Human Action Recognition Under View Change

Under the Guidance of
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# Project Abstract

- An automated visual surveillance system is used to detect abnormal behavior patterns and recognize the normal ones.

- If a person enters a room, video of him/her is captured and stored(both side view and the top view) then it is given to the training module here the video is checked if it is a normal behavior splited image is taken, whenever the action is recognized blob images are saved, and the frame counts are taken .

- In case, the anomaly is detected the red color will be displayed. The abnormal behavior is achieved by keep tracking the videos and blob frames and checking each frame values.

- The normality and abnormality of the captured motion is ascertained by checking the System for valid and invalid behavior. This involves training the module in the beginning for valid behavior by the controller.

Introduction

▶ Visual recognition and understanding of human actions have attracted much attention over the past three decades and remain an active research area of computer vision

▶ A good solution to the problem holds a yet unexplored potential for many applications, such as the search for and the structuring of large video archives, video surveillance, human-computer interaction, gesture recognition.

▶ Recent work has demonstrated the difficulty of the problem associated with the large variation of human action data due to the following reasons

  ▶ Varied Posture and motion
  ▶ Individual variations of people in expression
  ▶ Perspective effects, camera motions and illumination variations
  ▶ Distracting effects of scenes surroundings.

Introduction to Training and Detection Phase
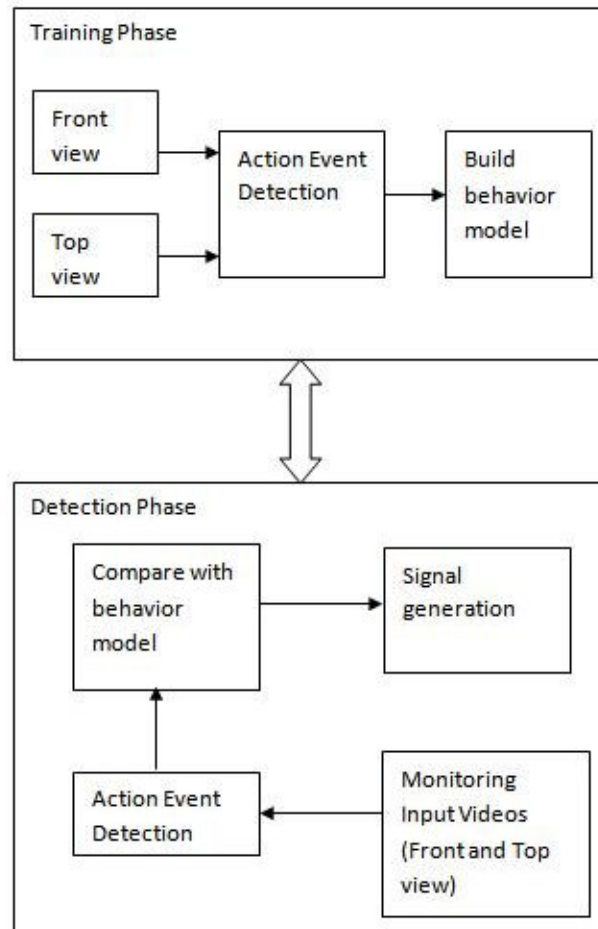
Literature Survey

- IEEE Reference Details:

  This paper appeared in: Pattern Analysis and Machine Intelligence, IEEE Transactions on
  TITLE: VIEW-INDEPENDENT ACTION RECOGNITION FROM TEMPORAL SELF-SIMILARITIES

- The project propose a self-similarity-based descriptor for view independent video analysis, with human action recognition as a central application.

- Self-similarity being possibly defined over a variety of image features, either static (histograms of intensity gradient directions) or dynamic (optical flows or point trajectories), these descriptors can take different form and can be combined for increased Descriptive power.

- Experimental validation on action recognition, as well as for the different problem of action synchronization, clearly confirms the stability of this type of description with respect to view variations.

- IEEE REFERENCE DETAILS:
- **<u>TITLE:THE RECOGNITION OF HUMAN MOVEMENT USING TEMPORAL TEMPLATES</u>**

- A new view-based approach to the representation and recognition of human movement is presented. The basis of the representation is a temporal template-a static vector-image where the vector value at each point is a function of the motion properties at the corresponding spatial location in an image sequence
- Then a recognition method matching temporal templates against stored instances of views of known actions is developed. The method automatically performs temporal segmentation, is invariant to linear changes in speed, and runs in real-time on standard platforms.
- It is in contrast to many recent efforts to recover the full three- dimensional reconstruction of the human form from image sequences, instead a view-based approach is developed to the representation and recognition of movement that is designed to support the direct recognition of the motion itself.
- Human Action Recognition Under View Change concentrates on the matching pattern of the human behaviour and can be used as a real time application.

- IEEE REFERENCE DETAILS:
- **<u>TITLE: A SURVEY OF ADVANCES IN VISION-BASED HUMAN MOTION CAPTURE AND ANALYSIS.</u>**

- The current scene is interpreted correctly from the front angle and tracking humans from the scene in one or more frames is done.

- It involves the analysis of the new patterns and makes a match with the pre defined stored patterns.

- The paper concentrates only on the front view which may be a disadvantage in some cases as Top view is also needed to be tracked.

- Human Action Recognition Under View Change concentrates on both top and front angle for better precision and accuracy in tracking.

- IEEE REFERENCE DETAILS:

- **TITLE: RECENT DEVELOPMENTS IN HUMAN MOTION ANALYSIS:**

- The above reference project concentrates on the human action and motion tracking and studying various behaviours of the human action.

- Human Action Under View Change elaborates the behavioural pattern and also stores it. It makes a match with the predefined pattern and produces a siren when mismatch occurs.

- It can also be used at any location or at any oganization and it is a real time application.

Existing System

- Existing System is based on the assumption that there exist well defined and known a priori behavior classes both normal and abnormal thus reduces the chance of finding

- In reality abnormal behavior is both rare and far from being well defined resulting in insufficient clearly labeled. Date required for supervised model building. It performs clustering on observed patterns and labels those forming small clusters as being abnormal or builds a system of spatiotemporal patches using only regular Normal behavior and detect those patterns that cannot be composed from the system as being abnormal

Disadvantages:

- Cannot be used for a dynamic environment where every valid visitor cannot be known before building the system

- Higher Cost involved due to lack of unsupervised Learning.

Proposed System

Proposed System is based on unsupervised behavior profiling. The framework's components are :

- A scene event-based behavior representation.
- Behavior profiling and pattern matching done to ensure security.
- Quick Anomaly detection .
- Dynamic in nature and adaptable to the given environment.

Advantages :

- It is fully unsupervised that manual interpretation is avoided.
- It is more robust and thus able to work effectively even with sparse and noisy data.
- It is superior in detecting anomaly from an unseen video.
- Each blob with an average PCH value greater than a threshold is defined as a scene event.

VIDEO BEHAVIOR PROFILING FOR ANOMALY DETECTION

TRAINING PHASE

```
┌─────────────────────────────┐
│        CAPTURE VIDEO        │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐
│    DIVIDE VIDEO INTO FRAMES  │
└─────────────────────────────┘
               │
               ▼
┌─────────────────────────────┐
│   DETECT EVENT IN EACH FRAMES│◄──────────┐
└─────────────────────────────┘           │
               │                           │
               ▼                           │
        ╱─────────────╲                    │
   NO  ╱   IF EVENT     ╲   YES            │
  ◄───╱    ALREADY       ╲──────┐          │
      ╲     EXISTS       ╱      │          │
       ╲─────────────╱          ▼          │
   │                    ┌──────────────┐   │
   ▼                    │  INCREMENT   │   │
┌──────────────┐        │  OCCURENCE   │   │
│ STORE EVENT  │        └──────────────┘   │
└──────────────┘              │            │
       │                      │            │
       └──────────┬───────────┘            │
                  ▼                        │
        ┌──────────────────┐               │
        │  SELECT NEXTFRAME │──────────────┘
        └──────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│  SELECT FREQUENTLY OCCURING EVENTS   │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│        BUILD BEHAVIOUR MOBEL         │
└─────────────────────────────────────┘
```
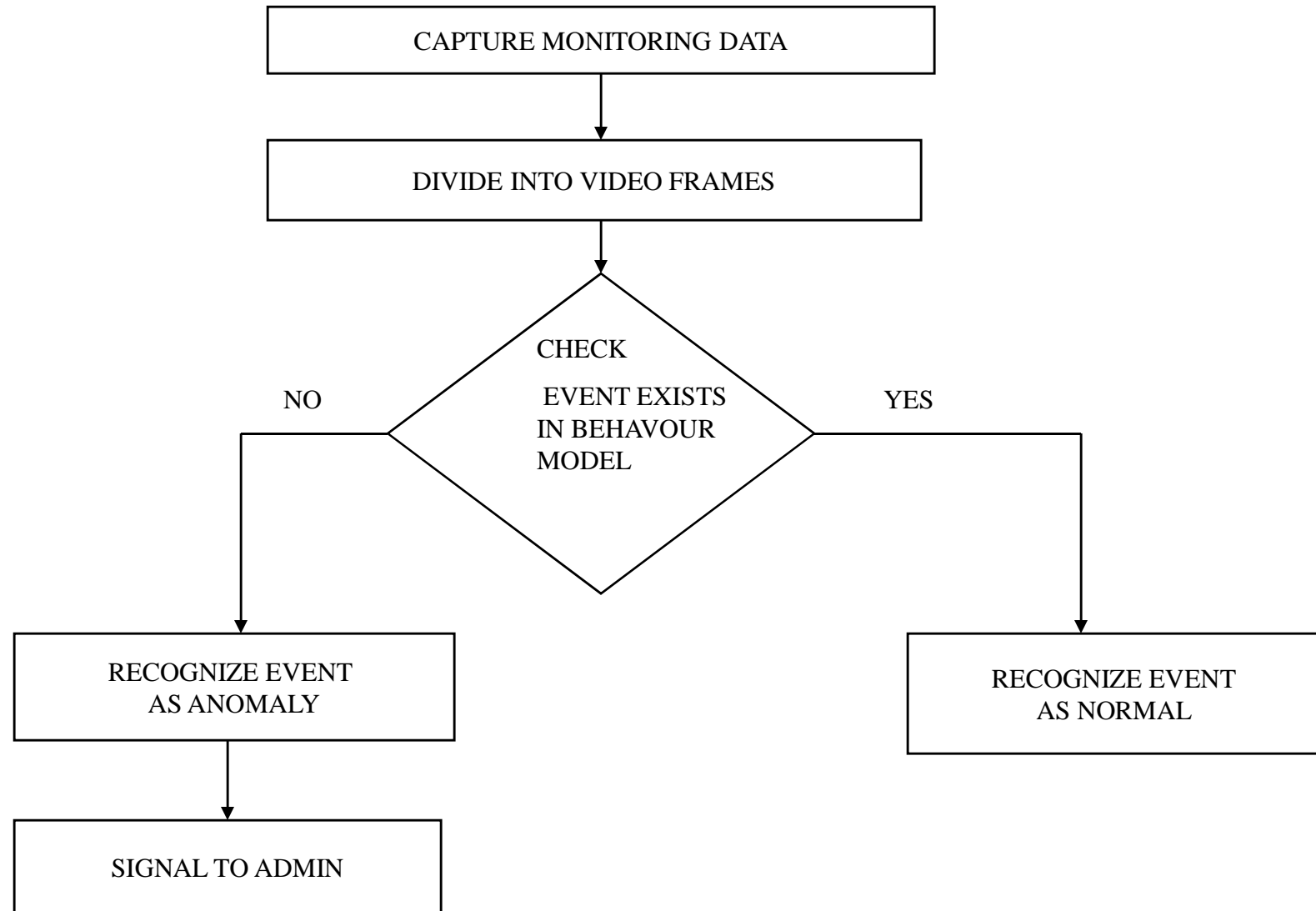
DETECTING PHASE

```
┌─────────────────────────────────────────┐
│         CAPTURE MONITORING DATA          │
└─────────────────────────────────────────┘
                     │
                     ▼
┌─────────────────────────────────────────┐
│         DIVIDE INTO VIDEO FRAMES         │
└─────────────────────────────────────────┘
                     │
                     ▼
```

CHECK EVENT EXISTS IN BEHAVOUR MODEL

NO

YES

RECOGNIZE EVENT AS ANOMALY

RECOGNIZE EVENT AS NORMAL

SIGNAL TO ADMIN
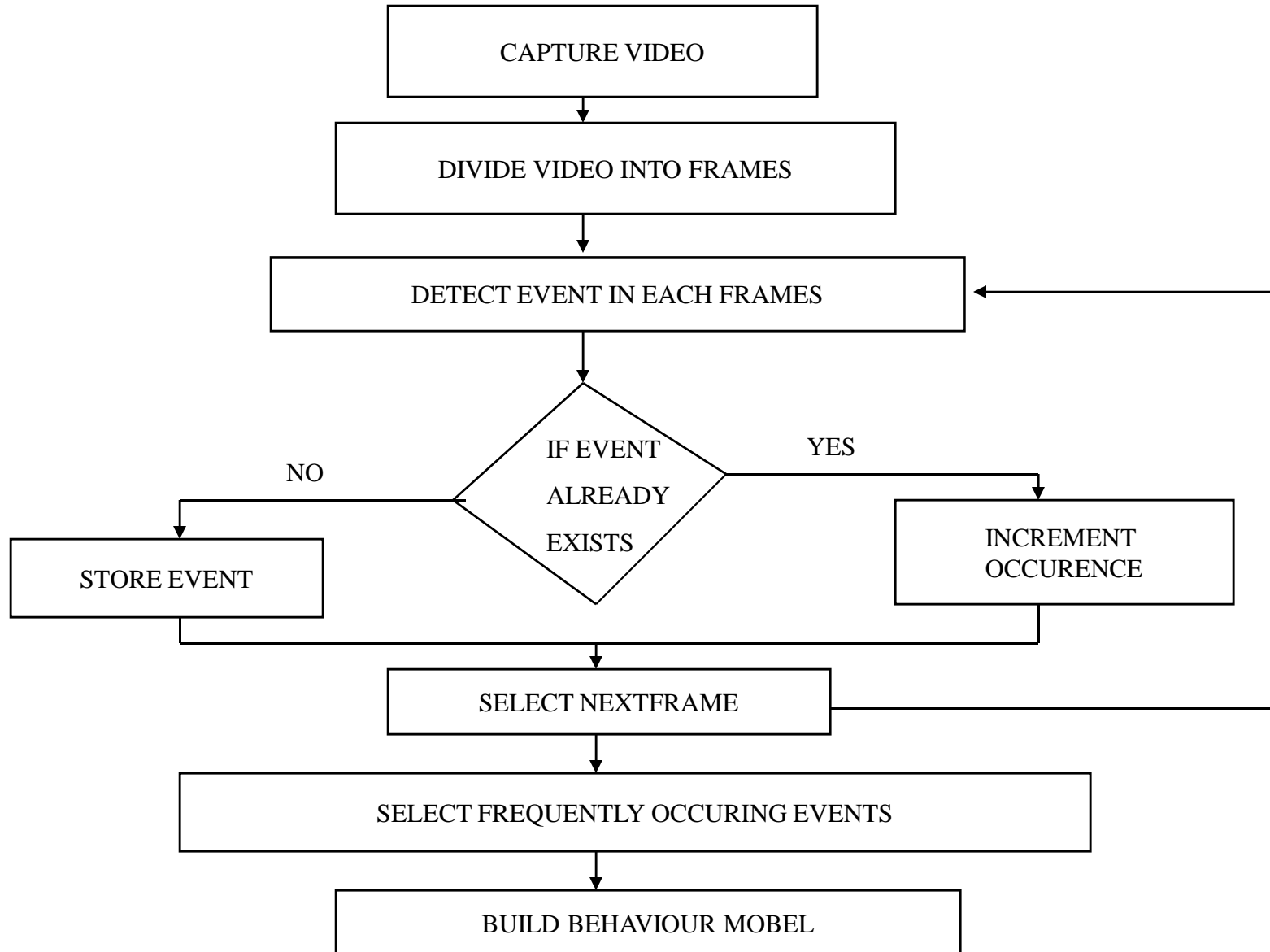
MODULES

List of various Modules Integrated into the proposed System:

- Video Segmentation

- Event Based Behavior Representation

- Anomaly Detection

- Alert System

VIDEO SEGMENTATION

◆ Video Segmentation involves spitting the input video from the surveillance camera into various sequence of frames with help of Java Media Framework.

◆ Video can be simply sliced into overlapping segments with a fixed time duration.

EVENT BASED BEHAVIOR REPRESENTATION

◆ Identify the foreground and background pixel of a frame.

◆ Background model stores the values of a particular pixel which corresponds to background colors.

◆ Pixel change history(PCH) is represented for a pixel.

◆ Similar foreground pixels are grouped to form a blob.

◆ A behavior pattern is represented as a sequence of various events.

ANOMALY DETECTION SYSTEM

◆ The video to be detected is divided into segment

◆ Each segment is divided into frames

◆ Event is detected for each frames

◆ If event not exists already in training video, it is considered as an anomaly

ALERT SYSTEM

◆ When the system detects an anomaly an unauthorized person enters the room and immediately this alert is sent to the Admin/Controller of the system.

◆ The alert system may also be extended by sending SMS to the controller if he is not available.

Module Split-up
(among Team Mates)

Murugappan :

◆Developing Video Segmentation

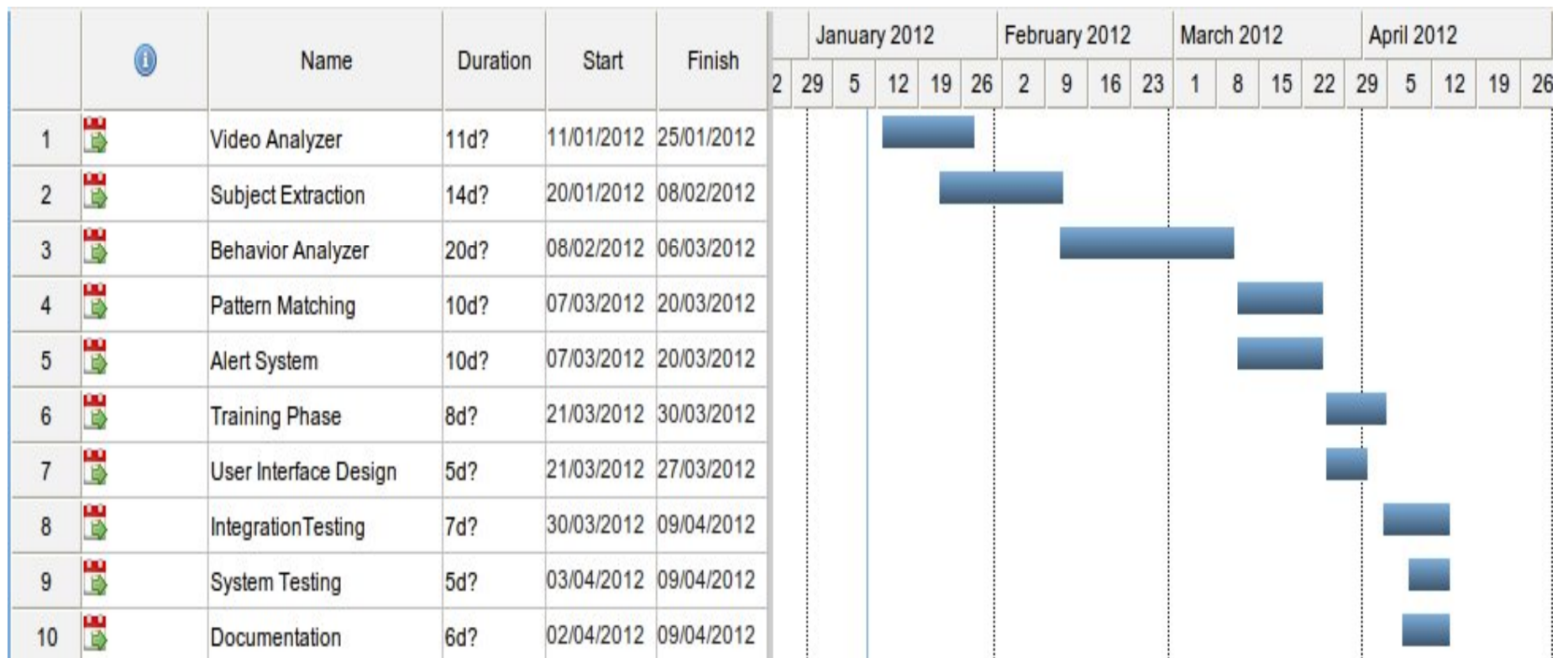◆Formation and storage of the BLOB image

◆Front End Designing.

 Maaniccka Sentil:

◆Build training data set

◆Behavior Analyzer

◆Pattern Matching

Mohamed Shamsudeen:

◆Anomaly Detection

◆Alert System

◆Testing and Documentation

Gantt Chart

		Name	Duration	Start	Finish
1		Video Analyzer	11d?	11/01/2012	25/01/2012
2		Subject Extraction	14d?	20/01/2012	08/02/2012
3		Behavior Analyzer	20d?	08/02/2012	06/03/2012
4		Pattern Matching	10d?	07/03/2012	20/03/2012
5		Alert System	10d?	07/03/2012	20/03/2012
6		Training Phase	8d?	21/03/2012	30/03/2012
7		User Interface Design	5d?	21/03/2012	27/03/2012
8		IntegrationTesting	7d?	30/03/2012	09/04/2012
9		System Testing	5d?	03/04/2012	09/04/2012
10		Documentation	6d?	02/04/2012	09/04/2012

REFERENCES

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