Object Detection and Tracking

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Abstract - *The task of real time detection and tracking of a moving object in a video stream is quite challenging if camera itself is moving. This paper presents an implementation of real time detection and tracking of an unknown object in video stream with 180° (azimuth) rotating camera. It also presents adaption of different object tracking algorithms and their effect on implementation. The system described in this paper contains a camera that is connected to an embedded system or PC/laptop. They (board/PC) are having an image processing algorithm which detects an object first and then tracks it as long as it is in the line of sight of the camera. As the object moves, the PC/laptop/embedded Board gives signal to motor to rotate the camera which is mounted on a servo motor assembly. To monitor Object in video user can have multiple options. If user is using laptop/PC to track object it is very simple for him because he already has a screen. The object can be defined directly by the end user by entering the ID number of object. The embedded board/PC used for servomechanism process.*

Key Words: object tracking, embedded board, rotating camera, and servomechanism.

1. INTRODUCTION

Digital image processing has become economical in many fields like signature recognition, iris recognition and face recognition, in forensics, in automobile detection and in military applications. Each of these applications has its basic requirements, which may be unique from the others. Everyone is concerned and demands a system as faster, more accurate, cheaper and more extensive computation. This idea has reviewed various image processing operations to illustrate the basic concepts and to use them in different fields with minor changes in the methodology. Detection of a moving object is necessary for any surveillance system. A static camera can detect and track an object as long as the object is inside the frame of the camera. But as the object goes beyond the boundary of the camera frame, the camera stops tracking it, which is a major limiting factor for the use of a static camera. This limitation can be overcome by using a rotating camera. This paper describes a system in which a camera rotates according to the path of a moving object and follows it. Two different designs, to track an unknown object in a video stream, are presented in this paper. 1. Embedded board with simple algorithm to track an object and control the motor. 2. PC/Laptop with complex image processing algorithm to track object and then control the motor using an embedded board locally.

2. BLOCK DIAGRAM
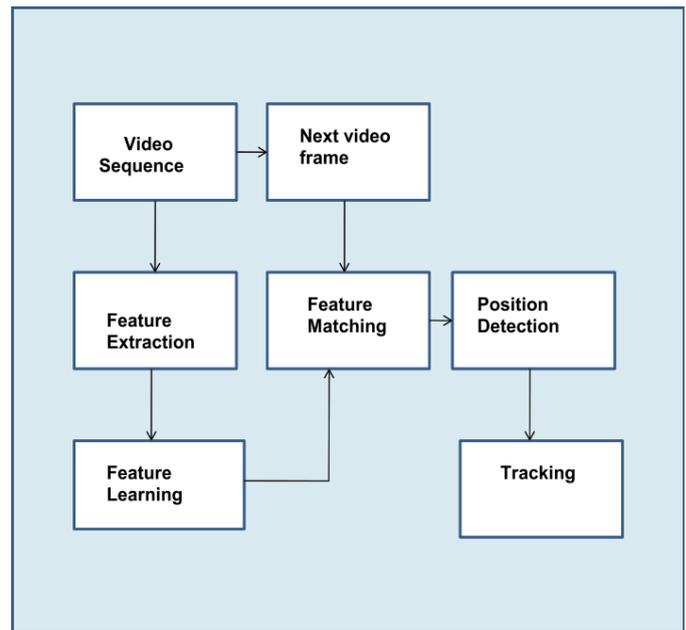
2.1 VIDEO SEQUENCE

We have acquired the video sequence from Logitech C310 HD(720p) webcam by setting standard resolution of 640x480 at 30 frame/sec we have connected our webcam to PC/laptop by means of USB cable. The camera should follow the system requirement of windows 7,8,10 and MAC OS X 10.6 or later. We have used windows 10 as an operating system.

2.2 FEATURE EXTRACTION AND LEARNING

In computer vision, the Kanade–Lucas–Tomasi(KLT) feature tracker is an approach to feature extraction. It is proposed mainly for the purpose of dealing with the problem that traditional image registration techniques are generally costly. KLT makes use of spatial intensity information to direct the search for the position that yields the best match. It is faster than traditional techniques for examining far fewer potential matches between the images. The point tracker object tracks a set of points using the Kanade-Lucas-Tomasi (KLT), feature-tracking algorithm. You can use the point tracker for video stabilization, camera motion estimation, and object tracking. It works particularly well for tracking objects that do not change shape and for those that exhibit visual texture. The point tracker is often used for short term tracking as part of a

larger tracking framework. As the point tracker algorithm progresses over time, points can be lost due to lighting variation, out of plane rotation, or articulated motion. To track an object over a long period of time, you may need to reacquire points periodically.

To track a set of points:

1. Create the vision. Point Tracker object and set its properties.

2. Call the object with arguments, as if it were a function.

2.3 FEATURE MATCHING

The KLT algorithm tracks a set of feature points across the video frames. Once the detection locates the face, the next step in the example identifies feature points that can be reliably tracked. Our features uses the standard, "good features to track" proposed by Shi and Tomasi. With the feature points identified, you can now use the vision. Point Tracker System object to track them. For each point in the previous frame, the point tracker attempts to find the corresponding point in the current frame. Then the estimate Geometric Transform function is used to estimate the translation, rotation, and scale between the old points and the new points. This transformation is applied to the bounding box around the face. Track the points from frame to frame, and use estimate Geometric Transform function to estimate the motion of the face.

2.4 POSITION DETECTION AND TRACKING

To detect the multiple objects we have used object of file Multi Object Tracker KLT. By using this object we have created two empty arrays one is tracker. boxes and another one tracker. BoxIds. tracker. boxIds contains numerical Id of the object from 1 to N and tracker. boxes contains coordinates of concern object in x, y, width and height. It has Nx4 elements. To track the object we can enter the number through GUI. To track the particular object we have to find ID number in tracker. boxIds. For that we calculate total number of rows in tracker. BoxIds. To find the index number of object whom we want track ,we compare entered number with all the elements of tracker. BoxIds and the obtained index number used to extract coordinate of tracked object giving the index number to tracker. Boxes. It gives x, y, width and height. By using the same we calculate the value of centroid for x and y axis. In order to track the object we used centroid values .To know where is the tracked object in the frame we used centroid values. To track the object we used servomechanism assembly of pan and tilt. Servomechanism assembly has two servomotors .One of the motor controls Horizontal motion and another controls vertical motion of camera. Initially both Motors are kept at angle of 90 degree. So first we synchronize maximum resolution of camera to maximum degree of angle. Using centroid values we check the position of tracked objects in the frame. For Horizontal Movement if the object is present at the left of the center we increment the angle of pan motor else we decrement the

count. We have used the same logic for tilt movement. Our program tries to take the object at the center of screen for that we set threshold of bounding box. The values of X and Y from MATLAB are passed to the arduino microcontroller board via serial communication.

3 SYSTEM DESIGN
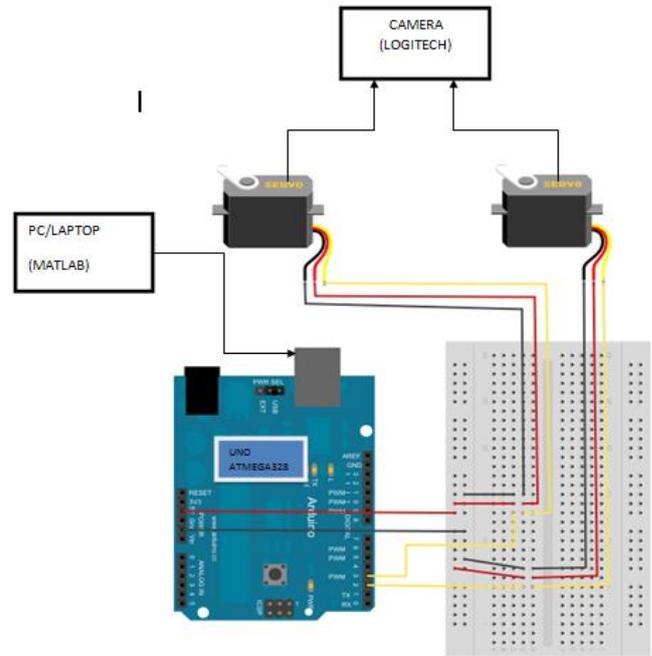
3.1 Description Of circuit Assembly

We have used MATLAB R2014 version on PC/Laptop. The software gives the values of bounding box coordinate x and y. these values of coordinates are transmitted by means of character serially to arduino through COM port. Arduino receives the character from PC/Laptop. Characters 'l','r','u','d' are defined for left right up and down. Here we have used two servomotors. Two motors of Micro servo9g of 1.8kg torque connected to digital pins 9 and 10 of arduino UNO. Initially two motors are set to 90degree.

If arduino receives 'l' from the Pc it means object is left of the center of screen. And 'r' receives then it will right to the frame center. The value of variable of motor incremented if the object is left to the screen. The value of variable of motor decremented if the object is right to the screen. If arduino receives 'u' from the Pc it means object is above the center of screen. And 'd' receives then it will down to the center of frame center. The value of variable of motor incremented if the object is below to the center of screen. The value of variable of motor decremented if the object is above to the center of screen. The pan and tilt motion of servomechanism of motor changes accordingly as per the value of motor variable. The camera Logitech c310 is mounted on servomechanism assembly. So as the Object moves in the frame consequently the concern character is sent to the arduino microcontroller board it will move the motors horizontally and vertically. Eventually the camera will move as per the motor.
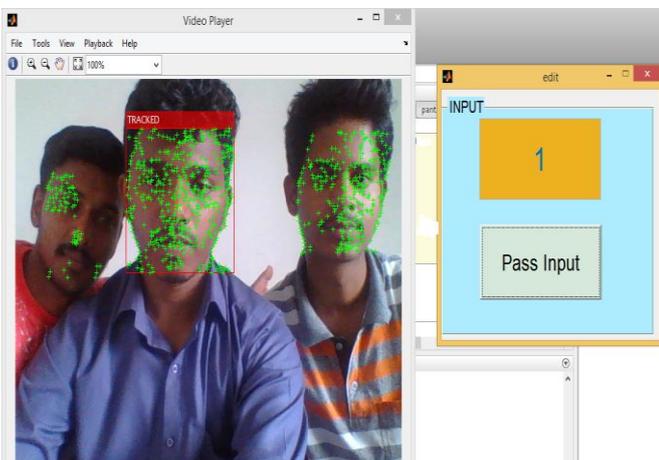
4 RESULTS

4.1 OBJECT DETECTED
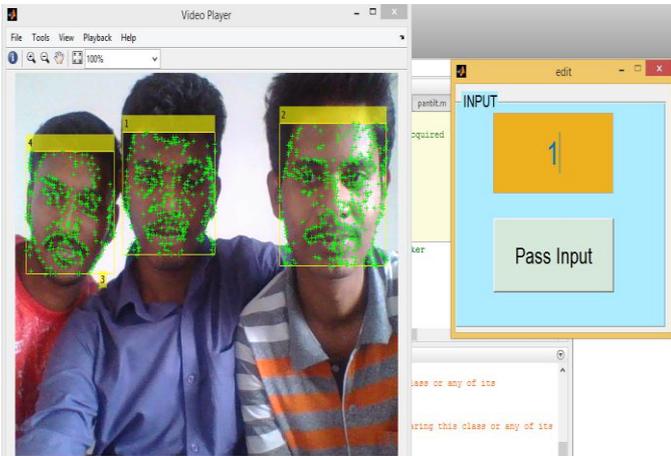
Above figure shows multiple detected faces in which we have used KLT point trackers and variables.This variables are used to store the data of each ID. KLT point tracker track the all feature points of face ID's. Futher we have designed user friendly GUI which helps to pass the ID number which we want to track.

4.2 OBJECT TRACKED

This figure shows the tracked face of ID number 1. It shows tracked face when the specific ID number is passed by user.Only user input one should be tracked out of all object and Remaning bounding boxes of objects are vanished .

5. CONCLUSION

 Object Detection and Tracking system is mainly designed for military applications in which we can detect multiple objects (Eg. Humans) and track one of them. Perform this operation in convenient way we have designed simple user friendly GUI (Graphical User Interface). Using this GUI even unskilled observer can handle this system by just passing the ID of the object. So it is easy to handle and also cost effective.

REFERENCES

1) Real Time Robust Human Detection and Tracking System by Jianpeng Zhou and Jack Hoang, I3DVR International Inc 780 Birchmount Road, Unit 16, Scarborough, Ontario, Canada M1K 5H4, Email:Jack@i3dvr.ca

2) Real Time Object Detection & Tracking System (locally and remotely) with Rotating Camera by Ravi D. Simaria Embedded system design, School of engineering, R.K.University, Rajkot, India rvsimaria2@gmail.com

Prof. D. S. Pipalia Assistant Professor, School of engineering, R.K.University, Rajkot, India dhaval.pipalia@rku.ac.in

3) Face Detection And Tracking Using KLT And VIOLA JONES by Ritesh Boda and M. Jasmine Pemeena Priyadarsini

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4) Object detection and tracking in video image. By Rajkamal kishor Gupta

5) https://in.mathworks.com/

6) https://www.youtube.com/watch?v=m7vOCg8GrAA

7) https://www.arduino.cc