

HUMAN MOTION DETECTION USING VIDEO SURVEILLANCE SYSTEM

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ABSTRACT

Security and surveillance are the most important issues in today's world. The recent acts of misconduct have highlighted the demand for efficient surveillance system. The recent surveillance systems use digital video recording cameras. The major disadvantage with this model is that it needs continuous manual monitoring which is in because of factors like human tiredness and cost of physical work. Moreover, it is virtually unfeasible to search through recordings for important events occur in the past since that it would need a playback of the complete duration of video footage. Hence, there is a requirement for an automated system for video surveillance which can detect unusual activities like physical abuse (slapping, beating etc.) of people in real time environment and trigger an alarm to the pocket device of the concerned person.

Keywords: Hog, CCTV, CAM Shift, TOI, CRT.

Introduction

Because of the enlargement demand for security, many countries have been establishing Closed Circuit Tele-Vision surveillance systems as a tool for strengthening preventive measures and assist post-incident investigations. A surveillance system is a crucial part of any modern automated home. Video surveillance systems play a major role in our daily life. These exist at govt. institutions, private institutions, airports, roads etc. and even at our homes to keep us safe from any unusual event or threat. The analysis found that that using surveillance system at different places like market, parking areas, public transportation or where public gathering is helps in reducing the crime rates. Video surveillance applications are under a transition phase where analog is being replaced with digital solutions. Being compare with analog, digital system provides more accurate video content and transmission rate is also better in digital video surveillance systems and a digital video surveillance offers much better flexibility in video content processing and transmission.

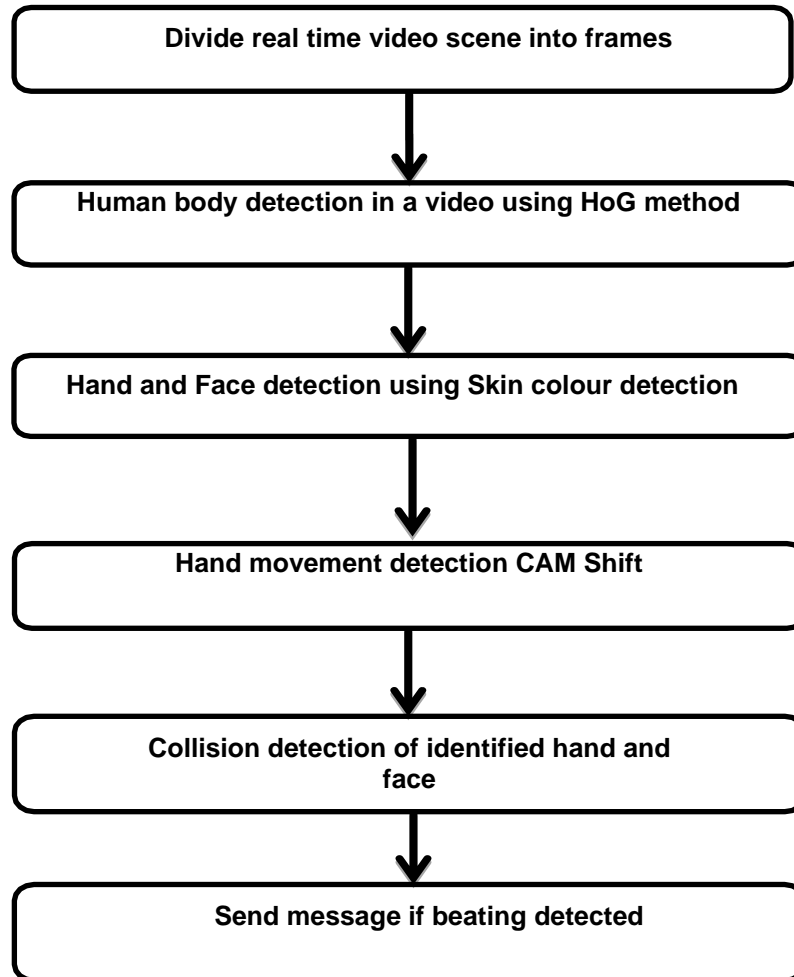
At the same time, it also, can easily implement advanced features such as motion detection, facial recognition, and object tracking. New approach can be used to design various video surveillance systems from low-end to high-end, from a portable implementation to plug-in implementation.

A Survey found that:

- Video surveillance system were most effective in parking areas, where their use resulted in a 51% decrease in crime;
- Public areas saw a 23% decrease in crimes;
- Systems in public settings were the least effective, with just a 7% decrease in crimes overall.

The main objective of this Paper is to analyse and integrate various methods required for detecting human face and hand detection in a video and identify beating event based on identified object collision and is to design a system to be applied in Video surveillance system for detecting human motion detection.

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Proposed Approach**Step 1: Divide Video into frames using video summarization technique**

With the advent of digital multimedia, a lot of digital content such as movies, news, television shows and sports is widely available. Also, due to the advances in digital content distribution (direct-to-home satellite reception) and digital video recorders, this digital content can be easily recorded. However, the user may NOT have sufficient time to watch the entire video (Ex. User may want to watch just the highlights of a game) or the whole of video content may not be of interest to the user (Ex. Golf game video). In such cases, the user may just want to view the summary of the video instead of watching the whole video.

Step 2: Human body detection from a video using HoG method:**HoG Method**

This method is commonly used for detecting human figures in static images. The image of one frame is divided by a movable window into sections in which it is observed whether they contain human figure outlines. The window size is chosen based on the approximate height of the human figure in the image and can vary if necessary. The HOG algorithm was developed for detecting objects in static images, but it can also be used to identify objects in video sequences. The HOG descriptor has some significant advantages compared to other descriptors, especially in the invariance of geometric and photometric transformations. The basic principle of the HOG method lies in object identification by gradient distribution of intensity in different directions. It can also be used to identify objects in video sequences.

Step 3: Hand and Face detection using Skin colour detection

Color spaces used for skin modelling Colorimetric, computer graphics and video signal transmission standards have given birth to many color spaces with different properties.

A wide variety of them have been applied to the problem of skin color modelling. We will briefly review the most popular color spaces and their properties.

RGB

RGB is a color space originated from CRT (or similar) display applications, when it was convenient to describe color as a combination of three colored rays (red, green and blue). It is one of the most widely used color spaces for processing and storing of digital image data.

Step 4: Hand movement detection CAM Shift

CAM Shift: - Continuous Adaptive Mean-Shift

Simulate the features of human binocular vision with two position unchanged cameras and capture video stream from them at the same time. Implement real-time CAM-shift tracking for the motion of hand in the left view by using colour histogram as objectives model. Obtain the image coordinates of every point. The Cam-Shift (Continuously Adaptive Mean Shift) is an algorithm for image segmentation color introduced by Gary Bradski in 1998. The Cam-shift skillfully exploits the algorithm mean-shift by changing the size of the window when it happened to convergence. The Cam-shift coupled is an adaption to the color image sequences, and is operated for further real-time object. A free implementation of this algorithm can be found in the software library of computer vision Open-CV.

Step 5: Speed detection of moving hand

Speed of moving hand can also be computed by constantly finding the object distance in every frame, thus speed is defined as,

$$|Object\ Distance_i - Object\ Distance_{i-1}| \times Frame\ Rate$$

where the suffix i denotes the frame number.

Step 6: Collision detection of identified human body & hand:

Collision detection typically refers to the computational problem of detecting the intersection of two or more objects. While the topic is most often associated with its use in video games and other physical simulations, it also has applications in robotics. In addition to determining whether two objects have collided, collision detection systems may also calculate time of impact (TOI), and report a contact manifold (the set of intersecting points).

Step 7: Alarm generation

Command line MMS client: - SMS Lib which is a command line SMS client. A command line client is a small program which can be incorporated into other larger programs such that it will be executed only if a specific stimulus is detected by the larger program. The stimulus would be the difference in the histograms of two frames of the room under surveillance which the image analysis program would detect. Once this would be detected by the image analysis software, the command line MMS client would be triggered and an MMS containing the abnormal frame would be sent to the security guard's handheld device.

Summary of the Client line MMS client:

- Abnormal frame detected by Image Analysis software due to change in histogram.
- Abnormal frame captured by surveillance camera.
- Command line MMS client triggered.
- MMS with abnormal frame generated.
- MMS sent to guard's device.

Conclusion

A home security and surveillance system is an essential part of any modern automated home. The basic design of a security system begins with analyzing the needs of the inhabitants, surveying existing technology and hardware, reviewing system costs, considering monitoring choices, and finally planning the installation. The design of a security and surveillance system should provide for the protection of the entire perimeter of a home as well as visual- and audio-based surveillance monitoring.

Video surveillance system is a useful tool for analyzing and detection the physical abusing of human body in real time. A lot of challenges exist in Video surveillance system, but these can be overcome by the implementation of new, modified approaches. In the past decade itself, research in the field of surveillance system has seen an increase. Though several approaches exist for surveillance system in different domains, however, each has its own limitation. The proposed approach of video surveillance system in home aims at detecting beating event of two or more human body in a real-time video. This approach has the advantages of being able to detect the collision between two human bodies and to generate instant alert to the people related/security guard. However, its application is limited by constraints such as the privacy and cost.

References

1. Robert T. Collins, Alan J. Lipton, and Takeo Kanade, "Introduction to the Special Edition on Video Surveillance", Proceedings of the IEEE Transactions on Pattern Analysis and Machine Intelligence, Volume 22, No. 8, pp 745-757, August 2000.
2. Ismail Haritaoglu, David Harwood and Larry S. Davis, "W4 : Real-Time Surveillance of people and their Activities", Proceedings of the IEEE Transactions on Pattern Analysis and Machine Intelligence, Volume 22, No. 8, pp 809-830, August 2000.
3. Ross Cutler and Larry S. Davis, "Robust Real-Time Periodic Motion Detection, Analysis, and Applications", Proceedings of the IEEE Transactions on Pattern Analysis and Machine Intelligence, Volume 22, No. 8, pp 781-796, August 2000.
4. N. Dalal and B. Triggs, "Histograms of oriented gradients for human. Detection", Proceedings of the Conference on Computer Vision and Pattern Recognition, San Diego, California, USA, pp. 886-893, 2005
5. M. Andriluka, S. Roth, and B. Schiele. Pictorial structures revisited: People detection and articulated pose estimation. In CVPR, 2009.
6. L. Bourdev, S. Maji, and J. Malik. Describing people: Poselet-based attribute classification. In ICCV, 2011.
7. L. Bourdev and J. Malik. Poselets: Body part detectors trained using 3d human pose annotations. In ICCV, 2009

