A Client-Server Based Architecture for Intruder Detecting and Playing Safety Alarm System

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   Abstract- The current world is rapidly growing depending on Information Technology. There is a most concern able issue, which is "Security". Today's world security necessity is extremely higher and sometimes it can be very expensive. Considering the "Security" of our daily life, this paper proposes architecture for physical intruder detecting and playing safety alarm system. In our application design, there is a web cam, which is connected to a client application program. The client application program always informs the server about any kind of bugler attack. Both client and server are connected using a well-established network .i.e. LAN, MAN and WAN. The web cam behaves as sensing device. Basically, it reads the environmental object status. Then image of web cam processes by a motion detection algorithm to detect, if there's any motion or change of that object. This object motion is primary symptom of bugler attack.

   Index Terms- Motion detection, bugler attack, intruder detection, safety alarm

I. INTRODUCTION

Ensuring security by costly and important devices are very challenging job. Detecting intruder is also another challenge to stop such criminal activities. The proposed architecture only uses are regularly used devices or easily available devices and added another services to us. So, this architecture is used as a security device. A webcam or CCTV is used to observe the environments of the object to ensure security. It can be set up in a sophisticated place to enhance the security. The system uses the webcam(s) to read the environmental status and if any kind of motion of objects is detected from webcam video image then it makes an alert to inform the environmental changes to the server using LAN, WLAN, MAN, WAN, PAN, intranet, internet etc. The security enhancing policy is simple. Whenever a motion of objects is detected in any client then client will send an appropriate signal to server. Server will save the data to keep the track and at the same time server will send to all clients this message. Then all clients will play alarming sound. The architecture can be used in bank security, home security, office space or sophisticated device security.

II. LITERATURE REVIEW

2.1. Existing Work

   Considering our country, we use basically key-lock system, which is defends on mechanical technology and has no proper safety.

2.1.1 Mechanical Lock

   A lock is a mechanical fastening device which may be used on a door, vehicle, or container, restricting access to the area or enclosed property. Commonly, it can be released by using a key.

2.1.2 Keycard Lock

Fig. 1. Keycard Lock.

   A keycard lock is a lock operated by a keycard with identical dimensions to that of a credit card or driver's license. Keycard systems operate either by physically moving detainees in the locking mechanism with the insertion of the card or by reading digital data encoded on the card's magnetic strip.
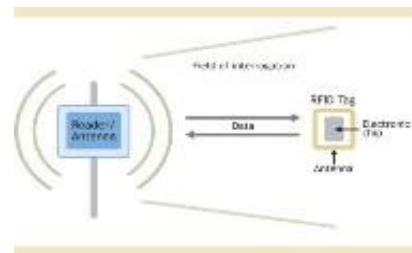
2.1.3 RFID signal

Fig. 2. RFID Signal.

   Radio-frequency identification (RFID) is the use of an object (typically referred to as an RFID tag) applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

2.1.4 Key Code

   A key code is a series of alphanumeric characters to create a key. There are two kinds of key codes: blind codes and biting codes.

2.1.5 Fingerprint

Fig. 3. Fingerprint.

A fingerprint is an impression of the friction ridges of all or any part of the finger. A friction ridge is a raised portion of the epidermis on the palmer (palm) or digits (fingers and toes) or plantar (sole) skin, consisting of one or more connected ridge units of friction ridge skin.

2.1.6 CCTV

Fig. 4. CCTV

Closed-circuit television (CCTV) is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point wireless links. CCTV is often used for surveillance in areas that may need monitoring such as banks, casinos, airports, military installations, and convenience stores. CCTV systems may operate continuously or only as required to monitor a particular event. A more advanced form of CCTV, utilizing Digital Video Recorders (DVRs), provides recording for possibly many years, with a variety of quality and performance options. It only stores some events but it cannot play alarm for bugler attack.

III. PROPOSED MODEL

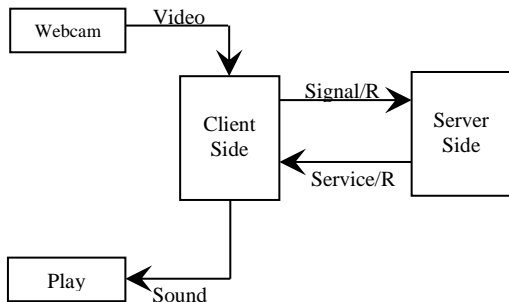The proposed architecture of intruder detection and safety alarm system modeled on figure 2.

Fig 5. Model of IDPSAS

A webcam read the environmental status as video image, which is processed by client application. Whenever any kind of motion is detected, detected motion is treated as a bugler attack, a signal is sent to server as sign of change of environment. Then server processes the signal and sends a signal to all clients to play the alarm services.

3.1 Client Application

A client is an application or system that accesses a remote service on another computer system. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await (listen to) incoming requests.

3.2 Server Application

In computing, a server [1, 2, 3, 4] is any combination of hardware or software designed to provide services to clients. When used alone, the term typically refers to a computer which may be running a server operating system, but is also used to refer to any software or dedicated hardware capable of providing services.

3.3 Internal Structure of Client-Server architecture

SZ=Sophisticated Zone
VICU=Video Image Capturing Unit
MDU=Motion Detection Unit
APU=Alarm Play Unit
SP=Sound Player

CMU=Client Managing Unit
SPvU=Service Provider Unit
SPrU=Signal Processing Unit
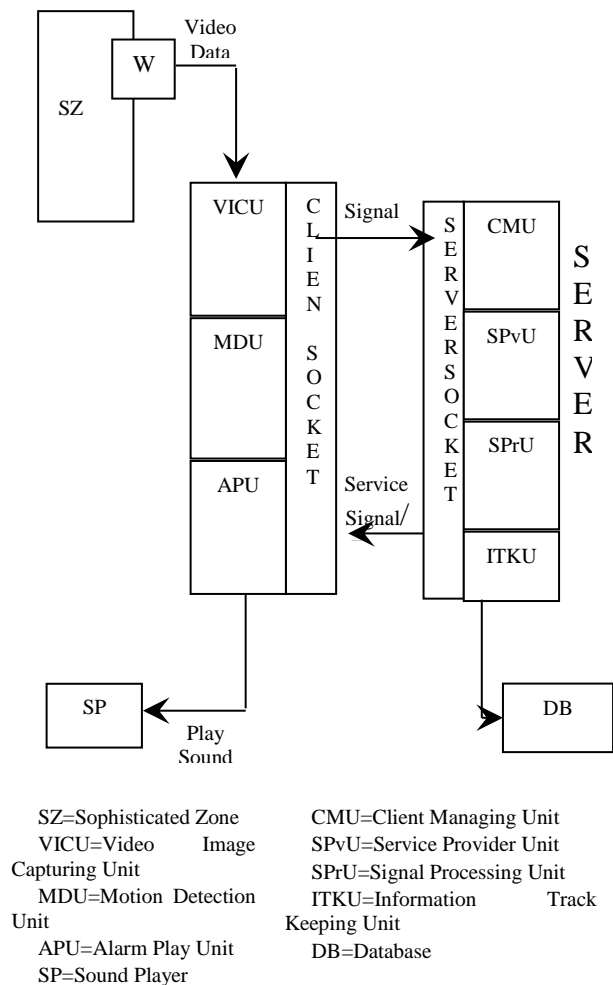ITKU=Information Track Keeping Unit
DB=Database

Fig 6. Internal Structure of Client-Server architecture of IDPSAS

This (Fig 6) is extended figure of previous (Simple Model, Fig 5) one. Client section holds Video Image Capturing Unit (VICU), which accepts the webcam captured video image. Motion Detection Unit (MDU), which analyzes the captured video image and find motion detected area. Alarm Play Unit (APU) and there are also some data processing units. Server section holds database and some data processing units. Server also holds clients managing unit. Here, the basic client-server communicating policy is very simple. Whenever any kind of motion is detected at any client side, the buglers attack message is sent to server and server accept this message and take necessary steps. Such as keeping track of buglers attack, informing to each clients about victim clients and request to play the alarming sound for buglers attack.

3.4 Motion Detection

Motion can be detected by measuring change in speed or vector of an object or objects in the field of view. This can be achieved either by mechanical devices that physically interact with the field or by electronic devices that quantifies and measures changes in the given environment.

3.4.1   Motion Detection Algorithmic Steps

Getting the video image data from the webcam [7, 8, 10] and set the reference image for once. Also need to calculate the average intensity. This reference image won't be changed until system termination. Then the newly captured image will be treated and processed as the current image. Here, mentionable thing that reference image will be kept in RBG format.

1. Now, Current image need to convert YUV to RGB for image processing purpose.
2. Calculating average image intensity of current image. This image intensity needs to calculate for each newly captured image by web cam
3. Calculating correction from determined average image intensities (Reference Image and Current Image). This correction value will carry a significant role for normalizing an image. Image normalization needs to eliminate noise effect, light intensity variation and increase the motion detecting performance.
4. Calculating image difference between reference and current image, where calculation contents R, G and B components. This calculation helps to find the significant properties of images. Example: $diff[i][j] = img1[i][j] - img2[i][j]$, this is a simple C syntax to find the image difference.
5. Normalizing R, G and B component by correction.
6. Calculating B\W component of subtracting image. To run any kind of morphological operation on an image, we need to convert it into Black and White image. Example: $eachPixel = sqrt(((R*R)+(G*G)+(B*B))/3)$, this simple C style syntax.
7. Now finding B\W white image by comparing with threshold value. By using threshold we can separate motion detected region from its background. Example:

   if $diff[i][j] > thresholdValue$

   $diff[i][j]=255$
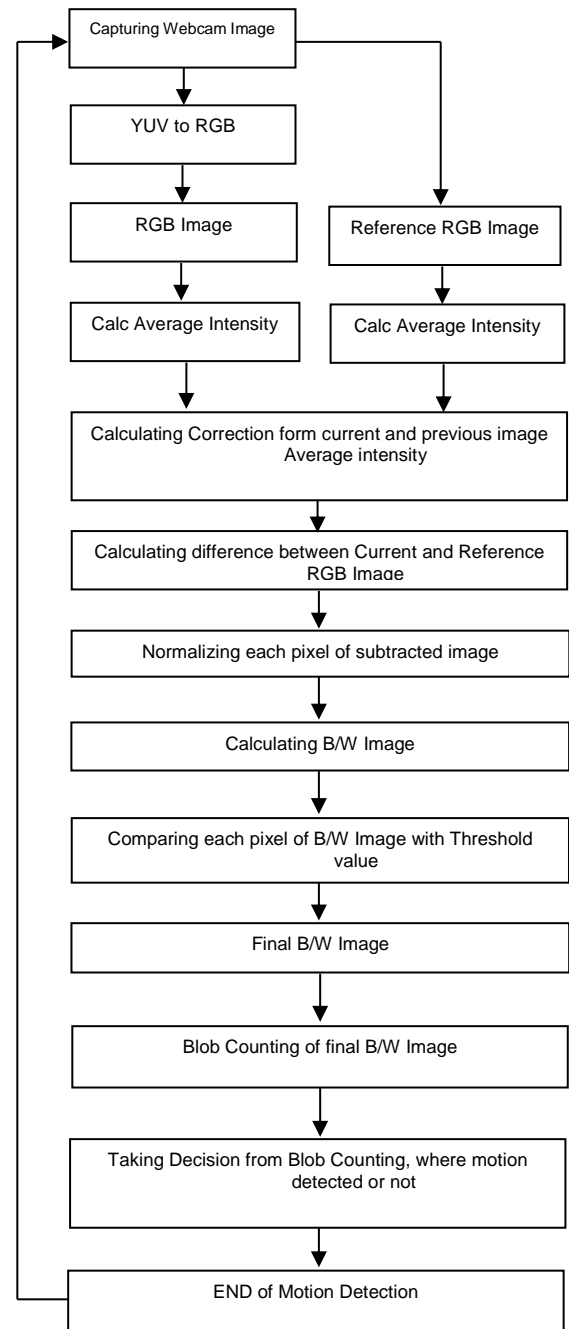
   else

$$diff[i][j]=diff[i][j]$$

Fig 7: Motion detection Flow

8. BLOB elimination
9. Take decision motion detected or not by comparing BLOB Counting with BLOB threshold

IV.   IMPLEMENTATION

Implementation is a phase in the project life cycle in which a product is put into use. It is when a chosen project solution is developed into a completed deliverable. Implementation is also a

term used as a synonym for development.

4.1 Developing Tools
- Language: Java
- JDK 1.6
- JRE 1.6
- JMF 2.1e
- Text Pad
- MYSQL 5.1.36
- Webcam 2MP
- Speaker

4.2 Work Steps
- Server Developing
  - Preparing server socket
  - Client managing unit
  - Messaging processing and other processing unit
- Client Developing
  - Developing webcam accessing unit and video image processing for detecting motion
  - Connecting to server and messaging unit

4.3 System Testing

Testing is an empirical investigation conducted to provide stakeholders with information about the quality of the product or service under test, with respect to the context in which it is intended to operate. System Testing also provides an objective, independent view of the system to allow the business to appreciate and understand the risks at implementation of the application. Test techniques include, but are not limited to, the process of executing a program or application with the intent of finding system bugs.

Fig. 8. Bugler attack informed to server

This figure states that bugler attract message [12, 14, 16] sends to server from the client application.

Fig. 9. Alam raising by client

This figure shows that client application accept the server request and message for raising bugler attract alarm. Finally,

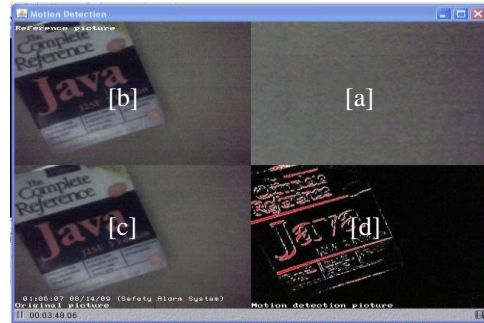alarm is raised successfully.

Fig. 10. Running webcam view

This figure represents the webcam images. Black image [Figure: d] represents the subtraction of previous [Figure: b] and current [Figure: c] image. Figure [a] is the initial image.

V. CONCLUSION

We hope that our paper will be a useful and greatly help to its users and it will meet user requirements. It will also be cost effective and maintenance will be lass costly. This application supports cross platform. So, Operating system does not matter, where it is running.

REFERENCES

[1] Tutorial on java socket programming" http://www.javaworld.com/jw-12-1996/jw-12-sockets.html Access on 25-3-12.

[2] "Tutorial on java socket programming form sun java" http://java.sun.com/developer/technicalArticles/ALT/sockets/ Access on 25-3-12.

[3] "Multithread socket programming" http://www.ccs.neu.edu/home/donghui/teaching/multithread_socket/ Access on 30-3-12.

[4] "Socket programming in java" http://www.devarticles.com/c/a/Java/Socket-Programming-in-Java/ Access on 27-3-12.

[5] "Motion detection algorithm" http://cahit.wordpress.com/2008/07/08/how-the-motion-detection-algorithm-works/ Access on 20-04-12.

[6] "Motion detection algorithm" http://www.ai.mit.edu/projects/cog/VisionSystem/motion_detection.html Access on 05-05-12.

[7] "JMF Solution in sun java" http://java.sun.com/javase/technologies/desktop/media/jmf/2.1.1/solutions/index.html Access on 11-06-12.

[8] "Uses of JMF" http://java.sun.com/javase/technologies/desktop/media/jmf/ Access on 17-06-12.

[9] "Socket Definitions" http://java.sun.com/docs/books/tutorial/networking/sockets/definition.html Access on 17-06-12.

[10] "MYSQL JDBC Driver" http://www.jarfinder.com/index.php/java/info/com.mysql.jdbc.Driver Access on 17-06-12.

[11] "Java Tutorial" http://www.java2s.com/Tutorial/Java/CatalogJava.htm Access on 20-07-12.

[12] "Java Socket Programming" http://www.javaworld.com/jw-12-1996/jw-12-sockets.html?page=1 Access on 20-07-12.

[13] "UDP Programming" http://java.sun.com/docs/books/tutorial/networking/datagrams/index.html Access on 23-07-12.

[14] "Read Write Operation in Socket" http://java.sun.com/docs/books /tutorial/networking/sockets/readingWriting.html Access on 24-07-12.

[15] "Digital Image Processing (2nd Edition)" by Rafael C. Gonzalez and Richard E. Woods.

[16] "Feature Extraction & Image Processing" by Mark S. Nixon and Alberto S. Aguado.

[17] "Algorithms for Image Processing and Computer Vision" by J.R. Parker.

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