ST. JOHN COLLEGE OF ENGINEERING AND TECHNOLOGY

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Vevoor , Manor Road, Palghar (E), District Thane – 401404

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THE HUMAN ACTIVITY DETECTION AND RECOGNITION IN VIDEOS

B. E. COMPUTER ENGINEERING (B)

By

Avni Parekh 36

Bhakti Patel 37

Priyanka Rauka 49

Under the guidance of

Mrs. Neeta Patil

Department of computer engineering

Department of Computer Engineering

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ST. JOHN COLLEGE OF ENGINEERING AND TECHNOLOGY

CERTIFICATE OF APPROVAL For

Project Synopsis

This to certify that

Avni Parekh 36

Bhakti Patel 37

Priyanka Rauka 49

have satisfactorily carried out the Project work entitled "Human activity detection in videos" in partial fulfillment of Bachelor of Engineering in Information Technology as laid down by University of Mumbai during the academic year 2013-2014

Internal Guide: Mrs. Neeta Patil **HOD:**

Internal Examiner **External Examiner**

Principal

Acknowledgement

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Abstract

This research project is carried out to determine some of the basic human motion detection algorithm that had been founded or developed or even researched previously. This thesis report would bring a presentation of these algorithms for researchers to get a basic idea of performing an algorithm for human motion detection systems. The main algorithm being discussed here are those implementing image subtraction methods and foreground-background segmentation approach. This report is also written with the purpose of documenting the design and development of a prototype human motion detection system. Here, we presented some basic ways to perform a human motion detection algorithm and also a new way to consider for background updating using spatial information instead of temporal. The experiments carried out to evaluate the performance of the prototype system is attempted and its results being recorded in this paper as well. As a conclusion, this paper is aimed to researchers interested to research on the basic idea of human motion detection algorithm using image subtraction and foreground-background segmentation techniques.

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CHAPTER 1: INTRODUCTION

In this chapter, we would just briefly look into the introduction of the project requirements needed for it and its purpose and aim. Also, a simple development plan for the prototype system which was drafted out is being presented here in this chapter. An overview of the system initially planned to be developed is also being presented here.

1.1 AIM AND OBJECTIVES

As proposed earlier, this project is to be linked with another project to come up with the final system called Human Motion Detection System. This project would be focused on the Video Motion Detection module where we would perform research on the techniques and methodology to detect motion and to develop a module for a technique that we prefer to use in this project. This module would record down motion and pass it into the next module that would be on object classification where it classify human and non-human object. Thus, this project is to come up with a solution that detects motion effectively and record it down with one or more objects that are moving and causing motions.

The purpose of this project is to help new researchers learn and further research on their topic of interest, which in this case is the human motion detection system. The question to be addressed here in this module is, given a sequence of images, how do we detect motion or track a moving object? The project is to mainly answer this particular question addressed by providing a prototype to emulate or prove the algorithms or techniques that are available to perform motion detection by an input of images in a number of frames.

CHAPTER 2: LITERATURE SURVEY

In this chapter, we will look at several motion detection techniques and methodologies that have been researched and implemented by other researchers. For further understanding on their methods and techniques, refer to the reference page at the end of this thesis report to search for the papers or text or even websites published.

Introduction to a Motion Detection Algorithm

The most popular way to implement motion detection algorithm is by implementing the image segmentation and image subtraction techniques of computer vision [8]. Most of the algorithm first segments the foreground moving objects from the background image. To do this, they would have to take a sequence of images with no motion by default to initialize the background image. This background image would be updated subsequently to provide a real-time environment where changes to the background are taken into considerations. For example, when a moving object stopped, it would then be a part of the background image. Clearly, the foreground objects can be acquired by using simple arithmetic using image subtraction. The result of the subtraction techniques where pixels belonging to the current image are subtracted by the corresponding pixels in the background image or vice versa would obtain the foreground moving objects. After obtaining the foreground objects, the focus for region of interest is set to these foreground objects instead of the whole image. Therefore further image processing is performed only on these regions of interest. One of the important steps here is to extract important features of the moving objects to recognize the object. However, recognizing the object is beyond this research topic as this module of the project is to provide the objects and the inputs to the object classification engine.

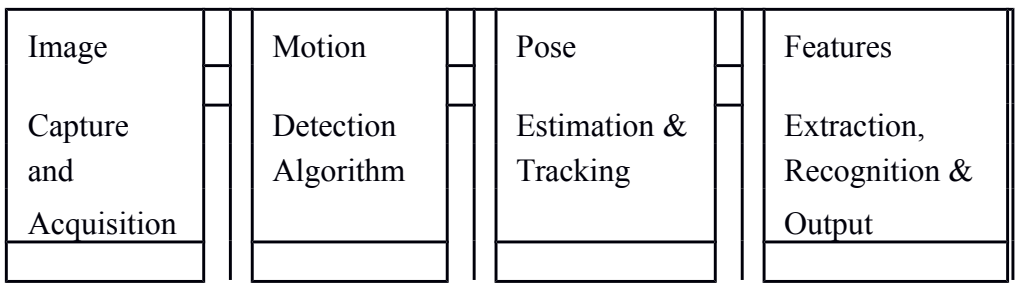
CHAPTER 3: EXISTING SYSTEM

The first step of a motion detection algorithm would be the foreground-background segmentation step. To segment out the foreground from background there's a lot of techniques available. Ming and Tim presented a way to improve the usual image subtraction techniques which only uses the pixels intensity values by adding also the colour illumination invariance into the algorithm. As a result, their work can also be implemented effectively on motion detection areas where the illumination changes rapidly.

Implementing edge detectors helps in obtaining a clearer picture of the moving objects. Ramesh, Rangachar and Brian & Milan, Vaclav, Roger both stated in their text that using edge detectors combining with the different pictures will give a better result for motion detection by helping to overcome several limitations. There are many edge detectors algorithms being introduced in the image processing field. Ramesh, Rangachar and Brian identified 3 steps in edge detection algorithms which are:

- Filtering
- Enhancement
- Detection

After having all the moving objects labelled and segmented, the next step is to understand what the object is or in other words, to recognize them. To achieve this, Song, Goncalves, Feng and Peron, have used a probabilistic structure to model a human body. Using point tracking algorithm, they can pose estimation on the human motion to distinguish them from other moving objects. Their work refers to Johansson's stimuli where each joint of the body is shown as a moving dot which is the basis of the point tracking algorithm.



A block diagram of an end product motion detection application.

CHAPTER 4: PROBLEM STATEMENT

Video surveillance works as to detect moving object classify The detected object track, them through the sequence of images and analysis the behaviors. Visual surveillance technologies ,CCD cameras, thermal cameras and night vision device are the three most widely used devices in the visual surveillance market.

The main goal of visual surveillance is not only to monitor, but also to automate the entire surveillance task. The goal of visual surveillance is to develop intelligent visual surveillance to replace the traditional passive video surveillance that is proving in effective as the numbers of cameras exceed the capability of human operators to monitor them. The automated surveillance systems can be implemented for both offline like storing the video sequence and to analyses the information in that sequence. But now days online surveillance system is very much needful in all public and private sectors due to predict and avoid unwanted movements, terrorist activities in those areas. It is helpful for traffic monitoring, transport networks, traffic flow analysis, understanding of human activity, home nursing, monitoring of endangered species, and observation of people and vehicles within a busy environment along many others to prevent theft and robbery.

CHAPTER 5: SCOPE OF THE PROJECT

Using IP camera and different algorithm and techniques we introduced our system human activity detection, which is not only capturing videos but also allow to recognize human activity and monitor them.

Predict and avoid unwanted movements.

Implemented in the area where security is the main concern.

Provides interactive environments such as smart rooms.

This model updates new strategy which improves model adaptability and motion segmentation accuracy.

This system focused about various methods of background modeling such as:

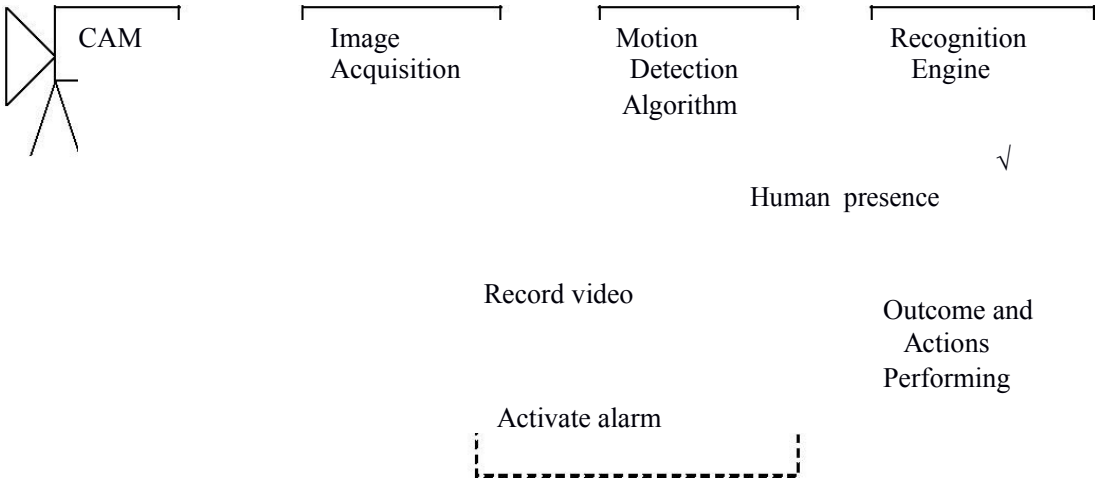
- pixel based
- edge pixel based
- edge segment based approaches

CHAPTER 6: CONSTRAINTS OF THE PROJECT

Previously system *used* edge segment based statistical background modeling algorithm and a moving edge detection framework for the detection of moving objects. This system used various methods of background removal. Here the proposed system use GMM method which updates new strategy which weighs the model adaptability and motion segmentation accuracy. Video Sequences paper presence a technique for motion detection which stores a set of value taken in the past in the same location or in the neighborhood. It then compares this set to current pixel value in order to determine whether the pixel belongs to the background and to adopt the model which substitutes from the background model.

CHAPTER 7: PROPOSED SYSTEM

The Proposed system gives human activity detection from online video surveillance and detects single human activity from video sequence. It is useful in many other applications.



Overview of a basic motion detection application system.

As shown in figure the basic human motion detection would have an alarm system integrated. However, the development of the prototype system did not include the alarm interfaces. Since there's no hardware for the research team to test, the program would only go as far as recording the video where motion events occurred in a scene. Thus, to get a clearer picture of the system developed is shown below:

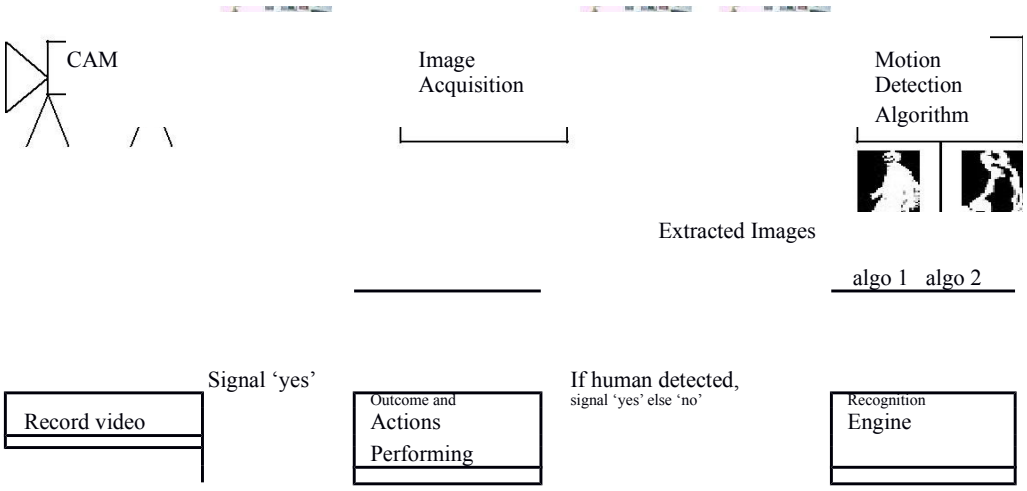
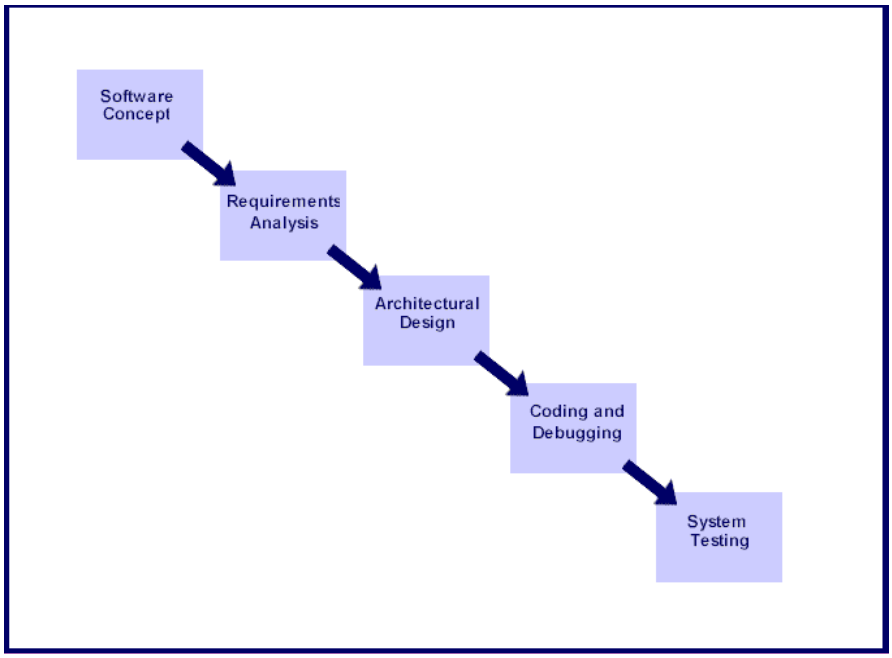


Figure 4: Overview of the prototype human motion detection application system.

CHAPTER 8:METHODOLOGY

Our project will be built on the waterfall mode. This model suggests work cascading from step to step like a series of waterfalls. It consists of the following steps in the following manner



⌟ Steps involved in the System Development Life Cycle :

Below are the steps involved in the System Development Life Cycle. Each phase within the overall cycle may be made up of several steps.

Step 1: Software Concept

The first step is to identify a need for the new system. This will include determining whether a business problem or opportunity exists, conducting a feasibility study to determine if the proposed solution is cost effective, and developing a project plan.

This process may involve end users who come up with an idea for improving their work. Ideally, the process occurs in tandem with a review of the organization's strategic plan to ensure that IT is being used to help the organization achieve its strategic objectives. Management may need to approve concept ideas before any money is budgeted for its development.

Step 2: Requirements Analysis

Requirements analysis is the process of analyzing the information needs of the end users, the organizational environment, and any system presently being used, developing the functional requirements of a system that can meet the needs of the users. Also, the requirements should be recorded in a document, email, user interface storyboard, executable prototype, or some other form. The requirements documentation should be referred to throughout the rest of the system development process to ensure the developing project aligns with user needs and requirements.

Professionals must involve end users in this process to ensure that the new system will function adequately and meets their needs and expectations.

Step 3: Architectural Design

After the requirements have been determined, the necessary specifications for the hardware, software, people, and data resources, and the information products that will satisfy the functional requirements of the proposed system

can be determined. The design will serve as a blueprint for the system and helps detect problems before these errors or problems are built into the final system. Professionals create the system design, but must review their work with the users to ensure the design meets users' needs.

Step 4: Coding and Debugging Coding and debugging is the act of creating the final system. This step is done by software developer.

Step 5: System Testing The system must be tested to evaluate its actual functionality in relation to expected or intended functionality. Some other issues to consider during this stage would be converting old data into the new system and training employees to use the new system. End users will be key in determining whether the developed system meets the intended requirements, and the extent to which the system is actually used.

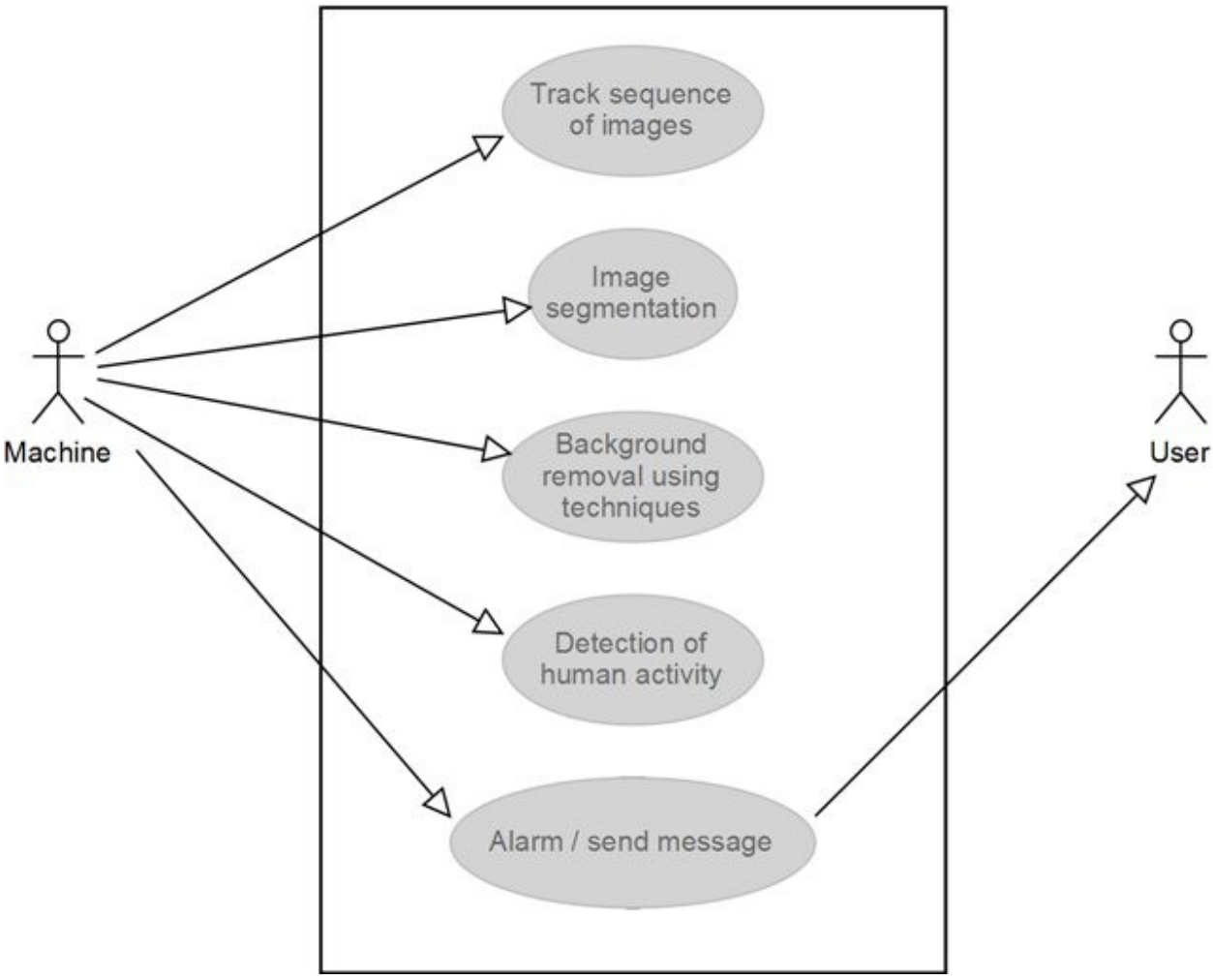
Step 6: Maintenance

Inevitably the system will need maintenance. Software will definitely undergo change once it is delivered to the customer. There are many reasons for the change. Change could happen because of some unexpected input values into the system. In addition, the changes in the system could directly affect the software operations. The software should be developed to accommodate changes that could happen during the post implementation period.

CHAPTER 9: REQUIREMENT GATHERING AND PLANNING

9.1 Requirement Elicitation

9.1.1 Use Case Diagram and description



SR.NO	ACTORS	USE CASE DESCRIPTION
1	Machine	• Track sequence of messages. • Segments the image. • Background removal using techniques. • Activity detection.
2	User	• Receives message.

9.2 FEASIBILITY STUDY

The very first phase in any system developing life cycle is preliminary investigation. The feasibility study is a major part of this phase. A measure of how beneficial or practical the development of any information system would be to the organization is the feasibility study.

9.2.1 TECHNICAL FEASIBILITY

- At least 166 MHz Pentium Processor or Intel compatible processor.

- At least 16 MB RAM.
- 14.4 kbps or higher modem.
- A video graphics card
- A mouse or other pointing device.
- At least 3 MB free hard disk space.
- Microsoft Internet Explorer 4.0 or higher

9.2.2 ECONOMICAL FEASIBILITY

Once the hardware and software requirements get fulfilled, there is no need for the user of our system to spend for any additional overhead.

For the user, the web site will be economically feasible in the following aspects:

- The web site will reduce a lot of paper work. Hence the cost will be reduced.
- Our web site will reduce the time that is wasted in manual processes.
- The storage and handling problems of the registers will be solved.

9.3 REQUIREMENT ANALYSIS

9.3.1 BLOCK DIAGRAM

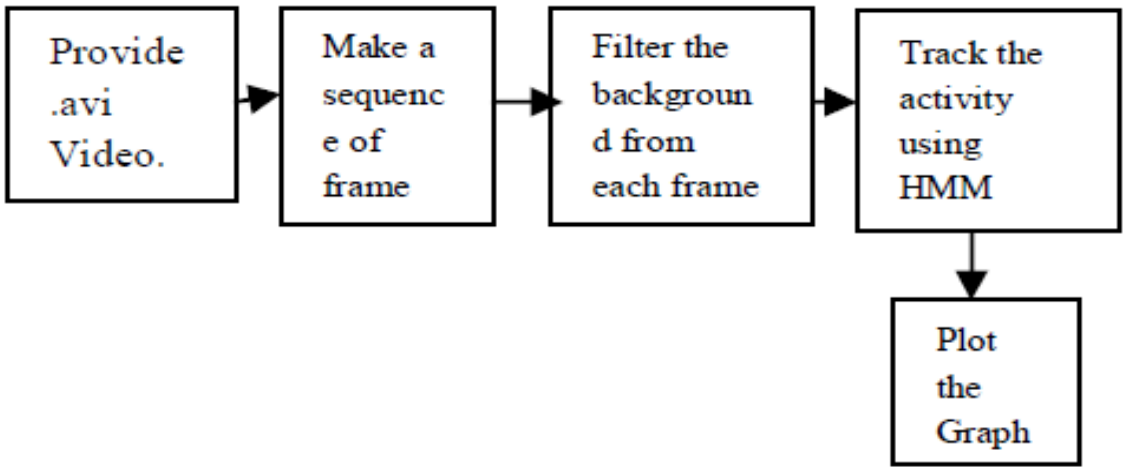
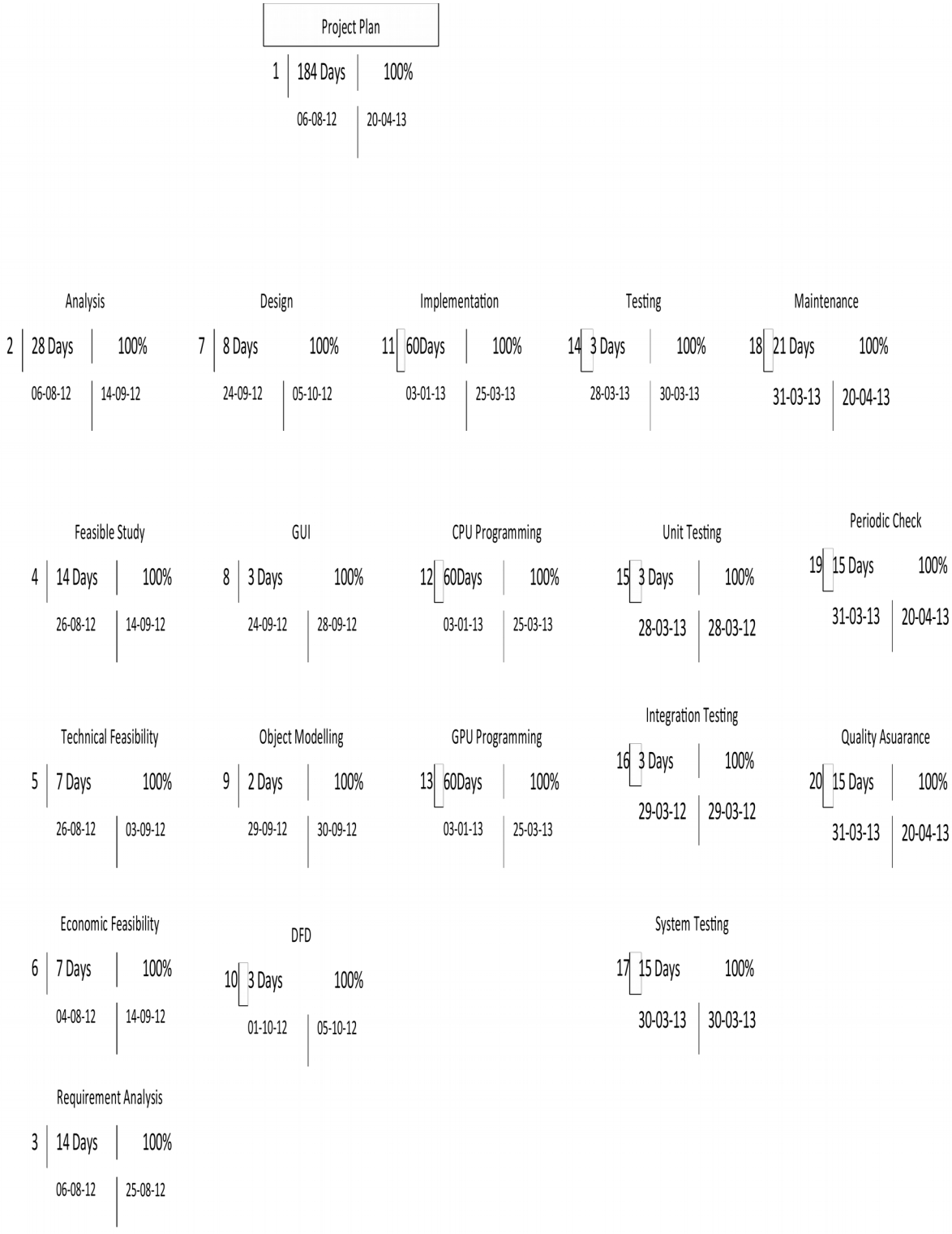


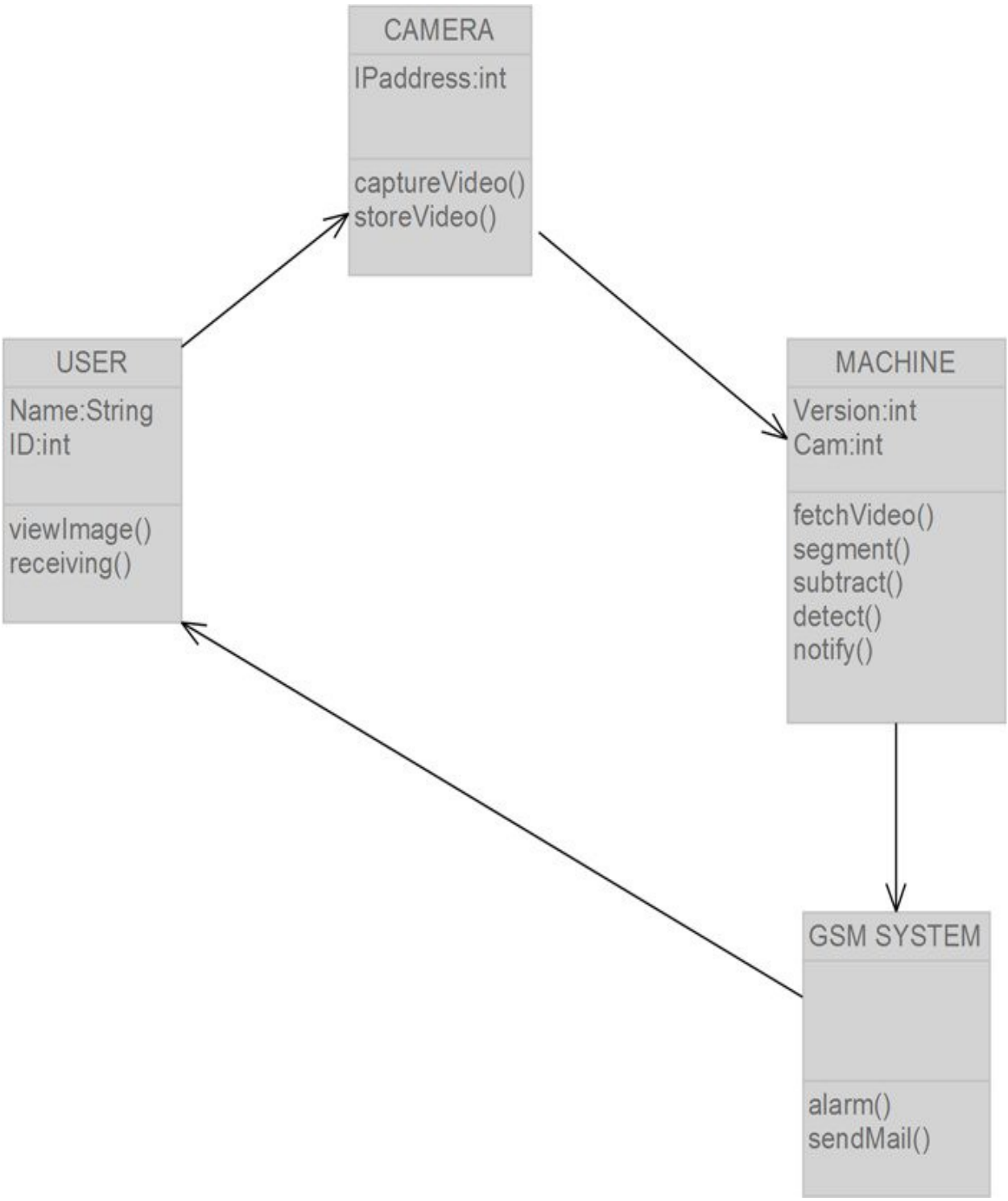
Figure 1. Shows the block diagram for human activity recognition.

9.4 W.B.S Chart

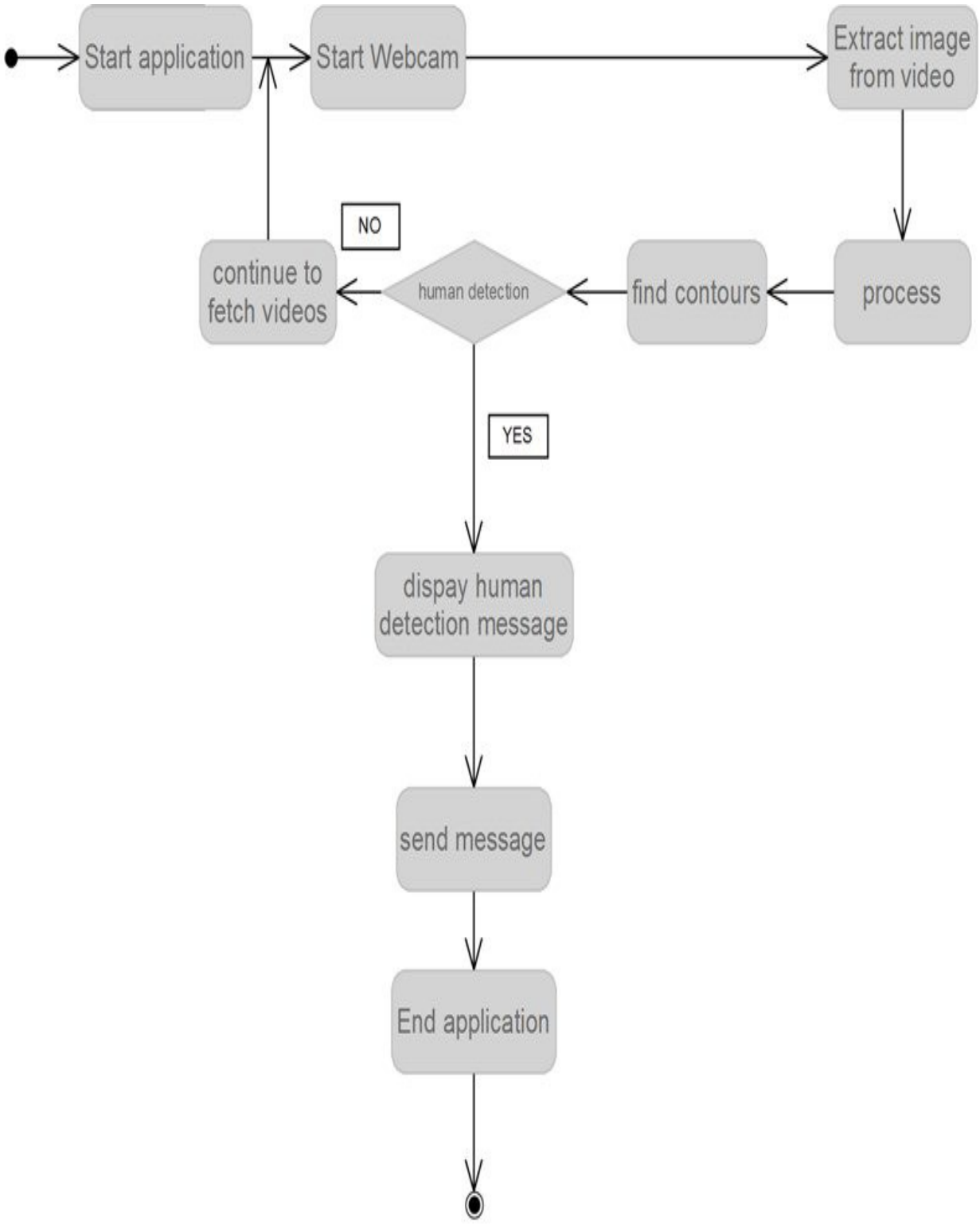


10.0 Analysis

10.1 Class Diagram



10.2 State Diagram


Start application
Start Webcam
Extract image from video
process
find contours
human detection
NO
continue to fetch videos
YES
dispay human detection message
send message
End application

11.0 Design

11.1 UI Design

12.0 APPENDIX

GMM: Gaussian Mixture Model-

Image segmentation

HAR: Human Activity Recognition-

Recognizing human activities from image sequences

HMM: Hidden Markov Model-

Recognition of activity from video

ROI: Region Of Interest-

Extract the area that contains the person performing the activity

13.0 Bibliography and References

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3. **"An Improved Motion Detection Method for Real-Time Surveillance" Nan Lu, Jihong Wang, Q.H. Wu and Li Yang IAENG International Journal of Computer Science**

4. **Peng Chena, Xiang Chenb, Beibei Jina, Xiangbing Zhua (2012) "Online EM Algorithm for Background Subtraction".**