



Low Cost and Multi-featured Surveillance Suite for Organizations

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Abstract— *The problem of huge organizations now a days is to keep eye on each and every activity done by their employees .This is not possible manually some system is required. For this from long period different system are getting developed and implemented. In this paper study of an integrated improvise real-time surveillance system is presented. This system contains mesh networked Radio Frequency Identification(RFID) location tracking and Optical Character Recognition(OCR) for observation of vehicles, along with the use of Close Circuit Television(CCTV) to monitor the inside area. This system is able to monitor complete organization with access to single administrator and, thus eliminating some drawbacks of each method.*

Keywords— *Radio Frequency Identification, Face recognition, Motion Detection, Optical Character Recognition, Multiple Component Integrator and Analyser*

I. INTRODUCTION

Active RFID can be used for a wide range of applications, such as object surveillance, tracking peoples from organization to detect suspicious activities which can prove harmful in future to the organization. Single organization like college, offices or school has number of people in working hours. Automated tracking of these people is a technological challenge, especially if immediate action needs to be taken place for any suspicious action from subject. CCTV monitoring is common way to keep watch on everyone but along with that Active RFID is new technological feature which makes us to locate specific person within minutes.

Along with Active RFID, OCR is a method by which characters in text are extracted by computer to understand them. Its application can be to keep record of all vehicles including regular and visitors. In case of crime number of things can be identified from one single name plate so we can say that OCR strongly supports for good surveillance system.

Indeed, number of system have been developed with OCR,RFID,CCTV separately but very rare or none system have been developed by integrating OCR,RFID and CCTV together. Primary issue of argument is utilising multiple security techniques in a single surveillance system can reduce the aforementioned issues and secondary issue is expensiveness of multimodal system. As a result, this paper conducted feasibility study into the topic of integration of different components which have different functioning in the field of surveillance.

II. BACK GROUND

The first thing we are going to see is Radio-frequency identification(RFID).RFID is used to transfer data in electromagnetic fields but in wireless pattern .Main purpose of RFID is to automatically identify and tracking of tags attached to objects or persons. There are different tags of which some gain energy from the interrogating radio waves and act as a passive transponder and others have a local power source like battery and their main feature is they can operate from hundreds of meters from the reader. In RFID system, there are tags or labels attached to the objects or persons to be identified. And two-way radio transmitter receivers are used called as interrogators or readers which sends signal to the tag and read response from the tag. RFID tags are of two types' active tags and passive tags. Active tags have battery on-board and passive tags don't have any battery. Passive tags use the radio energy transmitted by the reader. And this required energy power level is much stronger compared to the strength of signal to be transmitted. Therefore Active tags are better compared to passive tags in case of performance. RFID systems can be classified by the type of tag and reader. A Passive Reader Active Tag (PRAT) system has a passive reader which only receives radio signals from active tags (battery operated, transmit only). The reception range of a PRAT system reader can be adjusted from 1–2,000 feet (0–600 m)[citation needed], allowing flexibility in applications such as asset protection and supervision. An Active Reader Passive Tag (ARPT) system has an active reader, which transmits interrogator signals and also receives authentication replies from passive tags. An Active Reader Active Tag (ARAT) system uses active tags awoken with an interrogator signal from the active reader. A variation of this system could also use a Battery-Assisted Passive (BAP) tag which acts like a passive tag but has a small battery to power the tag's return reporting signal. Suppose you wanted to digitize a magazine article or a printed contract. You could spend hours retyping and then correcting misprints. Or you could convert all the required materials into digital format in few minutes using a scanner (or a digital camera) and Optical

Character Recognition software. OCR is a technology that enables you to convert different types of documents, such as scanned paper documents, PDF files or images captured by a digital camera into editable and searchable data. The exact mechanisms that allow humans to recognize objects are yet to be understood, but the three basic principles are already well known by scientists – integrity, purposefulness and adaptability (IPA). Images captured by a digital camera differ from scanned documents or image-only PDFs. They often have defects such as distortion at the edges and dimmed light, making it difficult for most OCR applications, to correctly recognize the text. There are some latest technologies like latest version of ABBYY Fine Reader which supports adaptive recognition technology specifically designed for processing camera images. It offers a range of features to improve the quality of such images, providing you with the ability to fully use the capabilities of your digital devices. Video Surveillance uses high end camera such as CCTV or IP camera. They are used with DVR to capture the video footage and store them securely.

III. EXISTING SYSTEM

There are number of video surveillance systems present in India and in other countries. Most of the systems are only video or using single security component. There are very few systems in which more than one security component has been used. Like that from India IBM’s Digital Video Surveillance system is there, this is very effective system but uses only video monitoring. Also one system for Maritime system has been seen in which OCR and RFID tags are integrated for better security of international level business. IN that tags are attached to objects and OCR is used where containers comes and goes. But if this system get improved with CCTV monitoring then this system will become more effective. With this thought we integrated this 3 very important components which can make any surveillance system more secured and effective. Also we have seen that number of systems use passive RFID tags which results in some limitations like range and every time making its entry into reader physically. Also doing this with low cost is another challenge seen with past systems which also we tried to minimize through this system.

IV. PROPOSED SCHEME

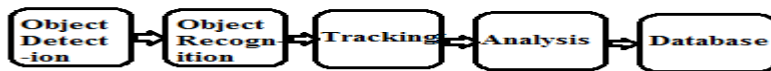


Fig. 1

A typical configuration of processing modules is shown in Fig. 1. These modules shows the low-level building blocks necessary for any distributed surveillance system. And modified one from this basic system which actually we are implementing is shown in Fig. 2.

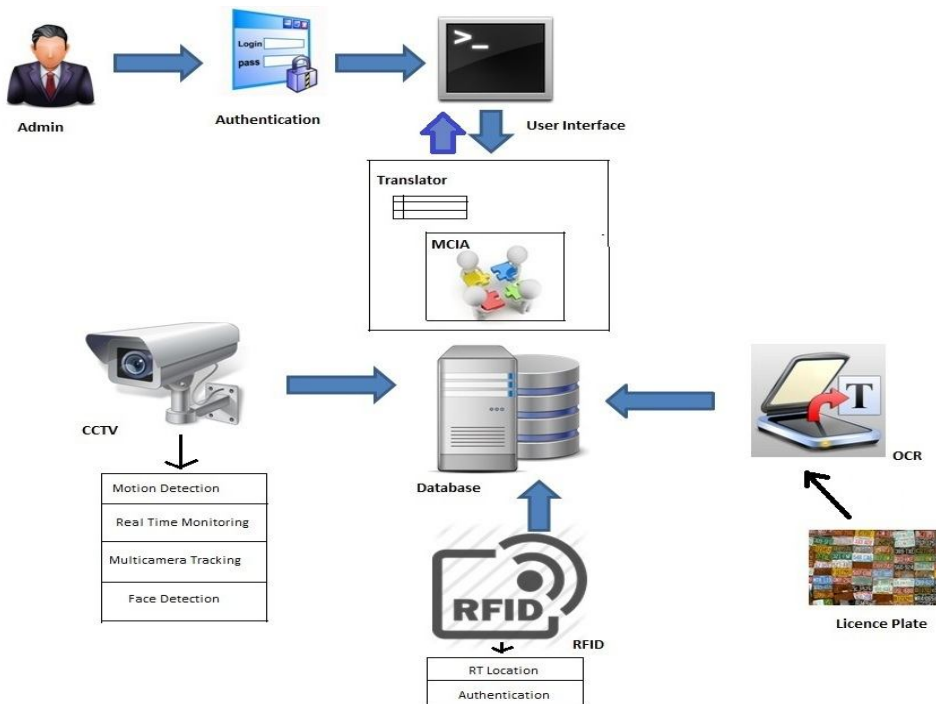


Fig.2

A. CCTV (Motion detection)

The very first step of our proposed scheme is motion detection of object or any person from the organisation. In other words we can call it as object detection. There are two conventional methods of object detection: 'temporal difference' and 'background subtraction'. The first method consists the subtraction of two consecutive frames followed by thresholding and the second method is based on subtraction of background from foreground. The first technique has good performance in dynamic environments because it is very adaptive, but it has a poor performance on extracting all the relevant object pixels. On the other hand, second technique has better performance extracting object information but it is sensitive to dynamic changes in the environment. A good background subtraction technique involves creating a suitable background model and upgrading it continuously as per requirements to avoid poor quality of result. There are different techniques to do such upgrading.

This job is implemented for motion detection means changes in motion of person that means input will be person from the set of input videos. In this first step is to give the input frames as input. Following figure is used as input. After this the next step is to subtract background from each frame and find the moving object. For all this the algorithm used here is HMIol. What is to do is first take first frame as frame folder. Then convert the image into gray scale image. Then go for second frame folder and convert second image into gray scale representation. After this take the next frame from the frames folder. And continue the above steps until all frames are processed. And after with the purpose of estimate threshold for removing the unwanted object. After estimating the threshold the next step is to perform the thresholding to remove the unwanted object. Finally the upshot is obtained. This phenomenon is illustrated in Fig.3 and Fig.4.



Fig.3

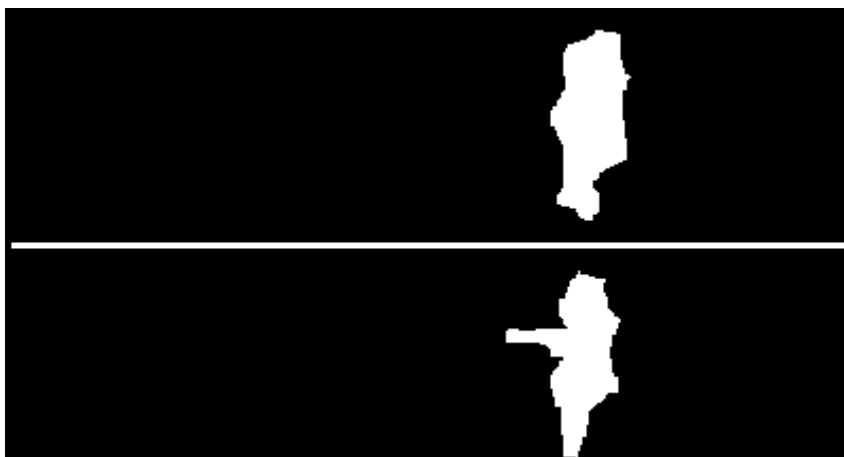


Fig.4

B. Face Recognition

Eigenfaces is the algorithm which has been used here for face detection, recognition and reconstruction. In social life face is primary focus of identification. After number of years we can recognize one's face easily compared to other organs. Therefore face is one of the important helping factor in maintaining security.

Using face for identification work is using holistic feature which include whole study of characteristic of face. Eigenface is the name given to a set of eigenvectors when they are used in human face recognition which is a problem of computer vision. The concept of eigenfaces was developed by Sirovich and Kirby and used by Matthew Turk and Alex Pentland in face classification. The eigenvectors are derived from the covariance matrix of the probability distribution over the high-dimensional vector space of face images. The eigenfaces themselves form a basis set of all images used to construct the covariance matrix. This produces dimension reduction by allowing the smaller set of basis images to represent the original training images. Classification can be achieved by comparing how faces are represented by the basis set. There are number of advantages of using eigenface. Like, the training process used for this is totally automatic and easy to code. Also statistical complexity in face image representation is reduced by eigenface. Eigenface can handle large database and once this database is calculated it can be easily used for face recognition at real time. Also there are few disadvantages of eigenface. It requires controlled environment as it is sensitive to lighting like factors. Also it has difficulty in capturing expression changes. Eigenfaces are mainly about illumination encoding, it doesn't provide required information regarding the actual face. To overcome from illumination distraction, in practice, eigenface method usually discards the first three eigenfaces from the dataset.

C. RFID

One common problem is seen as to identify set of tagged objects or persons simultaneously in an RFID network. And when there is multiple transmission from different tags towards single reader at that time signals may collide and cause problem. Therefore the modified version called Hasten Dynamic Frame Slotted ALOHA i.e. HDFSA is used here. It consider a number of transmission for one tag and therefore reduces processing time. This method preserves the accuracy of tag identification. There are few ALOHA based algorithm such as ALOHA , slotted ALOHA, frame slotted ALOHA and dynamic frame slotted ALOHA is a simple procedure with low complexity. We can say this is incrementing order of new algorithm i.e. next one is modified version of last one. ALOHA based protocol was mainly introduced to avoid the number of probability of collision by providing the time slot. The time slot given will allow the tags to transmit their ID in their preferable time which is distinct from each other. Thus, the occurrence of collision will reduce and this offer low complexity and computation. Hence, a modified version of AFSA was proposed, called Hasten Dynamic Frame Slotted ALOHA (HDFSA) which restrains the unread tag in the first reading cycle from being collided in the next reading cycle. The focus is on scheduling of the unread tags in the subsequent reading cycle. Due to reduction in collisions, the process of identification of tags will be faster and process will get in few transmissions of ID.

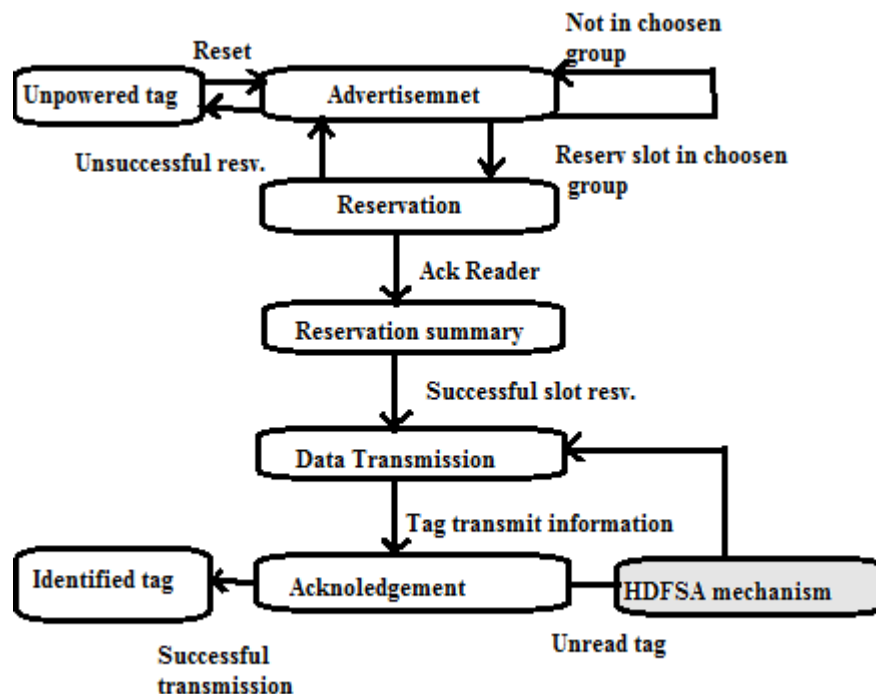


Fig.5

D. Hidden Markov model (HMM) for OCR

Actually OCR is the mechanical or electronic conversion of images of typewritten or printed text into machine-encoded text. Under this concept number of applications are seen like making Data entry for business documents,

e.g. check, passport, invoice, bank statement and receipt, Automatic number plate recognition, Automatic insurance documents key information extraction, Extracting business card information into a contact list, More quickly make textual versions of printed documents etc. Here for this system we are implementing the application as automatic number plate recognition from CCTV footage. For the purpose of OCR's this application we are using Hidden Markov Model(HMM) algorithm. This is a statistical Markov model. Here it is assumed that the system being modeled is a Markov process with unobserved (hidden) states. An HMM can be presented as the simplest dynamic Bayesian network. The mathematics behind the HMM was developed by L. E. Baum and co-workers. The state is directly visible to the observer in simpler Markov models and therefore the state transition probabilities are the only parameters. In hidden Markov model, the state is not directly visible but the output which is depend on that state is visible. The possible output tokens have probable distribution from each state because of that the sequence of tokens generated by HMM provides some information regarding the sequence of states.

Hidden Markov models are especially known for their application in temporal pattern recognition such as speech, handwriting, gesture recognition, part-of-speech tagging, musical score following, partial discharges and bioinformatics.

V. SIMULATION AND RESULT

As great deal of Image processing is used, more system resources will used up to their limit. Also the speed of the output will matter greatly. Hence in the core of application 'C++' language was used. C++ being compiled to machine code directly is faster than other languages. For Image processing 'OpenCV' framework is used, which is written entirely in C++. For creating UI we used VB.NET, but any languages can be used. As we proposed, the Surveillance system uses different modules together. Module 1 which is the CCTV captures video footage does specific functions told by system administrator. These functions include face detection, face recognition, motion detection, Object removal etc. Module 2 contains a simple database of all the people which comes under that specific organization. All of their information is stored in database. Module 3 is a active RFID system. It keeps a track of all the people wearing the tags. The RFID reader captures each tag code and calculates their position. This information is processed and we get a display of floor plan with the person active location.

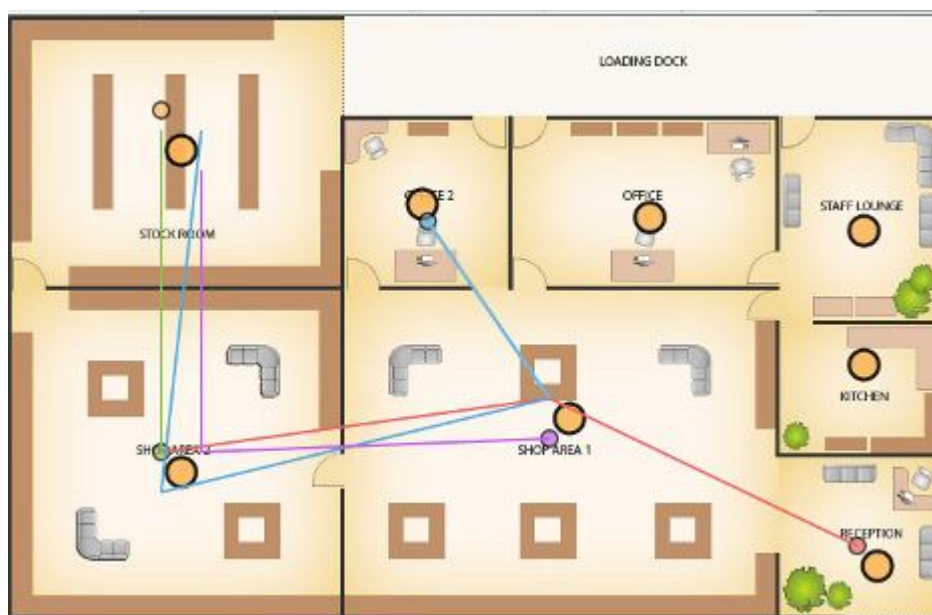


Fig.6

Now when a person is tracked by RFID, we can pull up the footage from the same location and visually locate that same person. Matching tag ID code from the database we can identify people accurately. Using different method of Surveillance together some drawbacks of each method is eliminated and overall efficiency is improved. This results in enhancement of security than that obtain from using system with only one method.

VI. CONCLUSION

This research was focused on integration of different components for making improvised surveillance system. Now a day's incidents of robbery, cyber crime are on increasing level so almost every organisation need a well structured system to secure confidential data of one's organisation. By knowing this today's need our main focus of research was on to combine different components which can help a single organisation to secure their data from all possible sides. Also using this any suspicious activities can be easily identified and one can avoid any crime. Main motto of this system is to combine different components input and give one homogeneous output from them.

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