

Lightweight Classroom Surveillance System with MIS Integration

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Abstract— The word “Classroom Surveillance” means monitoring the behavior, activities and changing information usually of people often in a surreptitious manner. It is done for the purpose of influencing, managing, and directing. It may be applied to observation from a distance by means of electronic equipment closed circuit (cc) cameras. The camera should be automatically on or off only when there is any activity going on inside the classroom. Object counter should be placed in tolerance to near point where all students enter in queue and not rushed together.

The system is also integrated with options for class schedules and count of students attend in each session and same will be reported to the management as MIS as Email or as a report, which helps the management to identify subjects, where students are less or average or more.

Index Terms—Closed circuit, MIS, Surveillance;

I. INTRODUCTION

Visual surveillance is a general framework that groups a number of different computer vision tasks aiming to detect and track the image sequences and on the next level to retain the images which has motion in it. The ultimate goal in designing smart visual surveillance systems is to replace the existing passive surveillance and to minimize the disk space. In the proposed system, we integrate motion detection to the existing surveillance system. In the proposed system, CCTV camera can be replaced by webcam. The images from the camera are taken for detecting motion. This is done by comparing the current frame with the previous frame, only the frames which are different are considered. The motions in the frames are identified based on the threshold value. If the difference count between the frames is more than the threshold value, then the movement is considered as the major movement & only those frames will be selected. The selected frames are converted to the video file and are sent to the centralized server. At the centralized server the administrator can view the videos. The proposed method is well-suited for modern video-surveillance architectures, where limited storage capacity is in need. Proposed system also integrated with Object counter equipped at class room entrance to count attendance based on each class session,

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which will be useful for the management to identify those subjects / teachers whose class strength is below average or above average for better quality towards improvement of education system.

The camera frames can be collected or ignored based on the change in the each video frame. When there is motion inside the classroom then frames are collected else ignored, so effective storage utilization is accomplished.



Fig1: Circuit design with IR sensors.

II. RELATED WORK

Video shot boundary detection has been deeply studied in recent years and has found applications in different domains like video indexing, video compression, video access and others. In the frame work of video indexing tool based on the MPEG7 content description standard, a fast and automatic temporal segmentation of video content is required in order to produce an accurate content description of each temporally homogenous shot.

Video shot boundary detection algorithm have to challenge the difficulty of finding shot boundary in the presence of camera and object motion and illumination variations. Moreover different video shot boundaries may present different appearances like abrupt temporal changes or smooth temporal transitions.

The algorithm used is that Video shot boundary detection, which segments a video by detecting boundaries between camera shots. It is focusing on detecting both abrupt and gradual transitions. If the object is moving smoothly we'll receive small changes from frame to frame. So, it's impossible to get the whole moving object. Things become worse, when the object is moving so slowly.

III. PROBLEM STATEMENT

The problem here is that, usually the cc camera that kept inside the classroom keeps recording the things even when

there are no activities inside the classroom. Since its keeps recording the multiple frames get wasted and it's of time waste.

When there will be very less movement in the frames there are chances of the frames will not be captured and the activities will be unaccounted. Things become worse, when the object is moving so slowly.

IV. SOLUTION

Solution for the above problem is making the closed circuit camera to automatically store the frames which show any kind of motion in the main server, on requirement the frames are stitched into one continuous video file and the frames with no motion are discarded. Once the video file is created the frames of the same file can be deleted to save memory.

Motion detection using background subtraction algorithm is used in this project. It's possible to compare the current frame not with the previous one but with the first frame in the video sequence. So, if there were no objects in the initial frame, comparison of the current frame with the first one will give us the whole moving object independently of its motion speed.

V. TOOLS

Microsoft Visual Studio

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop computer programs for Microsoft Windows, as well as web sites, web applications and web services. Visual Studio uses Microsoft software development platforms such as Windows API, Windows Forms, Windows Presentation Foundation, Windows Store and Microsoft Silver light. It can produce both native code and managed code.

Visual Studio supports different programming and allows the code editor and debugger to support nearly any programming language, provided a language-specific service exists. Built-in languages include C, C++ and C++/CLI (via Visual), VB.NET (via Visual Basic .NET), C# (via Visual C#), and F#. Webcam A webcam is a video camera that streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment. When sent to a remote location, the video stream may be saved, viewed or on sent there. Unlike an IP camera (which connects using Ethernet or Wi-Fi), a webcam is generally connected by a USB cable, or similar cable, or built into computer hardware, such as laptops.

Infrared Sensors

IR Sensors work by using a specific light sensor to detect a select light wavelength in the Infra-Red (IR) spectrum. By using an LED which produces light at the same wavelength as what the sensor is looking for, you can look at the intensity of the received light. When an object is close to the sensor, the light from the LED bounces off the object and into the light sensor. This results in a large jump in the intensity, which we already know can be detected using a threshold.

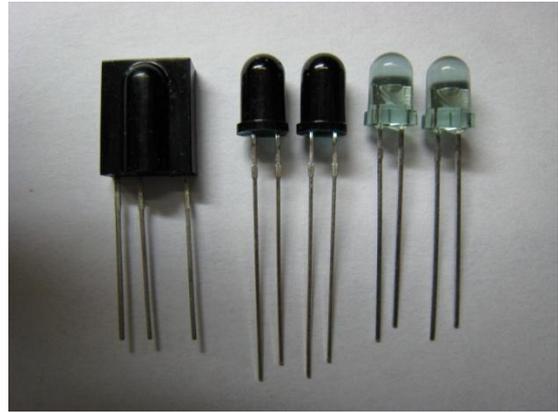


Fig 2: IR Sensors (emitters and detectors)

VI. WORKING

We are using two computers where one is used as a client (host) and other as server.

A client will keep track of the count of number of students entering the class with the help of IR sensors which is placed at the entrance. The client system is also connected to a webcam which is used to monitor the activities going on in the classroom by capturing it frame by frame. At the client we'll be maintaining the timetable where count keeps on updating for a particular class and will automatically update the same value to the next class if number of students remain the same, otherwise the new count value will be updated.

Server is the system which is connected to the client through NFS mapping and does the task of converting the frames received, to a video which can be viewed the Head of the Department at any point of time by logging into the server.

The process of motion detection happens in such a way that each frame is compared with the first frame in the video sequence and all those frames where motion is detected are saved, while other frames are discarded. These frames are then transferred to the server by using an NFS technology.

The Network File System (NFS) is a client/server application that lets a computer user view and optionally store and update file on a remote computer as though they were on the user's own computer. The user's system needs to have an NFS client and the other computer needs the NFS server.

Both of them require that you also have TCP/IP installed since the NFS server and client use TCP/IP as the program that sends the files and updates back and forth. Its protocol uses the Remote Procedure Call (RPC) method of communication between computers.

Once the frames are received at the server they are converted into a video using Windows Media API or AVI. The Head of the Department will be having the privilege of seeing the particular day's video and it is also possible to view the History as well.

A detailed report of the count of students in each class will be made and sent to concerned authority when it required or on a weekly basis.

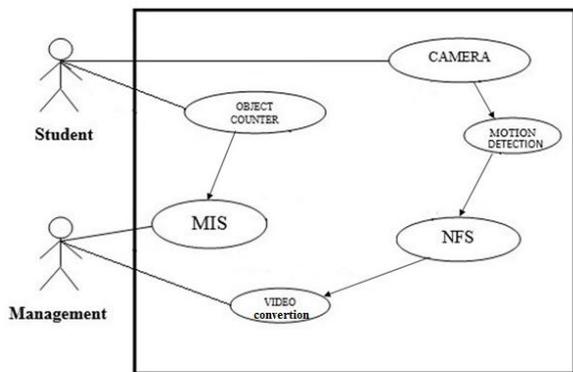


Fig 3: DFD of the surveillance system

The above figure shows interaction between the modules that takes place between the student and the management. As the student enters the class an object counter namely A which is setup at the entrance takes the count of the students entering the classroom and another counter B which takes the count when the student leaves the class. A camera which is setup inside the classroom is used for surveillance purpose. Upon motion detection in the class the camera captures the frames. Using the NFS technology we are mapping the logical drive of the client system to that of server. At the server these frames are collected and using an AVI it is converted to video into order to see continuous sequence of the frames. Using all the information above a MIS report is generated which is sent to the management for viewing the details of the particular subject.

VII. ADVANTAGES

- It minimizes the recorded file size by discarding video frames where there is no human activities, thus the server space will be reduced.
- Frames sent through the network can be viewed by the administrator as videos.
- No manual effort is required.
- Cost effective.

VIII. CONCLUSION AND FUTURE WORK

The system is integrated with options for class schedules and count of students attend in each session and same will be reported to the management as MIS as Email or as a report, which helps the management to identify subjects, where students are less or average or more.

The motion detection by background subtraction method is used in this project. It's possible to compare the current frame not with the previous one but with the first frame in the video sequence. So, if there were no objects in the initial frame, comparison of the current frame with the first one will give us the whole moving object independently of its motion speed.

All of these methods help in making the system more efficient and light weight in terms of storage space used by the frames.

For future enhancements, the system can be integrated with RFID sensors or Bio-metric readers as opposed to IR sensors which takes note of the number of people attending a lecture.

With RFID sensors or Bio-metric, we can integrate the attendance system and take note of who all are attending the lecture and not just the number of people attending it.

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