HUMAN BEHAVIOR OBSERVATION WITH

THE HELP OF HAND MOTION DETECTION

A Dissertation Proposal submitted

By

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ABSTRACT

Human psychology is the most complex phenomenon that possible can be correlated and understand from the human motion. Identifying and detecting human motion with the aid of surveillance system was the prime objective of this research project. Visual analysis of human motion is majorly interpreted with human psychology and is the most dynamic research area in computer vision. The present study was focused on different aspects of human figure which were observed in CCTV footage. We used background subtraction technique to understand human motion with the aid of MATLAB simulator. With multiple frame analysis hand gesture of individual person can be recognized and then by analyzing different hand positions using spatiotemporal segment, human psychology can be interpreted. Human detection, tracking and activity comprehending are three major components involved in a general human motion analysis. Multi-step process of human motion analysis was adapted for the present study. Human intention is the reflex of the human mind which is the most complex machine in the Earth and analysis of this reflex in terms of Human motion and activities was the prime focus of this research project. The outcome of the present study can be easily become an aid for criminal psychologist to study the behaviors and thoughts of criminals.

CERTIFICATE

This is to certify that **Kavita V. Bhaltilak** has completed M.Tech (computer science and technology) dissertation proposal titled **Human Behavior Observation with the help of Hand Motion Detection** under my guidance and supervision. To the best of my knowledge, the present work is the result of her original investigation and study. No part of the dissertation proposal has ever been submitted for any other degree or diploma. The dissertation proposal is fit for the submission and the partial fulfillment of the conditions for the award of M.Tech Computer Science & Engineering.

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Signature of Advisor

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ACKNOWLEDGEMENT

DECLARATION

I **Kavita V. Bhaltilak** hereby declare that the dissertation proposal entitled, **Human Behavior Observation with the Help of Hand Motion Detection** submitted for the M.Tech Degree is entirely my original work and all ideas and references have been duly acknowledged. It does not contain any work for the award of any other degree or diploma.

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CHAPTER 1
INTRODUCTION

1.1   INTRODUCTION

General physics define motion as change in position of object in relation to time and which can be detected by measuring changes in speed or vector of object. However motion detection is also a process of recognizing and isolating physical movement in a given area. Motion detection is most important concept in video surveillance system and many algorithms are developed to analyze and interpret motion, which are discussed in following sections. Motion detection of any moving object with respect to any reference point generally revel the characteristics change of the object. When we detect or analyze any motion, the characteristics of the object in motion is done by analyzing the position or reference point of the object in each frame of camera observations. A frame represents proper changes in a video. Frame is nothing but an image. Continuous frames represents continues changes in a video. Motion detection is clearly understand from frames, because in each frame negligible change is there which we cannot analysis by necked eyes.

The change in each frame is in pixels. Pixel is the smallest part of an image. In image we can see many things effects images quality, we called it as noise. This noise is due to climatic condition, which we cannot neglect. There are some factors which changes values of attributes like shadow, light, etc. Human motion detection having many applications such as for security, monitoring the activities or other changes occurs in the environment, etc. In this research work we are studying concepts such as surveillance system use, hand motion detection, image processing, psychology study, etc. so, trustworthy human motion identification i.e. detection is essential for the realization of these application. The task of human motion extraction and detection of moving body parts is not easy. Human motion tracking is a critical and tough task as recognizing individual from group or crowded area which is certainly not possible by image analysis of single camera.

Human motion analysis mainly contains three phases namely detection, tracking and behavior understanding. These three phases are shown in Figure 1. Detection phase generally includes two types, motion segmentation and object classification. Motion

segmentation done by some methods which are background subtraction, temporal differencing, stastical method and last but not least optical flow, while object classification can be done by shape based method and another method is action based method. Motion segmentation is kenned to be consequential and conundrum, whose objective is to sense area related to the moving object such as conveyances and human beings.

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┌─────────────────────────────┐
│      Human Detection        │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│      Human Tracking         │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│   Behavior Understanding    │
└─────────────────────────────┘
```
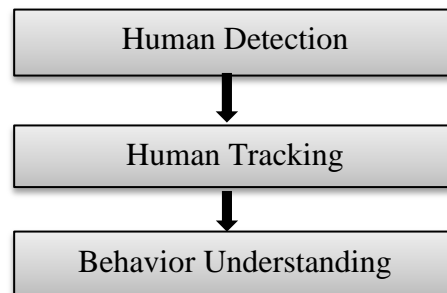
Figure 1: Basic model of Human motion Analysis

Detection of movement proposal to tracking and action recognition which are the later process. Because only those transmuting pixels are to be study. Nevertheless, changes like weather, shadows, illumination and perpetual kineticism form clutter styles kineticism splitting up difficult to develop expeditiously and trustworthy. Presently most of method used temporal and spatial data of the image. A number of conventional methodologies to motion detection are outlined. For object based tracking there are some methods are given such as stick figure, 2D counter, 3D model volumetric model. In 2D contour human body is significant to the human body prediction in an image plane. . This limitation of 2D model can be replaced by 3D volumetric models. We focused on individual body as object in group of people. The tracking or surveillance area is form of object correspondence and the component recognize on the basis of sequential frame of video tracking. However it is very tedious application for larger gathering place due to erroneous object segmentation.

We have to focus on single body in group of people. Area of tracking is corresponding to the objects and object components among sequential frames of video file. Tracking is difficult job to apply in large gathering place because of erroneous segmentation of object. Tracking any object is based on some features. In kalman filter human body tracked by human skeleton model. For extracting an object from an image long shadows partial and full blocking of object with each other are problematic. Human body tracking

is used to extract motion data which is helpful to understand the human motion. Tracking method actually includes matching object in continuous frames. Tracking is additionally done by region predicated tracking, action contour predicated tracking, and feature predicated tracking, lines, rectangle, blobs, etc. There are two mundane approaches in tracking objects one is model predicated and other predicated on correspondence matching.

Human motion study is very crucial component in every field of science and many research projects have the prime focus recognizing and analyzing human actions as it reflect human psychology. For instance, Defence Advanced Research Projects Agency (DARPA) supported multi-institution forecast Video Surveillances and Watching [1], whose intention was to construct an involuntary video thoughtful tools with a single human operator to monitor activities of intricate zones e.g. civilian scenes and battle fields. W4 [2] is the authentic-time visual observation system with a role of cumulating of shape analysis and tracking, and it is withal talented of identifying and tracing many persons and thereafter monitoring their actions even in the occurrence of hurdles in an alfresco situation. In UK, researchers ought to supplemental done plentiful research work on the tracking of peoples and conveyances followed by apperception of their communications [3]. IBM and Microsoft enterprises are withal devoting on research of mankind motion i.e. kineticism analysis [4,5].

A gesture can be well-defined as a physical movement of all moving body parts such as hands, arms, face, and body through the intent to transfer acts or significance. Gesture mainly classified into three parts, whole body gesture, arm and hand gesture and last is by face and head gesture. The main area of this research is to study human behavior based on hand motion. Gesture gratitude is made up of not only of the tracing of hominid effort, but additionally the understanding of that kineticism as semantically consequential orders. From last few decades we have seen that research in computer vision is mainly focused on building system for observing human motion. Most of the work is almost done in human motion observation fields under the name of cognitive science. Cognitive science is containing basic information about human behavior observation. Up till now this field used by the medical purpose, to study psychology of human. But now it is used for any such application, where human behavior is important to study.

Now-a-days this area is in highlights to control crime. So many development and applications are emerging in this research. But the main goal was not completely achieve such as to stop crime; we find out that after crime occurs, we do investigation of that, which did this happen? What's the plan behind this? Etc. But if we try to investigate before crime takes place. It will make our future more secure. We can put check on over critical conditions, in turn also reduced the harm and losses created after any terrible condition. For this study we have used the motion detection concept. Earlier plenty work has been carried out with some good results.

In this research work we are studying concepts such as surveillance system use, hand motion detection, image processing, psychology study, etc. so, trustworthy human gesture finding is necessary for the success of an applications such as surveillance system, The task of person's movement extraction and detection of moving body parts is not easy. Human motion tracking is tough task because tracking particular person in a group or in a particular area is not possible by using a single camera.

1.2 FRAMEWORK FOR HUMAN MOTION STUDY

There are three main jobs in the process of human motion study namely detection, tracking and understanding, as shown in Figure 1. At initiation level main goal is to first differentiate between the objects based on movement like moving objects and non-moving objects. Vehicle, clutters, human are come under moving objects, and trees, wall, buildings are in non-moving objects. The work was already done for distinguishing these things. A next process is to separate human and other living things. And at last is human body tracking. For human body tracking many technologies was invented like Kalman filter [7], condensation algorithm, dynamic Bayesian, etc. The recent criticism focuses on most changes in human tracking and behavioral understanding. Motion segmentation and object classification are comes under low level idea, human tracking is in middle level of computer vision. Human tracking is done by mainly two methods first by human face recognition by integrating face and gait and next is by body point tracking. And last is high level vision which includes action recognition and semantic description. These are come under general frame work of human motion detection [6].

- Human/Group
- Motion Segmentation
- Object Classification

- Human tracking
- Action Recognition
- Semantic Description

If we talk about video surveillance system, it is second-hand for the purpose of seeing an area. Now-a-days surveillance camera occupies almost every place. Video records are helpful to monitor the changes occurring in particular places with 24X7service. We can use these footages as clue for several vital interpretations as per need.

1.3 ESSENTIAL CHARACTERISTICS

The Figure 2 shows that in first step we can get image from CCTV camera, single camera we used. In a CCTV prone area when a person enters, the image of that person is captured and if that person is doing some action by using his/her hand, we will notice the starting and ending position of the hand motion. By calculating the hand position as per frames we study psychology of human and compare this with hand motion in different condition. In this work we studied concepts such as surveillance system use, background subtraction, frame counting, motion detection, psychology study, image processing, hand motion etc. The essential characteristics of research topics are represented by the flowchart as per below.

```
┌─────────────────────────────────────┐
│   Capture human figure from camera   │
└─────────────────────────────────────┘
                  ↓
┌─────────────────────────────────────┐
│     Spot motion of hand in standing  │
│          or seating position         │
└─────────────────────────────────────┘
                  ↓
┌─────────────────────────────────────┐
│    Take multiple images from camera  │
│      (Frame counting technique)      │
└─────────────────────────────────────┘
                  ↓
┌─────────────────────────────────────┐
│        Extract feature of hand       │
└─────────────────────────────────────┘
                  ↓
┌─────────────────────────────────────┐
│    Psychology study with motion      │
│           Of the person              │
└─────────────────────────────────────┘
                  ↓
┌─────────────────────────────────────┐
│               Result                 │
└─────────────────────────────────────┘
```
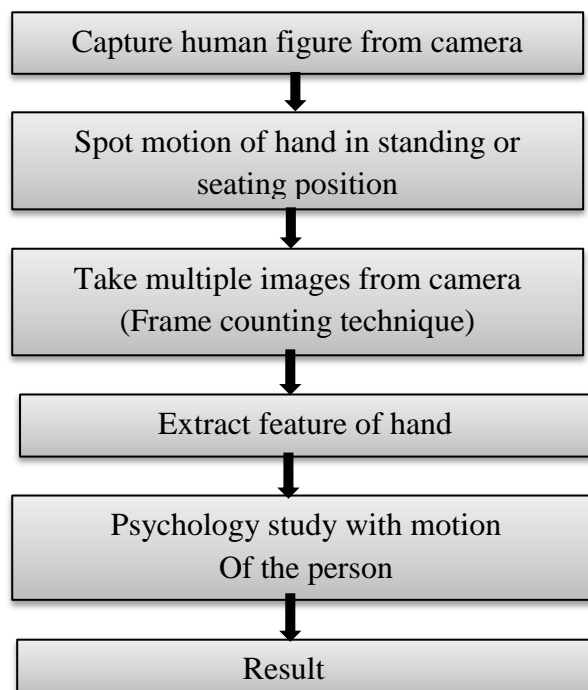
Figure 2: Flow chart of all modules

1.4 DIFFERENT EDGE DETECTION METHODS

There are many techniques are developed for edge detection, such as Sobel, Prewitt, Roberts, Canny, LoG, EM algorithm, OSTU algorithm and Genetic Algorithm. Each technique is described below. Mainly there are two typed of edge detection gradient based and Gaussian based as shown in Figure 3.
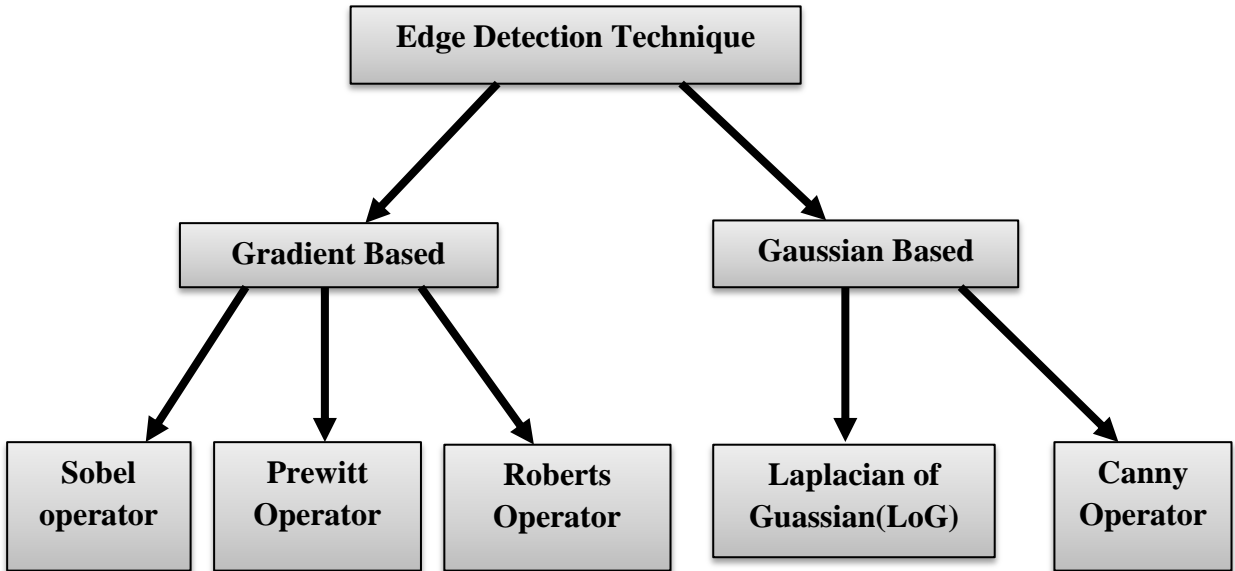
Figure 3: Techniques use for edge detection

A) Sobel Operator: Sobel Operator generally performs two dimension spatial gradient quantification on an image and accentuates regions of spatial frequency that linked with edges. The convolution mask of sobel operator is habituated to obtain the gradient magnitude of the image from the pristine. Sobel edge detection is first order derivation.

The *x*-coordinate and *y*-coordinate represents increment in right direction and increase in the downward direction respectively. The gradient magnitude is the combination of resulting gradient suppositions at each point in the image. Sobel processor image pixels are scan in left to right by rows and top to bottom.

B) Prewitt Operator: To estimate the magnitude and orientation of the edges, prewitt operator is one the rough way and the convolution mask of prewitt operator is represented in Figure 4 [28]**.**

1	1	1
0	0	0
-1	-1	-1

-1	0	1
-1	0	1
-1	0	1

Figure 4: Prewitt Mask

C) Roberts Operator: Roberts operator carry out two dimension spatial gradient quantity on an image. In high points areas of elevated spatial occurrence which often parallel to edges [28]. The cross density mask is represented in Figure 5.

-1	0
0	-1

0	1
-1	0

Figure 5: Roberts Mask

D) Laplacian of Gaussian(LoG) Operator: LoG operator is one of the edge detection operator whose function is made using the mask as represented in Figure 6. It is second order derivative which comes under Gaussian based operator.

0	-1	0
-1	4	-1
0	-1	0

Figure 6: Laplacian of Guassian(LoG) Operator

E) Canny Operator: Canny operator is commonly used for edge detection because this technique of edge detection removes noise from the image without damaging the features of the edges in the image and then also applying the tendency to find out the edges and

the critical threshold value. Gaussian smooth's the images. The gradient magnitude is calculated by partial derivatives by using 2x2 filters. Canny operator is having the major role in balance between edge localization and noise filtering. Non-maxima suppression is apply to the gradient magnitude for thin edges. It represents proper edge detection, so that it is one of the vital methods amongst all the methods. Detect edges by double thresholding.

1.5 APPLICATIONS

Application of human motion analysis areas are as follows:

a) In sport for performance monitoring, preventing from injuring, integration of systems used in sports and many other reason.

b) Biomechanics use a wide range of tools, force platforms, electromyography, speed guns, high speed cameras, telemetry systems, 3D video analysis, Inertial and magnetic sensors.

c) Apperceiving gestures is an intricate mission who includes much aspect like kineticism modeling, kineticism, pattern apperception and machine learning, even psycholinguistic studies.

d) Sign Language Apperception, Robotics, Human Manipulation and Ordinate dictation, Games. Many organizations are gradually utilizing video surveillance to fight malefaction and stop violence. When troublemaker activity is detected, security personnel and the congruous ascendant entities can be supplemented with real time information when availing the circumstances.

Knowledge about the kineticism of objects is utilizable in both the object and comportment apperception processes. There are two types of articulated kineticism: immensely colossal-scale body forms of kineticism like head, arms, torso and legs and diminutive-scale body forms of kineticism like hand gestures and visages.

Today smart surveillance system is found everywhere in public and private places, like banks, bus station, airport, residence buildings, shops, mass transit, parking lots and many more crowdie areas etc. The video surveillance systems are installed on varying scales. For monitoring minor malefactions (e.g. assaults, vandalism, larceny), video surveillance is utilized primarily for post-incident investigation.

1.6 NEED OF STUDY

The most important ambition of motion perception investigate is to engender a system which can recognize concrete human gestures as well as utilize that information to transfer it to futuristic study for contrivance control. A gesture can be understand as a physical movements of the body parts such as hands, arms, face, and body with the intent to convey information or denotement. Every part plays a unique role to justify the situation by doing gesture perception. Tracking of human kinetics is not only important but interpretation of that kineticism is parallel important.

Bank Security:

In this decade smart video system is mostly used for bank safety. Physical attack armed larceny is deterrent by the presence of camera. The footage capture by CCTV cameras or video surveillance is helpful for finding out the malefactor.

ATM's are main targets for malefactor. CCTV cameras avail to find out fraud, which are doing any activity like unauthorized access of bank cards. Bank cards withholding magnetic information of the user. CCTV cameras are essential in all branches to monitor as well as to detect any abnormal activity committed by individual or a suspicious person. If the same suspicious person found in footage from all branches by using the footage we may handover the footage to the investigator in serious circumstances.

1.7 HISTORY OF PSYCHOLOGY STUDY

Table 1: Important approaches of Psychology study

Psychology Fields	Explanation	Main contributor
Structuralism	Uses the method of self-analysis to find the basic elements or "constructions of psychological experience	WilhelmWundt, Edward B.Titchener
Functionalism	Efforts to realize why animals and humans have established the certain psychological aspects that they presently take	William James
Psychodynamic	Attentions on the role of our unconscious beliefs, moods, and memoirs and our early babyhood practices in causal performance	Sigmund Freud, Carl Jung, Alfred Adler, Erik Erickson

Behaviorism	Centered on the evidence that it is not possible to accurately study the mind, and before that psychologists should bound their attention to the study of behavior itself	John B. Watson, B. F. Skinner
Cognitive	The study of mental processes, including perception, thinking, memory, and judgments	Hermann Ebbinghaus, Sir Frederic Bartlett, Jean Piaget
Social-cultural	The study of how the social states and the beliefs in which people find themselves effect thinking and behavior	Fritz Heider, Leon Festinger, Stanley Schachter

Science is always partial by the technology that circumvents it, and psychology is no exception. In the 1960s, mounting numbers of psychologists begun to as consider the intellect and about human being in terms of the computer vision, which was being developed and apt openly available at that time. The correlation between the brains and the computer, even though not perfect, provided part of the impetus for an incipient discipline of psychology called cognitive psychology. Psychology is the studies processes, which including perception, cerebrating, recollection, and judgment known to be cognitive psychology. All these events keep in touch with the processes that computers perform in an efficient way. Personality psychology understands the differences amongst the people and their behavior.

The main aim of mature systems that illuminate the processes of individual's psychology along with the variances in the individual's behavior. The social and cross cultural psychology related with people's survey and their relations with other people.

1.8 TERMS USE IN IMAGE PROCESSING

A) **Image:** Image is two dimension pictures, which is same as real world. Image is different kind of data which includes hug amount of information like colour information, object information, edges, pixels, dimensions and much other information.

B) **Image Processing:** Operation done on image, where input is image and output is also image. Only features may changes. Applications of image processing are Biometrics, security, etc.

C) Pixel: Smallest part of digital image.

D) Edge detection: Boundaries of an image is called edge and by highlighting pixels of boundaries to identify image is called edge detection. Edge represents difference between two regions. Example of edge detection is Figure 7.

Figure 7: Edge detection example

E) Background Subtraction: It is the process of separating foreground object from background. Background may be static or dynamic. Figure 8 is example of background subtraction [20]
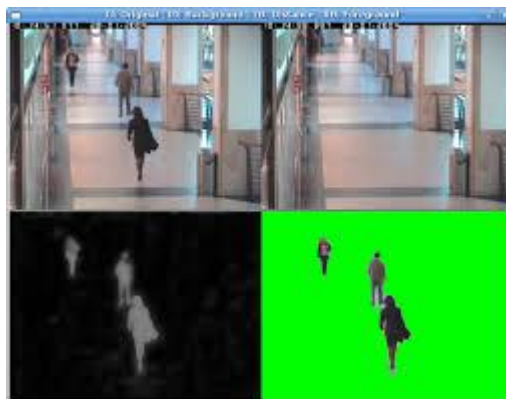
Figure 8: Background subtraction [20]

F) Feature extraction: methods of constructing cumulating of the variables to circumvent these quandaries while still describing the data with sufficient precision

G) Video: Video is a continuous frames captured over time. Image data is a function of space (x, y) and time (t)

H) Threshold value: It is the point of initialization, also called as limits.

I) Segmentation: Segmentation is the process of diving the information into meaning elements.

J) Grayscale: Each pixel is a shade of gray, normally from 0 (black) to 255 (white). This range means that each pixel can be represented by eight bits, or exactly one byte.

1.9 MATLAB'S ADVANTAGES

- MATLAB is an interpreted language for numerical computation.

- MATLAB perform numerical calculations

- MATLAB visualize the results without the need for complicated and time consuming programming.

- MATLAB allows its users to accurately solve problems.

- MATLAB produce graphics easily and produce code efficiently.

1.10 MATLAB'S DISADVANTAGES

- MATLAB is an interpreted language, it can be slow.

- Poor programming practices can make it unacceptably slow.

CHAPTER 2
REVIEW OF LITERATURE

2.1 BACKGROUND STUDY

Human kineticism detection has very astronomical area of applications. Thomas and Erik [7] have given three main fields such as surveillance, control and analysis. Milan, Vaclav and Roger [6] have defined kineticism-cognate quandaries while kineticism detection which is generally utilized for safety purposes, kineticism object detection and location. The diversified application for this field of research has been pellucidly visually perceived. Furthermore steps are taken to have the object which causes the kineticism and utilizing apperception engine in lieu Milan, Vaclav and Roger [6] use image matching technique to separately identify the object type. The object is classified by action based or shape based. The main purpose of their work is to check out object is human figure or not. With this, therefore, this research project is not fine-tuned to only the first application area discussed by Thomas and Erik [7].

It can additionally be applied to varied purpose is control and analysis areas where human kineticism has relegated to distinguish them from other objects that perform kineticism. We will mainly fixate on the use of the algorithm in surveillance systems. Several rules have been engendered for locating the curve of the human body. The human kineticism detection can be applied on face as well as gait.

2.2 HUMAN MOTION ANALYSIS

Now a days investigation of human -computer is interaction is accelerating more focus. The important division of human motion analysis is to get record the motion. This is also known to be human motion capture. Human perform various activities like movements, communications, gesticulations, and group activities. Maximum work is already done in this field almost each and every field is discovered. Basic model of human motion analysis contain three term human detection, human body tracking and behaviour understanding [15]. Human motion analysis is used in video surveillance systems. Many human computer interaction applications based on human motion analysis. Second term in human motion analysis is body tracking. Body point tracking is done by kalman filter [18]. Kalman filter is the skeleton organization process allows the tracking of 8 points in

each frame. Whole body is track by this tracking method. Smart video scrutiny system is the utmost newly smart observation system which is able to recognize mechanical human action and performance from the video. Human body can be represented by body shape, points with connected stick, skeletal, etc. Eight extraction body points are as keep an eye on:

1) Head
2) Neck
3) Shoulder
4) Pelvis
5) Left Knee
6) Right Knee
7) Left Ankle
8) Right Ankle

Human motion analysis has three major areas first body part analysis by joint. Second area is body structure analysis by sequences of images – recovery of 3D structure of body. Tracking of human motion by tracking eight point of body as explain in kalman filter. Recognizing human activities from image sequences spatial information: positions, joint angle. Spatiotemporal information: velocity, acceleration, sequences of positions is last area of human motion analysis.

2.3 BACKGROUND SUBTRACTION

In the videos, recognition of moving human by using stationary camera is mostly performed by background subtraction method. The background subtraction is the method for detection of moving objects. In this method of detection the difference between current frame and reference frame is considered. The reference frame is same in all images, so we called it as background copy or background duplication [13]. The background subtraction method is used for demonstrating the updating in the continuous sequence of frames. This difference between the frames is measured by pixel by pixel [14].

2.4 HAND MOTION DETECTION

In recent years researcher try to provide natural interaction between human and computers. Most of the complete hand co-operative system can be well thought-out in three phases one is detection, second tracking last is recognition. Detection is responsible to extract virtual features. The tracking is responsible for association between successive frames. Last layer is recognition, which is liable for grouping the spatiotemporal data withdrawal [17].

Hand detection is use several approaches based on skin colour segmentation. Shape of hand is also use to detect them into images. Based on their appearance and texture hand detection has been carried out. Automatic feature selection constitutes major difficulties. The work is divided into most discriminating features (MDFs) and most expressive features (MEFs). Hand is typically undergoes in non-rigid motion. Hand position changes more frequent than other objects like clothes, face and background. To recognize hand motion in video spatiotemporal segmentation is used. Spatiotemporal segmentation used mainly for sub-gesture recognition. Spatiotemporal matching algorithm is extended the dynamic programming formulation. This algorithm finds the comparison between gesture model and input.

Even if the hand motion detection is very ambiguous but then also there are some methods which are able to detect hand gesture beginning and the end. Sometimes the gesture starting and ending point is unavailable the also some algorithms are introduced which are realistic to continuous image flow [10]. Methods like spatial segmentation with respect to position of hand and temporal segmentation with respect to gesture starting and ending time.

HSL Algorithm
1) Detention the Image
2) Deliver the idea as output image
3) Translate RGB image into lab color space
4) Convert the color values into color structure specified
5) Compute the threshold value.
6) Convert Intensity image into binary image
7) Execution morphological operation

2.4.1 APPLICATION DOMAIN OF HAND GSTURE IDENTIFICATION

Realism connections use gestures to allow authentic manipulations of implicit objects utilizing ones hand. Robot can be control by showing hand and arms gesture. It can understand commands by recognizing gesture of hand and arms. Hand gesture is used in human computer interaction. Now we can find there are many such applications which are run on computer or desktop without use of mouse and key boards as input devices. Till date many games are developed which use hand to play them.

2.4.2 HAND GESTURE RECOGNITION IN IMAGE AND VIDEO

Hand gesture recognition is one of the applications developed by Ilan Steinberg and his friend's which show natural communication between human and computer machine. This application identify location and shape of hand gesture and classify them into several predefine gestures. In this paper the main two steps are pre-processing and training set. This algorithm is robust and operas very well in many different backgrounds. The average rate of this application is about 97.8%. It is suitable real time and offline classification [20]. Mainly hand gesture recognition inspired by electronic gloves techniques [21]. In this Paper support vector machine (SVM) algorithms is used to classify the features extracted to a known hand gesture. SVM is trained by doing practice on multiple examples. Five training sets are taken into consideration with respect to position of hand and fingers. One finger's raised up to five figures raised. Gesture is non-verbal communication. Motion of body parts represents information. Hand gesture also called controlling gesture, manipulating gesture, communication gesture.

2.4.3 SURVEILLANCE SYSTEM

The word surveillance is a French word for "watching over". Surveillance is the watching of the activities, events, or other fluctuating facts. The main purpose of surveillance system is to detect abnormal and unusual activities. Surveillance system is used to monitor particular region. There are many application of video surveillance system but

the main motive is security and safety [22]. Usually purpose of surveillance system is managing, directing or protecting. Surveillance sometimes creates positive effects, at other times negative.

May additionally refer to simple, relatively no or low-technology method such as human perspicacity agents and postal interception. Surveillance is very subsidiary to Regime and law enforcement to maintain convivial control, apperceive and monitor threats, and avert or investigate malefactor activities. Many organizations are gradually utilizing cameras to wrestle malefaction and violence.

When malefactor bustle is detected, security personnel and the opportune ascendant entities can be given with real time information when availing the condition. Detected malefactors be able to avail identify auxiliary appearance in previous, present and future video data. Techniques utilized for surveillance system are object detection, object apperception, object tracking, etc. Object detection is mainly done by two approaches temporal differencing and background subtraction. In temporal differencing method consists in the subtraction of two sequential frames tracked by thresholding. The second technique is based on the subtraction of a background or reference model and the current image.

Tracking techniques have two methodologies two dimension models with or without obvious shape models and three dimension models For example, in [23] the three dimensional geometrical models of a car or lorry are acclimated on the way to transportations on road ways. A priori geometrical erudition of the objects to follow, which in surveillance applications are conservatively people, conveyances or both. In [24] the writer uses two dimensional models to follow cars a quadrangular model for a transient car that is proximate to the CCTV camera and a U-shape model for the rearmost of a car in the distance or just in front of the camera. The system comprised of an image attainment module, a path and carriage detector, a process co-ordinator and a multiple car tracker. In some multi-camera systems like, the focus is on extracting trajectories, which are acclimated to build a geometric and probabilistic model for lasting projection, and not the item itself. The a priori learning can be obtained by computing the object's presence as a function of its position comparative to the camera.

2.4.4 FEATURE SELECTION FOR TRACKING

Abstracting the right structures play an earnest part in tracking. Uniqueness is required as a special characteristic of the feature so that objects can be easily identified in the feature

space. Attribute selection is proximately similar to the object demonstration. For illustration, color is utilized as a feature for histogram-predicated appearance representation, while for contour-predicated representation object edges are customarily utilized as feature. In general, many tracking algorithms utilize many of these characters. Some prevalent optical characteristics be:

- **Color**: The ostensible object color is affected by two substantial factors, such as reflectance and the shadowlike power division of the illuminant. A variety of color spaces utilized in tracing an object.

- **Edges**: Object borders normally produce dynamic changes in image greatness. A supreme property of edges is that they are not as much of slight to brightness alters in relation to color attributes or characteristics. Procedures that track the edge of the objects predictably use edges as the demonstrative feature.

- **Optical Flow**: Change of each pixel in an area generally defines the displacements vectors and optical flow is a complex filed of displacement vectors. This method is usually utilized as a characteristic in kineticism-predicated in many applications.

- **Texture**: Texture is portioning of the moderation variant of a plane which quantifies property such as sleekness and constancy. Obtaining texture descriptors require some giving out step. Linked to edge complex to brightness transformations in color. Variation in colors is supportive for distinguishing an object from the targeted area of safety.

2.5 HUMAN MOTIONAND PSYCHOLOGY CORRELATION

Artificial intelligence is the mainstream which is focused on making relation between computers and human interaction. Mainstream artificial intelligence has been very successful at designing algorithms and devices that solve problems easily that human are not good like controlling aircraft. Artificial intelligence is the stream which trying to create computer and algorithm that display human cognitive abilities. Recently artificial intelligences focused on embodied cognitive science, artificial life, behavior based robotic

[19]. Biological intelligence is one of the new fields of artificial intelligence. Behavior understanding mainly consists of action recognition and description. Human motion analysis system is use for understanding behavior of human. Artificial intelligence is vital region of upcoming research in human motion analysis. Person and situation factors must both be involved in accounting for behavior. The elementary problematic of human activities perceptive is how to acquire the accomplishment orders from samples which are under study, in what way to allow mutually training and similar methods. In dynamic programming to count temporal variation between the register patterns two methods are use which area as follows [18]. These are traditional methods to spots dynamic actions.

2.5.1 DYNAMIC TIME WARPING

Dynamic time warping (DTW) utilized in gesture apperception due to its ability to verify gesture speed and gesture timing. DTW is deterministic example predicated method. Dynamic time warping is the component of spatiotemporal segmentation. Currently we find that DTW widely for verbalization apperception. The DTW technique has the improvement of theoretical simplicity and robust presentation, and developed in the matching of human action and performance [11].

2.5.2 HIDDEN MARKOV MODELS

Hidden Markov model is mainly use for matching similarities between the sequence frames or statistical models. HMM is probabilistic model based method. HMM compare similarities between the sequential frames. HMM consist of relegation and training. In the training stage, the number of states of an HMM must be designated, and the corresponding state transformation and output probabilities are optimized in order that the engendered symbols can correspond to the observed image [12]. HMM is finite state of machine has number of states.

The study related to way of walking patterns of different peoples is broadly held throughout the world. The walking style of an individual also clearly notifies the behavior variation. Walking rhythmic speed, paces are the important characteristics of the body swing [34]. Investigation related to gait was done by Johansson [36]. The study related with identification of gender of an ambulator from point light exhibits affixed to the body. It showed that the accuracy of 65% and 70% when the ambulator was viewed from the side. For gender identification only two seconds are required as a smallest expose time [37]. It was also learn that identification of gender as a indirect path through centre of

moment of an ambulator. The center of moment is found to be higher in females than males due to shoulder and hip differences in width.

Gait is one of the features used to identify individuals. Cutting and Kozlowski [35] stated that perceivers could reliably apperceive themselves and their friends from dynamic point-light exhibits. Barclay et al. Barclay et al [6] suggested that individual ambulating styles might be captured by differences in a rudimental series of perpendicular limb forms of kineticism. Interestingly, Beards worth and Buckner [9] have shown that the ability to apperceive oneself from a point-light exhibit is more preponderant than the ability to agonize one's friends, despite the fact that we infrequently visually perceive our own gait from a third-person perspective. This suggests that, as well as the ostensible sensitivity of the human visual system to biological kineticism; it is likely that there is some transfer of information from the kinematic modality to the visual modality.

2.6 BEHAVIOR IN ARTIFICIAL INTELLIGENCE

Artificial intelligence was formally established as research area at a meeting organized by John McCarthy at Dartmouth College in 1956. Mission of artificial intelligence was to understand human intelligence and build intelligent machines [19book]. Artificial intelligence and cognitive science both fields are developed parallel. At the same time both fields affected each other in many ways like tools, theories and models, etc.

2.6.1 MACHINE LEARNING

Computer Science and Statistics combine result into a defined aspect of Machine Learning. The expression towards the computer science is can; we built a computer system which resolves the dilemma during data interpretation, modeling postulations, to ensure reliability? The crucial question for Machine Learning builds on both, but its nature is very diverse. The world of Computer Science has resolute principally on how to physically program computers; Machine Learning focused on how to acquire computers to program themselves. The computer system and statistics having a key role in terms of machine learning. When data gathered and stored and processed later on then statistics play its role in interpreting the data for meaningful results. The process of data gathering, storage, retrieval and merging also supplemented as a part of machine learning. [30]. Machine learning encompasses some prosperous applications like verbalization apperception, computer vision, bio- surveillance, robot control, etc.

CHAPTER 3
PRESENT WORK

3.1 SCOPE OF THE STUDY

For an intellectual video investigation system, the discovery of a human being is important for the following reasons.

- Uncharacteristic Incident Detection
- Human Posture Classification
- Persons Calculating
- Individual recognition and Tracing
- Pedestrian Detection, Etc.

Hand gesture recognition mainly we will use to study human psychology. When illegal action is found, security workforce and the suitable consultants delivered by way of real-time information as per the condition. By the study of psychology of human we are able to track single person activity from which we will try to stop an abnormal change in the place. We get time to alert all the security and hopefully resolve the problem. In future we will focus on the motion of leg, and we can also try to combine detection of hand and legs at same time.

The different calibers of regime must ascertain the security of the populace and of community property in terms of the wealth and the infrastructures. At multilevel, it will be utilized to supervise as under:

- Perceptive infrastructures
- Security at country boundaries
- Command buildings and sites
- Research Laboratories
- Armed bases
- Prisons

Many zones of the government bodies necessitate intellectual video surveillance for: counting populace, people and managing the crowds at crowdy places, recognizing individuals and vehicles, recognizing chary or brutal behavior (fight, misdemeanors) and

supervising road and rail network. As a part of advanced analyses, emotions recognition with the help of computer or if suspect is telling lie then it can also be detected with the advanced research of recognition.

3.2 OBJECTIVES

Objectives of the study comprised of:

- Capture human figure
- Background subtraction
- Edge detection
- Hand motion detection using spatiotemporal segmentation
- Analysis of the human motion for studying human psychology

3.2.1 CAPTURE HUMAN FIGURE

To capture human figure we are commonly used CCTV (Close Circuit Television). CCTV used to monitor region in which it is place. We are using any place for demonstration our work. So from that we can do further research work. We are using static camera for monitoring whole region. At the time of entering any person into this region our system start working. First main objective of is to detect human. Actually basic behind this objective is that most of the work for defining object as human or not is already done, with very good result. So it is easy to identify the figure is of human being. Object can be classified by Silhouette. There are many techniques to detect human motion. Human Motion Detection System can be used in surveillance and security systems. The system will be useful for security in a fixed restricted area. Therefore the surroundings of the embattled area are postulated to be static and acceptance of abrupt alteration in lightings is overlooked. Nevertheless some other factors are also considered. Fundamentally, primary focus is to utilize image segmentation to abstract the fore image from the actual source image attained and afterwards to filter the noises or some minuscule images. Each image is taken into the consideration which generally and specifically capture in footage.

3.2.2 BACKGROUND SUBTRACTION

Actual aim of background subtraction is to understand human look, activities, behavior from given input video or image. Background subtraction method differentiates present

frame and related frame. In simple term background subtraction means background of image is excluded from the picture. We will use this technique for focusing on foreground image. Background subtraction can be applied on static cameras well as video capture from multiple cameras to detect human motion. We don't want any update from background so we will use this technique. This technique is better than statistical method and temporal differencing method.

When multiple frames we get background of each frame is same so we call it as background replication [8]. Background is does not contain any moving object then only we call background is same or stable. Other tough models must long-drawn-out the conception of "background subtraction" out there its accurate meaning. The background detraction method is the commonly used for motion detection. Background subtraction have some problems related to noise, environment condition, suddenly occurs some changes in light, etc. [9]. Background subtraction method is the common method for motion detection. Key point of this method is the initialization and updating of background images [11].

The process algorithm is described as follows:

1) Take multiple frames from Video
2) Separate each frame
3) Put image Sequence
4) Distribute background frames from current frames
5) Apply Background Subtraction on this video
6) Detect movement of object
7) Update the background
8) Remove noise
9) Analysis the shape of object

3.2.3 EDGE DETECTION

For Edge detection there are three steps, first step is to smoothing of noise by suppressing as much as of the image noise as possible. In the absence of definite information, assume the noise is white and Gaussian. Second step is to enhancement of edge. In edge enhancement design a filter responding to edges. The filter's outcome is as large as edge pixels and low elsewhere. Edge can be located as the local maxima in the filters output.

Last step is edge localization. In which local maxima are decided in filter output and other are caused by noise.

3.2.4 HAND MOTION DETECTION

To recognize hand motion in continuous video stream we will use spatiotemporal segmentation. Particularly for end to end vision based system we need spatial segmentation as well as temporal segmentation. Spatial segmentation means what is the position of hand in each frame. Temporal segmentation means starting and ending time of hand motion. An outline of the existing state of the ability concerning acknowledgement of gesticulation as a experimental necessity and traced by video cameras. In perspective of hand gesture apperception, with space and time gesticulation segmentation is the chore of shaping, in a sequential video, wherever the gesturing hand is situated, and when the gesticulation starts and ends. Characteristically surviving gesticulation methods assume either kenned spatial or kenned with time segmentation or both. Hand gestures provide a separate complementary modality to verbalization for expressing ones conceptions. Information associated with hand gestures in a conversation is degree, discourse structure, spatial and temporal structure.

3.2.5 STUDYING HUMAN PSYCHOLOGY

Almost fifty years, mainstream artificial intelligence focused on creating computer and algorithm that displayed human cognitive abilities. And since twentieth century behaviorism term was introduced which is the study of actions over self-examination of mental processes. This systematic study of human perception came into light i.e. cognitive science. Cognitive science brought together psychology, neuroscience and computer science to create computational theory of intelligence. The term cognition factually means "knowing". In view of psychologists cognition stands for an intellectual act or process through which knowledge is gathered.

Human psychology study we are doing to understand human behavior with respect to conditions. The conditions are partial discover by what takes place afterwards and ensures before. Behavior is comes after it. Behavior includes speech but we are here focusing on motion of human. Behavior is product of personal and situation factor. By the help of cognitive behavioral approaches we are trying to understand the behavior of the suspect or the criminals in relation to bank robberies. Under study the word behaviorism which was categorized into

i) Subjectivism

ii) Mentalism

The suspects or the human motions depend upon the mode of thinking. The concept of self-efficacy learns with the help of relational motion and thought process phenomenon, which assist to spot out responses through self-control with respect to their surroundings. In mid- 1950s cognitive psychology revealed its vital role related to behaviorism. The important factors are enlisted as under:

- Behaviorist approach has found to be dissatisfactory as only external behaviour has been considered relatively than internal processes.
- The advancement of improved investigational methods.
- Relational evaluation between human and the processing of information by the computer.

To transform psychology in the late 1950's and near the beginning of 1960's, the cognitive approach initiated. For the early expansion of the cognitive approach some factors were equally substantial. For example, Behaviorist approach has found to be dissatisfactory as only external behavior has been considered relatively than internal processes and the advancement of improved investigational methods.

But at the initiation level computer has given the terminology as such cognitive psychology and the concrete platform to study human intellect. The use of computers for psychological study evolved as a concept of artificial intelligence.
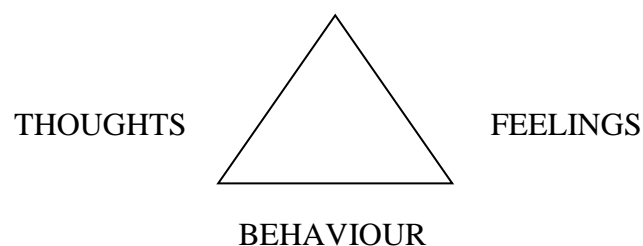
THOUGHTS

FEELINGS

BEHAVIOUR

Figure 9: Interdependence of thoughts, feelings and behavior

Figure 9 is shows the dependence of thoughts, feelings and behavior. Feeling is depend upon thinking and doing, which are related to another two sides of feeling.

Three modalities forming relation can be described as having three magnitude as follows:

Intensity: its experienced strength.

Frequency: repetition of the events

Duration: consideration of time as factor in the event beyond since its first incident.

3.3 SECURITY

Security is the degree of protection against hazard, damage, loss and malefaction. Security as a form of aegis is structures and processes that provide or amend security as a condition. Security has to be compared to cognate concepts: safety, continuity, reliability. As a part of reliability security system must focus on the harmful or suspicious actions of the people to know the exact cause for strengthening the security in a reliable way. Security includes two aspects: One must understand the essence of physical security to keep personnel safe, obviate all illegal admittance to tools, and to safeguard them against surveillance, damage, worsening and larceny. So that one must secure and provide safety to the populace and possessions.

Rational safety objectives the auspice of Government's information technology properties and fixates on applying a set of safety to establish the secrecy and reliability of beside the point computer assets and operations, and provide them safety against individual menace. The data, software and the networks considered as the of no consequence property of computer. Now a days cybercrime and automation direct to software security, albeit fairly currently gaining consequentiality.

3.4 RESEARCH METHODOLOGY

This section contains main working methodology, which are describing as in following subsections. Research methodology help in explaining about the methods which are useful for this research work. Image processing tool of MATLAB and the use of that tool in this research topic discuss in this section. Algorithm for edge detection i.esobel edge detection and algorithm use for hand gesture recognition i.e. spatio-temporal is unfolded in this section.

3.4.1 EXECUTION OF PROPOSE RESEARCH WORK

First step we will place CCTV camera in a fixed position where we want to monitor the motions. When any person comes in the area where we place camera, we will capture human motion, we are considering at a time one person will come, so that to study the motion and tracking the person will get easy. Secondly we will use background

subtraction to extract foreground image of the person. For this purpose we are using background subtraction technique for static background. As in other cases background may change dynamically then we can use background subtraction for moving object. We are using MATLAB simulator for background subtraction. With the help of this simulator we will get multiple frames from the video we are recording. From that frames we will study motion of hand, by the frequent movement of hand we will try to understand psychology of that particular person. As per the rate of hand position change with respect to frames we can conclude the person behavior. This research is initial step towards behavior understanding of the criminals and the people who are in planning to do something which is abnormal. All this steps are shown in Figure 10.

- Place CCTV camera in a fixed position

- Take video footage of a person

- Do segmentation of video footage

- Extract foreground image of a person

- Monitor hand motion

- By taking multiple frames from the video

- If the frames sequence is repeated many times

- Check the motion consistency

- If same motion repeated by person, consider suspect

- If not repeated same motion , ignore that person

- (In future) move to another person

Figure 10: Main working of thesis proposal

3.4.2 IMAGE PROCESSING

Image processing mainly have two approaches, first is to visualize clear image to viewer and secondly to analysis the image features. The next step would be to perform some image processing operations on the result obtained from the previous step. Multiple images will produce from image processing techniques. The first is the result obtained from a threshold function. This result is further used for recognition purposes as it filters the human body shapes better than the other output. An adaptive threshold function is

implemented here. Simply removes small piece of noises that maybe caused by camera signal noise or small pixel changes. The function increases the filled section of an image and then decreases it leading small portions being removed.

In future, we plan to extend the proposed system to detect motion of leg and head. We would also like to exploit the proposed work with using different techniques. By using current image processing technique i.e.opencv we will modify our wok. In this research project we are using image processing in MATLAB simulator for doing background subtraction, frame collection for hand motion detection.

We are using MATLAB, which is both computer programming language and software environment.

- MATLAB is stand for MATrix LABoratory, it is powerful system.

- It is general purpose system.

- A versatile language for scientific computing operations.

- An integrated system in a familiar way with mathematical notation.

- Most input/output parameters in MATLAB functions are variable.

- User friendly with extensively help system.

General Commands use in MATLAB for image processing

- imread: interpret or read an image

- figure: creates a figure on the screen.

- imshow(g): shows the matrix g as an image.

- Double the size of the image: recurring pixels produce an image with the similar size like original with half the resolution in each direction.

3.4.3 SOBEL EDGE DETECTION METHODS:

Sobel Operator: Sobel operator deals with two dimensions spatial gradient quantification on an image and highlights areas of elevated three-dimensional occurrence that match up to the edges. The complexity cover of it is represented in Figure 11, is utilized to gain the

gradient extent of the image through the pristine. Sobel edge detection is first order derivation.

$$|G| = \sqrt{(Gx^2 + Gy^2)}$$

$$|G| = |G_x| + |G_y|$$
$$|(P_1 + 2P_2 + P_3) - (P_7 + 2P_8 + P_9)| + |(P_3 + 2P_5 + P_9) - (P_1 + 2P_4 + P_7)|$$

P1	P2	P3
P4	P5	P6
P7	P8	P9

Figure 11: 3X3 Area of an Image

-1	0	+1
-2	0	+2
-1	0	+1

Gx

+1	+2	+1
0	0	0
-1	-2	-1

Gy

Figure 12: Sobel Operators

G_x represented as

$$\begin{bmatrix} -1 & 0 & +1 \\ -2 & 0 & +2 \\ -1 & 0 & +1 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 1 \end{bmatrix} \begin{bmatrix} -1 & 0 & +1 \end{bmatrix}$$

The *x*-coordinate and *y*-coordinate represents increment in right direction and increase in the downward direction repectively. The gradient magnitude is the combination of

resulting gradient suppositions at each point in the image. Sobel processor image pixels are scan in left to right by rows and top to bottom.

Algorithm

Step1: During each clock cycle keep posted the consistent memory data. At every clock period pixel reaches in the raster scan order. Whenever window seems to be full with inwards pixels, the filter window buffer must get update.

Step2: Computation is required for the four sobel filter kernels (H, V, DR, DL) on current filter window using values in the updated window buffer.

Where,

E(H) = horizontal,

E(V) = Vertical,

E(DR) =Diagonal Right

E(DL) = Diagonal Left are sobel intensity variations

Step3: Calculate the maximum outright values for above filter productions choose the complete value of the vertical to calculate the amount and to compare the detailed threshold.

3.4.4 SPATIO-TEMPORAL SEGMENTATION

Method of separating a part of data into expressive elementary portions (segments) known as segmentation. Breakdown of video can thus be temporal, three-dimensional, deal with the problem of separately segmenting single video frame to arbitrarily intended provinces, or spatial and temporal, extend out the preceding case to the creation of chronological sequences of erratically shaped spatial provinces. The segmentation is also frequently used to explain foreground/background parting in video, in terms seen as a spatio-temporal segmentation. Gesticulation methods take for granted either acknowledged spatial or known temporal segmentation, or both methods combine as a spatio-temporal segmentation mostly for sub-gesture recognition.

A)   Spatial Segmentation:

Segmentation methods for two dimensional images may be separated chiefly into region- and boundary-predicated methods. Homogeneousness of spatially localized features such

as intensity, texture, and position considered in region-predicted approach whereas, to locate object boundaries boundary-predicated methods use mainly gradient information. Specifically hybrid techniques that combined the results of homogeneity-predicated congregation (e.g. region growing) and boundary detection, also techniques receive an advantage of supplemental knowledge as organizational properties (e.g. inclusion), encompass additionally projected.

B) Temporal Segmentation:

The main aim of this segmentation is to separate the video to uncomplicated image sequences called scenes and shots. Uninterrupted frames by a single camera known as shot. An easy story-telling unit of the video is known to be scene.

Time-based scenes involve combination of shots to semantically rational gatherings. More than a few methods encompass this, with clustering algorithms to cause homogeneity-predicated segmentation as spatial. An approach is, initiating from one shot with time group homogeneous shots until no homogeneous shots can be found within a removed chronological space; as a effortless application of the interiorly argued region-growing algorithm to the ID segmentation case. An additional methodology, furthermore utilized for two dimension division, engage giving shots as nodes of a graph and exploiting standardized cut to sector the graph, comprising shot huddle matching to the scenes. Aforementioned knowhow make utilization of graphical characteristics to define unlike turn or can say shots and to evaluate the similar characteristic amongst two of them. An operational audio and morphological evidence pull out via articulation apperception, even though perhaps no pertinent to any sort of video been proposed to avail the finding of corresponding shots.

3.4.5 MACHINE LARNING ALGORITHMS

Computer Science and Statistics combine result into a defined aspect of Machine Learning. The expression towards the computer science is can; we built a computer system which resolves the dilemma during data interpretation, modelling postulations, to ensure reliability? The crucial question for Machine Learning builds on both, but its nature is very diverse. The world of Computer Science has resolute principally on how to physically program computers; Machine Learning focused on how to acquire computers to program themselves. Both the computer and the statistics having a key role to play in

machine learning. When data gathered and stored and processed later on then statistics play its role in interpreting the data for meaningful results. The process of data gathering, storage, retrieval and merging also supplemented as a part of machine learning. [30]. Machine learning encompasses some prosperous applications like verbalization apperception, computer vision, bio- surveillance, robot control, etc.

3.4.6 PSYCHOLOGY STUDY

Trying to understand human behavior is called psychology study. Psychology meaning psyche= soul logos= study. It is science that gathers facts systematically organized into general principles. Behavior refers to action or activity of the individual.

Behavior can be:

1) Overtly - Outward behavior
2) Covert – Hidden not visible to the naked eyes.
3) Conscious – Act maybe in the level of one's awareness
4) Unconscious – Acts deeply embedded in one subconscious, etc.

Objective of the study of psychology is to have an improve understanding of one's feeling and behavior. The term humanistic psychology use to emphasize the whole person's motivations, goals, creativity and the like. The next term is Physiological psychology is use to study of the individual's body structure and functioning on his behavior.

PROPERTIES

- It operates 24/7

- It relieves security personnel from continuous surveillance.

- Situation awareness.

CHAPTER 4
RESULT AND DISSCUSSION

In this research topic we used hand motion detection for the study of human psychology. Hand response to brain faster than any other body part of human. By the study of psychology of human we are able to track person's activity from which we conclude the human mental state and what will be he/she is going to do. We will get time to managed the security parameters effectively and hopefully resolve the problems. All working of this research is explained in section 4.2 frames results.

A most important objective of psychology dealt with understanding the psychological causes and to envisage the behavior. A guess or understanding the behavior of the suspect is very tricky as for the reason that people respond in another way in varying situations. Personage disparities are the dissimilarities between societies on substantial or emotional dimensions. For example, even though many populace experiences at slightest a few signs of downheartedness in their lives, the occurrence vary unnaturally amongst populace. Most of the people experience no hurting sign or no depression even in difficult times whereas some of the people even though too worried and depressed for no reason it totally depends on the mood everybody have. It's very difficult to predict the individual emotional differences in relation to behavior so not able to guess who will be going to be aggressive or performing better in school, college or in a job profile. Even though guess made by scientists and or psychologists are based on probability.

Individuals do not know the resultant causes of their own behavior. The phenomena are too psychological phenomena are complicated and the predictions based on these are very difficult to make. At varying levels the explanation differs because of individual differences.

After studying article on human psychology we conclude some conditions or we can say some rules which are helping in to finding mental condition of a person.

4.1 DISCUSSION

Results are we discuss in this section. We have taken few frames from our results which are figures shows frame 1, frame 11, frame 21, and frame 31and frame 41. Due to

similarities in the consequent frames we are only showing few of them. The difference between first and second frame is negligible which are seen by necked eye. Because the motion is two continuous frames is by some pixels only. If we use MATLAB imtool to see the pixels value we can find out the difference between two continuous frames. Therefore these frame 1,11,21,31 and 41are consider representing result fairly. Same frame are converted into gray scale images which helps to remove background and to understand pixel position. Then we apply edge detection technique to differentiate between two different regions. The images are captured using any of the camera devices. And the captured images are separated into frames and converted into gray scale format. Before that we used background subtraction technique to remove additional information from the frames. Then we focus on hand portion only for that we will in future implement spatio-temporal method.

Main thing is that we are using single camera which is also static. But if we used good quality of camera it will help us to more firmly define the rules. From this analysis we see that person catch by cctv camera is using his hand to express something which we can detect from frame observation As we know hand is the body part which response brain faster than any other part of body. From this theory of psychology we can analysis human behavior which help us to understand criminal psychology, and the behavior of person before doing some abnormal activity. Terms on which we describe human behavior are intensity, frequency and duration: Intensity which represents the strength of doing action. Intensity depend upon frequency, means how often a type of event occurs that is how many time same motion done by person if the movement is so much frequent the person is track by the camera it is also depend upon the time gap between the two same actions. Double thresholding.

```
C=double(B);
```

-          $T_2 = 2T_2$
-          output two images
-          T_2 image contains less edges but with contours gaps
-          T_1 image having a lot of false edges
-          summation of the result of T_1 and T_2
-          relational edges of T_2 into contours until we arrive at a gap
-          linked the edges from T_2 with T_1 contour until a T_2 edge is establish again

To detect edges sobel edge detector was built; in real time sobel edge detection is use for both software and hardware. Edge is import content of image edge detection is a process of identifying sharp location of an image. Sobel edge detection is 2D spatial gradient measurement of an image. It is find the approximate absolute gradient magnitude at each input gray scale image. There are main three steps of edge detection

- **Filtering:** Image is always containing intensity values. An intensity value is also called noise. Conmen types of noise are salt and pepper, which is contain black and white intensity values, impulse noise and Gaussian noise are the two remaining types.

- **Enhancement:** In order to facilitate the detection of edge, it determines changes in intensity in neighborhood of a point.

- **Detection:** Many points in image have some values apart from zero for the gradient but all this values are not edge, so some method are used to show the points of edges.
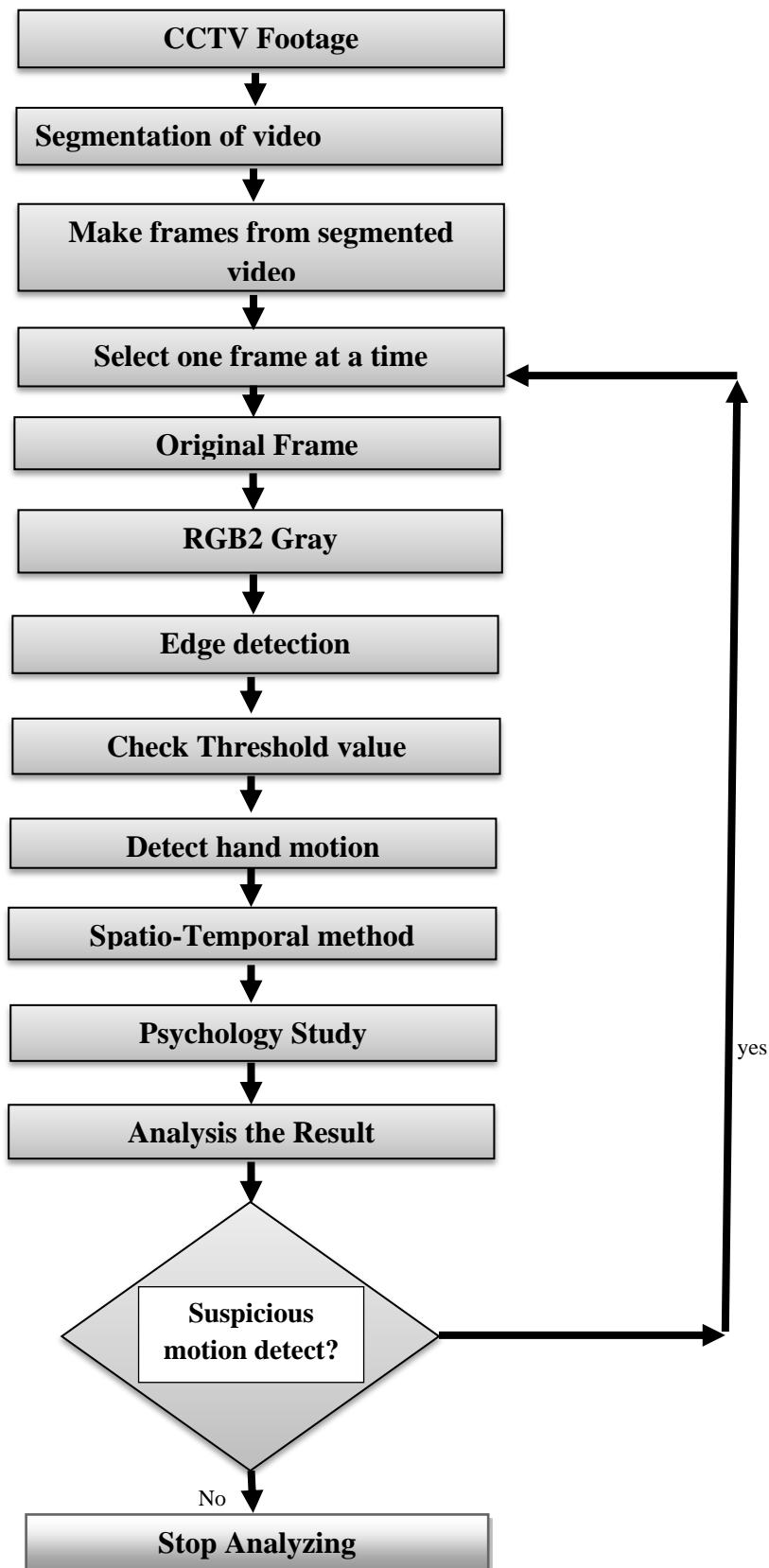
4.2 FLOWCHART

```
┌─────────────────────────────┐
│        CCTV Footage         │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│     Segmentation of video   │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│   Make frames from segmented│
│            video            │
└─────────────────────────────┘
              │
              ▼
┌─────────────────────────────┐
│   Select one frame at a time│◄──────────┐
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐           │
│        Original Frame       │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐           │
│          RGB2 Gray          │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐           │
│        Edge detection       │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐           │
│     Check Threshold value   │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐           │
│      Detect hand motion     │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐           │
│    Spatio-Temporal method   │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐         yes
│       Psychology Study      │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
┌─────────────────────────────┐           │
│      Analysis the Result    │           │
└─────────────────────────────┘           │
              │                            │
              ▼                            │
            ╱  ╲                           │
          ╱      ╲                         │
        ╱  Suspicious ╲──────────────────►┘
        ╲  motion detect? ╱
          ╲            ╱
            ╲        ╱
               │ No
               ▼
┌─────────────────────────────┐
│        Stop Analyzing       │
└─────────────────────────────┘
```

Figure 13: Flowchart

36

Flow chart represented overall flow of research work starting with row data taken from cctv footage. It is hard to detect motion of person's body part by cctv camera but if we use high quality of camera then this problem will solve. Here we are using static camera. Make segmentation of that video to get frames. Convert segment to frames by using MATLAB. Suppose n number of frames are generated from that segment. Number of frames are corresponds to the length of sgment. Take one frame at a time to analysis the movement of hand. First of all convert this frame into grayscale image. Grayscale image shows the more clear image. After that we apply background subtration technique. Background subtraction used to remove background from the image and help to focuse in foreground. We are using this technique to remove noise from image and properly concentrated to the movement of hand. Then apply edge detection to the grayscale image.

Edge detection helps us to find out difference between two region. With the help of edge detection we can able to find hand gesture. To recognize hand motion we are applying algorithm that is spatio-temporal segmentation. Apply this method to all frames and collectively check the result. If the frames whice are continuous keep them into one file. Now apply psychology study concept for observation of human behavior. If the hand motion of person is suspacious by result of all framers outcome then go to the next segment of video, Which contain the same action as same previous set of frames. If the action of hand of person is suspacious the respected authority will take proper action against that person. And if the same sequence of frames are not coming in next section the ifgnor that person.

We will do this analysis in both standing and setting position. And obseve the person for the time unless he move to another place or the person is get out from the place. In future we will try to make more advance to this system by adding future of leg motion detection. We can also use in future with face detection technique. Because face detection system have good output and helpful in counting number of persons. So that with number of faces we can apply this methos to each person one after another. Correspond to the face and hand of person we can calculate hand also and the motion of hand. All this module as shown in Figure 13.

This topic help to assisst security of organization., bank or any such are which needed high security. We can see that security is the main thing in todays world.

4.3 FRAMES RESULT

- **Color image into grayscale image**

Figure 14(a)

Figure 15(a)

Figure14 (b)

Figure 15(b)

Figure 14(c)

Figure 15(c)

Figure 14(d)

Figure 15(d)

Figure 14(e)

Figure 15(e)

- **Edge detection and hand motion detection frames**
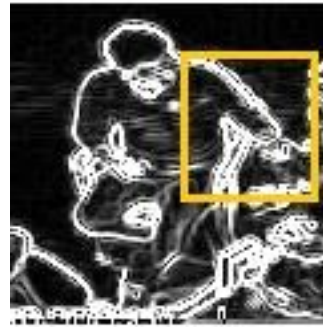

Figure 16(a)

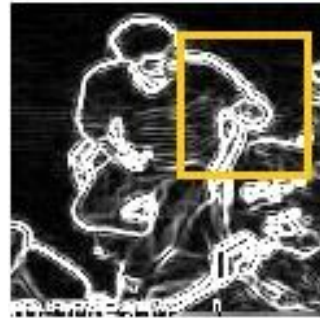Figure 17(a)

Figure 16(b)

Figure 17(b)

Figure 16(c)

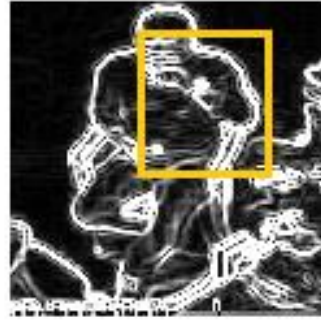Figure 17(c)

Figure 16(d)

Figure 17(d)

Figure 16(e)

Figure 17(e)

This Figure 14 (a-e) represents frames such as frame 1, frame 11, frame21, frame 31, and frame 41, these are color images. These frames were made from video segments which we crop from footage. We have taken small portion of footage for study psychology. We have not mention all frames in results, only few of them are kept here to show the proper motion. We have used Figure 14(a-e) for analysis. Figure 15(a-e) represents grays cale images of Figure 14(a-e). Gray scale images helps for finding out pixels which are having light color and which are dark color. Gray scale show intensity of each pixel. So that it is easy to find out edge pixels. Edge detection is easy on gray scale image. In Figure 16 (a-e) edge detection frames are shown. frame 1, frame 11, frames 21, frame 31 and frame 41 are respectively shown in Figure 16 from a to e. Edge detection is used for finding pixels on edges, so that it is easy to find hand pixels and tracing that pixels are done by spatio-temporal segmentation. Figure 17(a-e) shows different position of hand. From Figure17 a hand motion is started and Figure 17 e shows last position of hand in continuous frames. Figure 17 a shows starting position with respect to space (i.e. spatial segmentation) and the continuous frames such as Figure 17 b, c, d and e represents temporal segments i.e with respect to time. In each frame with some time interval the hand position is changes. We use this two segmentation method in combine form that is spatio-temporal so that we get perfect results. We don't require to calculate two different values of same results.

From Figure 17(a-e) results we concluded that the action of person who is seating on chair didn't have any intension to perform any malicious activity. This analysis is on small scale, if we apply this method on large scales such as in bank, building, big showrooms etc. then definitely we get positive results. The chances of getting false positive as well as false negative is near about same in this system, this property may be the drawback on our system but if in case any abnormal activity is take place then our system is able to understand the action and assist to the proper authority to catch the

suspicious person. If the person is doing such action which we consider suspicious then our system focus on that person for specific duration, if the person is very frequently doing same action of hand then we consider him/her suspect.

CHAPTER 5
CONCLUSSION AND FUTURE SCOPE

5.1 CONCLUSION

This section contains all summary of this research topic. We divide our work into six modules. First part is to collect video clip. Second part is to make segments of that clip with respect to movement of hand of a person. Third part is make frames of clip for hand motion detection. Fourth part form frames check the sequence of same action done by hand. Fifth part if the action is going on frequently with, that is we are checking same sequence format of few frames in which same action we had discover. Last but not the least part is to analyses the result of motion. In this research work we try to make an application which helps agents that are professional interact with peoples who had try to make some obscene action. This application helps us to find out abnormal event probability of occurrences. Smart surveillance system is developed check nuisance activities in crowd prone areas [22].

We did this research for understanding behavior; nature and activities mostly done by the robbers and terrorist. The important data may be expected based on the correlation studies between human motion detection and human psychology. Here, we had presented a research on some image processing techniques implemented for motion detection algorithms and also some of the methodology and approaches of implementing a motion detection algorithm itself. In short this research topic we first capture human motion then we will focus only on hand portion of that human. We use multiple frames to identify the starting and ending point of the hand motion. After the analysis of our study result , we will move to understand the psychology of human being .We are doing this research for understanding behavior, nature and activities mostly done by the robbers and terrorist. The result obtained and discusses the several advantages such as its implementation; we implement this system for controlling the robberies in banks and shops. Requirement tools are also easily we get and we have knowledge about the techniques also so that, the way of using this system is understandable. Our aim was to build smart surveillance system, which take decision

on its own way. Machine learning is main topic which helps to relate computer interaction with human being.

5.2 FUTURE SCOPE

In future, we will explore furthermore research in this topic. We can apply this technique by using color images in our simulator or we can expand each module by using the most popular openCV simulator which is mainly developed for image processing. Also we will focus on to make this system is usable into check the nuisance activities in the crowd prone areas. This research plays an important role in studying the human psychology based on human motion. In future we will focus on the perfect blend of leg as well as hand motion detection at one go. We can think of having alert messages on the monitor if frequent activity happened by any person. Steady standing activity by the person at a window or sitting at one place for longer time in the bank also considered as a suspect. One drawback of this system that is if multiple hands are at same place then action of particular hand recognition is very difficult.

We will try to extend this topic by analyzing multiple persons hand motion at a time. Also we define time duration for analyzing motion of hand. There are so much concepts remain which are helpful to make this system more powerful, which we will study in future. We can see from last few decades it is the most interesting topic of the researcher, so that if we want to study this subject that is Psychology study with machine learning which is come under artificial intelligence field. Cognitive psychology is sub part of machine language and machine language come below the artificial intelligence branch. So we have so much work to extend in this topic which we will discuss in future.

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APPENDIX

DARPA- Defence Advanced Research Projects Agency

MDF- Most Discriminating Features

MEF- Most Expressive Features

DTW- Dynamic Time Warping

HMM- Hidden Markov Model

MATLAB –Matrix Laboratory

LIST OF PUBLICATION

1] Kavita V. Bhaltilak, Harleen Kaur and Cherry Khosla ,"Human Motion Analysis with the Help of Video Surveillance: A Review", International Journal of Computer Science and Information Technologies, Vol. 5 (5) , 2014, 6586-6590.