate.net/publication/323856159>, 2019.
- [4] Dominique Vanneste, Petronela Tudorache; Flavia Teodoroiu ; Thérèse Steenberghen, "The impact of the 2016 terrorist attacks in Brussels on tourism," *National Committee of Geography of Belgium, Société Royale Belge de Géographie*, 2017.
- [5] Sei-Youen Oh, "A Comparative Study on AI-based Anti-terror Crime System," *international Journal of Innovative Technology and Exploring Engineering (IJITEE)*ISSN: 2278-3075, vol. 8, no. 8S2, 2019.
- [6] "Artificial Intelligence -A European approach to excellence and trust," Law and Political Sciences Conferences, Brussels, 2020.
- [7] Boaz Ganor, "Artificial or Human: A New Era of Counterterrorism Intelligence?," Download citation <https://doi.org/10.1080/1057610X.2019.1568815> , 2019.
- [8] Ahmad F. Al Musawi, "Computer Science Approaches for Counterterrorism," *International Journal of Innovative Engineering and Emerging Technology (IJIEET)*, vol. 2, no. 4, pp. 19-25, 2016.
- [9] Deepa; SP.Chokkalingam, "Deep Convolutional Neural Networks (CNN) for Medical Image Analysis," *International Journal of Engineering and Advanced Technology (IJEAT)*, vol. 8, no. 3, 2019.
- [10] Sunghyuck Hong;JungsooHan; Guijung Kim, "Security Issues Related to Biometric Security," *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, vol. 6, no. 1, 2019.
- [11] Akanksha;Harjeet Singh, "Face detection and Recognition: A review," *International Conference on Advancements in Engineering & Technology (ICAET-2018)*, pp. 23-24, 2018.
- [12] Savitha , Keerthi , "Video based Face Recognition using Image Processing Techniques," *International Research Journal of Engineering and Technology (IRJET)* e-ISSN: 2395-0056, vol. 6, no. 1, 2019.
- [13] S.Sandhya; M.Senthil Kumar ; L.Karthikeyan, "A Hybrid Fusion of Multimodal Medical Images for the Enhancement of Visual Quality in Medical Diagnosis," Springer, 2019.
- [14] Shakir F. Kak; Firas Mahmood Mustafa ; Pedro Valente;, "A Review of Person Recognition Based on Face Model," *Eurasian Journal of Science & Engineering* ISSN 2414-5629 (Print), ISSN 2414-5602 (Online), vol. 4, no. 1, 2018.
- [15] Zafaruddin, G. M., ; Fadewar, D. H., "Face Recognition: A Holistic Approach Review," *International Conference on Contemporary Computing and Informatics Mysore, India: IEEE*, pp. 175-178, 2014.
- [16] Liu, Z., Lv, L., ; Yong, W., "Development of face Recognition System Based on peA and LBP for Intelligent Anti-Theft Doors," *International Conference on Computer and Communications Chengdu, China: IEEE.*, pp. 341-346, 2016.

- [17] Phaneendra, P., Ramachandran, V., & Reddy, E. S., "Human Face Detection and Recognition using PCA and DCT in HMM," *International Journal of Scientific Engineering and Technology Research*, 4(35), 7080-7085, 2015.
- [18] Alaa Tharwat, "AdaBoost classifier: an overview," *Research Gate*, p. 12, 2018.
- [19] Abdul Mohsen Abdul Hossen; Raheem Abd Alsaheb Ogl; Maitham Mahmood Ali, "Face Detection by Using OpenCV's Viola-Jones Algorithm based on coding," *Iraqi Journal of Science*, vol. 58, no. 2, pp. 735-745, 2017.
- [20] EUROPIAN COMMISSION, "REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL," EUROPIAN COMMISSION, Brussels, 2018.
- [21] Yann LeCun; Yoshua Bengio; Geoffrey Hinton, "Deep learning," *NATURE*, vol. 521, p. 436, 2015.
- [22] Umer, S., B.C.Dhara ; B.Chanda,, "Biometric recognition system for challenging faces Paper presented at the Computer Vision, Pattern Recognition," *Image Processing and Graphics (NCVPRIPG), 2015 Fifth National Conference on*, 2015.
- [23] Shah, D.H., D.J.Shah ; D.T.V.Shah,, "The Exploration of Face Recognition Techniques," *International Journal of Application or Innovation in Engg And Management (IJAIEM)*, vol. 3, no. 1, 2014.
- [24] Ahmad F. Al Musawi, "Computer Science Approaches for Counterterrorism," *International Journal of Innovative Engineering and Emerging Technology (IJIEET)*, vol. 2, no. 4, pp. 19-25, 2016.