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SURVEY ON MOVING OBJECT TRACKING AND DETECTION

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ABSTRACT:

Object tracking is an important component of many computer vision systems. It is widely used in number of fields such as video surveillance, robotics, medical imaging, and human computer interface. To identify and tracking the real time object is important concept in computer vision. In the paper, image processing algorithms are used for tracking a moving video object. The image processing algorithms used are (a)Noisy video generation with real time object motion (b)Video image back ground subtraction (c)Video image these holding (d)Video image region filling(e)Video image height and width calculation (f) Video image center computation (g) Video image and center image over lay. The image processing algorithms are developed initially by Model Based Design Approach using Simulink models of Matlab Tool. Then these algorithms can be implemented on Raspberry Pi device.

KEYWORDS: **Raspberry pi, Simulink, Video image processing, tracking.**

1. INTRODUCTION:

The system is proposed for the purpose of intrusion detection, track and destroy the intruding object. The system will be mounted at some suitable place from which complete and clear view of the area under surveillance can be captured with camera. Thus the image will be captured; processed and desired action will be performed on it. Object segmentation separates regions of interest in image data that identify real world objects. Segmenting and tracking regions of arbitrary size within a scene allow the application to focus on more complex tasks like object recognition within a smaller spatial domain of the entire spatial scene which reduces the processing time required to identify the object of interest. Reducing the spatial domain of the image decreases the computational resources necessary for the detailed analyses required for object recognition.

The system is provided with a higher solution camera, image processing hard ware, microcontroller, two servomotors and other supplementary hardware and mechanisms [1].Image Processing Hardware will acquire images captured by camera after some pre defined interval of time. Then it will processes much captured image for detecting intrusion. If intrusion is detected Image Processing Hardware will extract the features of that intruding object and compare them with features of objects stored in database. We have collected database for the objects those are to be destroyed. If match between intruding object and one of the objects from database is found object is said to be recognized. System will track that object to calculate its velocity of motion. This velocity information is needed to decide the angle and time in stant at which projectile is to be launched at intruding object to destroy it. Position of the intruding object in the form of x-yco-ordinate is found and sent to microcontroller. Microcontroller will control the angle of rotation of two Servo Motors to position the can non aiming at the intruding object. At last cannon will get fired.

Object tracking is an important task within the field of computer vision. The proliferation of high- powered computers, the availability of high quality and in expensive video cameras, and the increasing need for automated video analysis has generated a great deal of interest in object tracking algorithms. In its simplest form, tracking can be defined as the problem of estimating the trajectory of an object in the image plane sit moves around a scene. In other words, a tracker assigns consistent labels to the tracked objects in different frame sofa video [2].

Additionally, depending on the tracking domain, a tracker can also provide object centric information, such as orientation, area, or shape of an object.

For Object Tracking and Classification basic thing is to obtaining an initial ask for a moving object, and to preprocess the mask. Normally the mask is affected by "salt –and -pepper" noises. We apply morphological filters based on combinations of dilation and erosion to reduce the influence of noise, followed by a connected component analysis for labeling each moving object region.

Very small regions are discarded. At this stage we calculate the following features for each moving object region: bounding rectangle: the smallest aesthetic rectangle that contains the object region. Kept record of

the coordinate of the upper left position and the lower right position, what also provides size information (width and height of each rectangle).**Color**: the mean R G B values of the moving object.**Center**: we use the center of the bounding box as a simple approximation of the centroid of a moving object region.**Velocity**: defined as movement of number of pixels/second in both horizontal and vertical direction.

In order to track moving objects accurately, especially when objects are partially occluded, and the position of the camera is not restricted to any predefined viewing angle, these features are actually insufficient. We have to add further features that are robust and which can also be extracted even if partial occlusion occurs.

One can simplify tracking by imposing constraints on the motion and/or appearance of objects. For example, almost all tracking algorithms assume that the object motion is smooth with no abrupt changes. One can further constrain the object motion to be of constant velocity or constant acceleration based on a priori information. Prior knowledge about the number and the size of objects, or the object appearance and shape, can also be used to simplify the problem.

GOALS AND OBJECTIVES:

To design a system to detect intrusions, track intruding object and destroying it which will give complete and clear view of the area under surveillance and can be captured with camera. The system should be provided with a high resolution camera, image processing hardware, microcontroller, two servo motors and other supplementary hardware and mechanisms. Camera should be placed at the fix point from where the area will be covered clearly.

MOTIVATION OF THE PROJECT:

Motivation of the project comes from the loss of human being or soldiers during the war keeping surveillance. Instead of humans we could replace our system with camera and gun.

2. LITERATURE SURVEY:

A. An FPGA based Embedded Vision System for Real-Time Motion Segmentation by Jorge [1]

The proposed approach of an FPGA based real time video processing platform for motion detection. The main advantage of FPGA based systems respect to processor based systems is its high performance when processing large amount of data flow, as video streams. The work details the hardware implementation of real time motion segmentation algorithms on a FPGA Including the capture, processing and display stages. The proposed platform offers the flexibility of changing the processing modules, allowing the implementation of different motion segmentation algorithms and the online observation of the processing results. The system uses a minimum resource of cells allowing its implementation on low cost FPGAs.

B. Background Subtraction Algorithm for Moving Object Detection in FPGA by J. Y. Mori [2]

Currently, both the market and the academic communities have required applications based on image and video processing with several real-time constraints. On the other hand, detection of moving objects is a very important task in mobile robotics and surveillance applications. In order to achieve an alternative design that allows for rapid development of real time motion detection systems, the paper proposes hardware architecture for motion detection based on the background subtraction algorithm, which is implemented on FPGAs (Field Programmable Gate Arrays). For achieving this, the following steps are executed: (a) a background image (in gray-level format) is stored in an external SRAM memory, (b) a low-pass filter is applied to both the stored and current images, (c) a subtraction operation between both images is obtained, and (d) a morphological filter is applied over the resulting image.

Afterward, the gravity center of the object is calculated and sent to a PC (via RS-232 interface). Both the practical results of the motion detection system and synthesis results have demonstrated the feasibility of FPGAs for implementing the proposed algorithms on an FPGA based hardware platform. The implemented system provides one processed pixel per FPGA's clock cycle (after the latency time) and speed-ups the software implementation (using the real-time *xPC Target* OS from Math Works) by a factor of 32.

C. FPGA Based Object Tracking System by Suhas Jadhav[3]

The Paper presented an object tracking system based on FPGA using canny edge detection Algorithm. The system consists of canny edge detection algorithm implemented on FPGA kit to identify edges of real time object. Also a tracking and reorganization of object is done by Smartphone camera. Canny edge detection algorithm is key stage in image processing and object recognizing application.

The field programmable gate array contains logic components that can be programmed to perform complex mathematical functions making them highly suitable for the implementation of matrix algorithm. Individual frames acquired from the target video are fed into the FPGA.
These are subject to segmentation, thresholding, filtering stages. Following the object is tracked by comparing the background frame and the processed updated frame containing the new location of the target. The result of the FPGA implementation in tracking a moving object were found to be correct and suitable for object tracking.

D. Moving Object Detection and Tracking Based on ZYNQ FPGA and ARM SOC by Wenchao Liu [4]

In the paper, FPGA-based moving object detection and tracking system is introduced for image processing application. The algorithms presented include object detection based on dynamic background difference, kalman filter for object tracking. The target device for the implementation is a Xilinx Zynq-7000 FPGA.

The use of ARM dual core processor, NEON vector coprocessor unit and co-processing IP peripherals generated by vivado HLS aim to improve the data processing ability of the system. In the dynamic background, the system realized accurate detection and tracking of moving objects in real-time.

E. Moving Object Tracking Application: FPGAand Model Based Implementation Using Image Processing Algorithms by Sofia Nayak [5]

With increased resource size, powerful DSP blocks and large on-chip memory, Field Programmable Gate Array (FPGA) devices play a major role as hardware platforms for implementing compute intensive video image Processing applications. In this paper, image processing algorithms are used for tracking a moving video object. The image processing algorithms used are (a) Noisy video generation with random motion (b) Video image median filter (c) Video image back ground removal (d) Video image thresholding (e) Video image edge detection (f) Video image height and width calculation (g) Video image center computation (h) Video image and center image overlay. The image processing algorithms are developed initially by Model Based Design Approach using Simulink models of MATHWORK's MATLAB Tool. Then these algorithms are implemented on ALTERA CYCLONE-II FPGA device using TERASIC DE2 FPGA hardware kit and ALTERA QUARTUS-II software tool. The input video image is taken From a NTSC/PAL camera and processed in real time using the algorithms on the FPGA and the resulted tracked video image output is displayed on a VGA monitor.

F. In 2003, Object Classification and Tracking in Video Surveillance by Qi Zang and ReinhardKletteg [6]

In the paper, they have reviewed previous research on moving object tracking techniques, analyze some experimental results, and finally provide our conclusions for improved performances of traffic surveillance systems. One stationary camera has been used. Many applications have been developed for monitoring public areas such as offices, shopping malls or traffic highways. In order to control normal activities in these areas, tracking of pedestrians and vehicles play the key role in video surveillance systems. We classify these tracking techniques into four categories:

- Tracking based on a moving object region
- Tracking based on an active contour of a moving object
- Tracking based on a moving object model
- Tracking based on selected features of moving objects

Besides these four main categories, there are also some other approaches on object tracking presents a tracking method based on wavelet analysis.

G. In 2004, Moving Object Detection, Tracking and Classification for Smart Video Surveillance By Yi githan Dedeoglu[7]

The paper,represents a smart visual surveillance system with real-time moving object detection, classification and tracking capabilities. The system operates on both color and gray scale video imagery from a stationary camera. In the proposed system moving object detection is handled by the use of an adaptive background subtraction scheme which reliably works in indoor and outdoor environments. We also present two other object detection schemes, temporal differencing and adaptive background mixture models, for performance and detection quality comparison. The proposed system is able to distinguish transitory and stopped foreground removed objects; classify detected objects into different groups such as human, human group and vehicle; track objects and generate trajectory information even in multi-occlusion cases and detect fire in video imagery.

System is assumed to work real time as a part of avideo-based surveillance system. The computational complexity and even the constant factors of the algorithms we use are important for real time performance. Hence,

our decisions on selecting the computer vision algorithms for various problems are affected by their computational run time performance as well as quality. Furthermore, our system's use is limited only to stationary cameras and video inputs from Pan/Tilt/Zoom cameras where the view frustum may change arbitrarily are not supported. The system is initialized by feeding video imagery from a static camera monitoring a site. Most of the methods are able to work on both color and monochrome video imagery.

3. PROPOSED WORK:

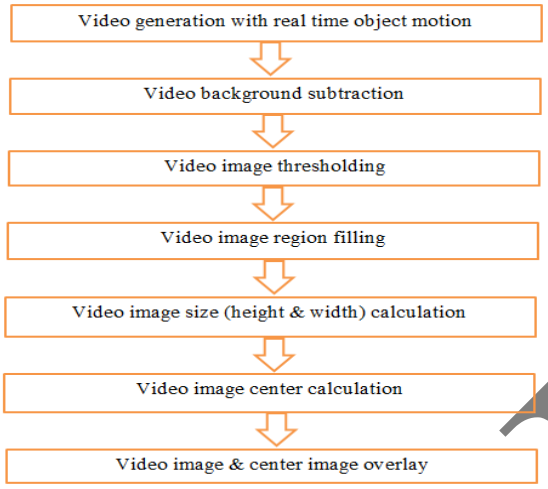

Figure 1: Flow Diagram of Proposed Work

Raspberry-pi sends command to camera to capture image. Image Processing Algorithm running in raspberry-pi will acquire images captured by camera after some predefined interval of time. Then it will process every captured image for detecting intrusion. If intrusion is detected Image Processing Hardware will extract the features of that intruding object and compare them with features of objects stored in database. We have collected database for the objects those are to be destroyed. If match is found between intruding object and the object from database, object is said to be recognized. System will track that object to calculate its velocity of motion. This velocity information is needed to decide the angle and time instant at which projectile is to be launched at intruding object to destroy it. Position of the intruding object in the form of x-y co-ordinate is found and alarm will be given

4. CONCLUSION:

The survey on object identification, detection and tracking techniques that is able to detect an object. Many research issues have been highlighted here. There are a lot of challenges in object detection and identification; still research works are taking place in this field.Availability, efficiency of usage along with the increasing popularity of video on internet and versatility of video application heavily rely on object detection and tracking in videos. Object detection provides a good range of accuracy at different scenarios based on their application.

In the paper, an overview of recent research activities in a video tracking systems has been presented. In video tracking systems, the researchers will cope with the problems of visual content extraction and image understanding that several of techniques have been proposed in detection, tracking, object representation and recognize human behaviors.

Furthermore, for the future of video tracking systems, enlarge and enhance the view of a tracking system with multiple cameras should be considered. In this issue we should deal with environment situation in different object views, a huge volume of video data recorder and real-time processing.

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