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Moving Object Tracking using Kalman Filter

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Abstract— **In this paper we described a method for moving object detection and tracking using Kalman filter. Basically, estimation process is very important in the surveillance system. This process is for finding out the location of the target. The decomposition is also helpful for the estimation process, in this process first step is the tracking the video, and then the video is converted into frames in the initialization period and every frame is made up of a piece of picture. In further step, the targets in each frame are identified by means of color recognition; next position is the moving target and to identify the center coordinates and next another last step the coordinate of the previous and current frames is inputted and find out the location of the moving target which is present frame. And this frame is estimated by filter. The tracking is very important for different object. The objects are tracked with the help of Kalman filter. This filter is used for the pixel wise subtraction of current frame. As well as also used to be find out the error between actual position of the ball and estimated position value with the help of this filter.**

Keywords— Object Detection, kalman filter, tracking object.

I .INTRODUCTION

Motion analysis is commonly based on a pixel per pixel estimation of the instantaneous displacement of the underlying physical points. In wide area applications of moving target are used in many fields, like that used in computer vision with the typically such as the video monitoring, image encoding, robot technology, etc., there for it is applied in research for detection and tracking. The Moving object tracking are the tracking based on Kalman algorithm. The Kalman algorithm means to predict and track moving targets, where to recognize the moving target is the first priority. The Ground surveillance aims to determining the situation a large military ground with numerous targets as well as also determining the situation of weather and conditions for the daylight. The art sensor technology is used for the tracking. This technology is called as airborne ground moving target indicator.

In this subject is providing high-quality tracking of military equipment, also providing the vehicles such as cars? The tracking of target is used to support surveillance. The tracking of ground targets are used for airborne sensors. It has some advantages such as low visibility and target density is high. Therefore, it has to improve the quality and continuity of tracking, as well as also used for the previous information should be utilized as much as possible, which is highly desirable. The research on the identification of moving targets are provides us with the information and the important for implications for us to understand the treatment of video images deeply.

II .LITERATURE REVIEW

Surveillance systems are very most important for detection and tracking of the object. The first step is to detect the any object and second step is tracking object. In detection of moving object can be done by using the various methods.

Hong-Son was proposed the system which is depend on pedestrian detection method [1]. They pointed out the processing rate has improved detection performance.

Also, this method has highly potential as compared to other method. In [2] Tested on designed Omni -directional robot base and also present a robust real-time framework. This frame work used for moving object detection, on the base of estimation and prediction of trajectory. Sunil Kumar Vengalil and Neelam Sinha proposed the system which is Based Texture Detection Algorithm [3]. They also focused on the types of the Texture. Sam Schauland, Joerg Velten, and Anton Kummert were proposed digital filter [4]. They pointed out the separation of dimensional signals. Also get the good performance for motion-based object detection

In This paper we have focused on the types of methods. The method is consisting of the first is temporal differencing. The temporal differencing has depended upon the basic principle of pixel wise subtraction of current. It has disadvantages of it is required to sensitive to dynamic change. Second detection method is optical flow it has also required the large amount of calculation. Next object tracking method is simple template matching is depending upon matching region of interest in video for algorithm. It has required equivalent model for each region of interest for each image.

The tracking of the object has consisted of partical filter. The partical filter is depending upon the recursive filter algorithm. But it has computational timer to moderate to high. And it has complex background also required the big calculations.
So Kalman filter are overcome the partical filter problems and also used to Kalman filtering algorithm to track the object.

III .METHEDOLOGY

The Kalman filter is a set of mathematical equations which has provides estimate the state of a process, in a way that minimizes the mean of the squared error. The filter is very powerful in several aspects: it supports estimations of past, present, and even future states, and it can do so even when the precise nature of the modeled system is unknown. It is very important for first step is find out the detection. Reorganization and tracking of the object sequence. Images or video are firstly detected and track is very important and risky tasks, to find out the object. Such as this is used in surveillance system, military and automatic robotic system. It has roll is to finding out the object which is present in the frame of images or video. Next tracking methods are consisting of the track the object for every frame. There for the camera are used for the Object tracking process of locating an object. If increasing availability for the high-powered computers, then they also are increasing availability of high quality .so by default increasing need for tracking algorithms. Basically, tracking algorithms has consisted of three key steps. First step is analysis of video, second step is detection of moving objects; third step is tracking of objects which is present in every frame. Therefore, the tracking is most important tasks of the system which is nothing but the recognition of motion based.

A. Kalman Filter

It is recursive estimator. The judge the value for the current state, which is used for the current measurement. The type of the filter is consisting of two variables, which is state time and error covariance.

$X_{K\backslash K}$: estimate the state at time K
$P_{K\backslash K}$: error covariance matrix .

B. Kalman Filtering Algorithm

The kalman filter is estimation. The estimation processes have consisted of important previous step & current measurement step. Fig. 1 Shows the estimation cycle of kalman filter. Basically, Kalman Filtering Algorithm is consisting of the two methods. Fist methods are time update and second method are measurement.
The feedback controls are used for the estimation process. The process has consisted of the state at some time for the time updates and then last step is to get the feedback, which is in the form of corrected update. The time updates are nothing but the prediction and measurement update nothing but the correction. These measurements are also called as the noisy measurements. It has consisted of two types of the equations: predict equations and correct equations. The predictions are responsible for project covariance system. It's also called as in time. The important task of the correct update equations is feedback. This feedback has considered the main important task is to convert the new correct update equation in to the judge the value. It has used the to get the new judge value in the processes. Then last the find out the noisy value.

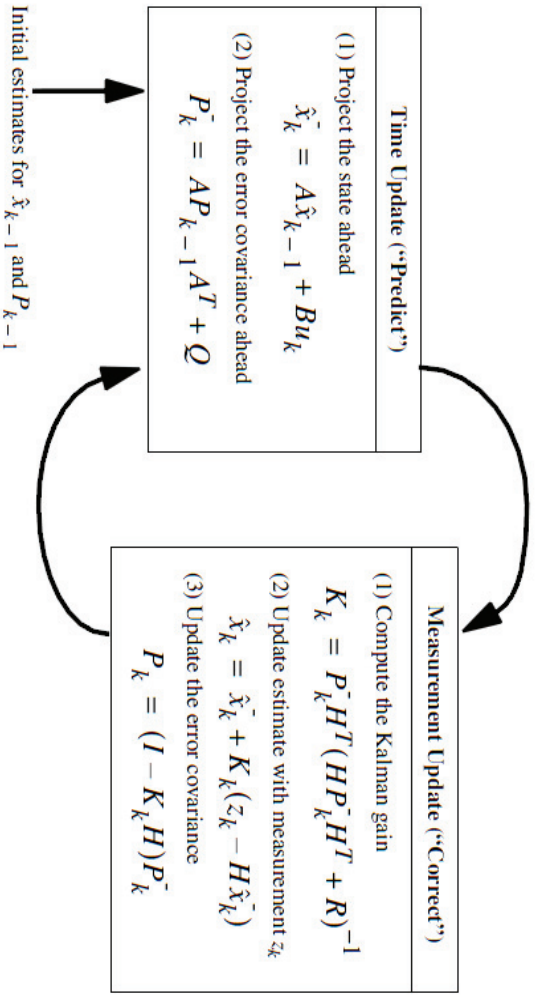

Fig 1: Kalman filter prediction estimation cycle

C. Filtering Problem

Kalman filtering is found out the problems of filtering and next to give the simple solution. Fig. 2 is shows the typical application of the Kalman filter. A physical system has consisted of the mobile robot, chemical process, satellite. The system has given the two inputs, first input is control and another is system error sources. The system state is the output which is nothing but the desired. The system state and measurements error sources have two inputs are given to the

measuring devices. The measuring devices have obtained the observed measurements. Finally, Kalman filter are obtained the optimal estimate of the system state.

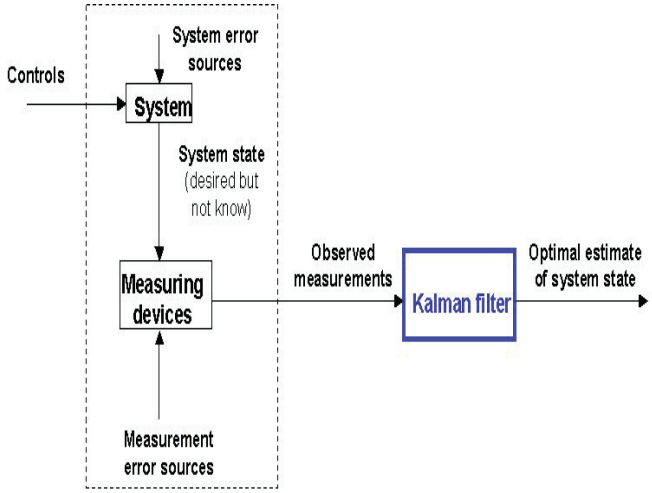

Fig 2: Typical application of the Kalman Filter

So, this is used of the filter. This filter is useful in the navigation, bus stop station, railway station, military are etc. The general filtering problem has used for following Formulate, consider

$$x(k+1) = f(x(k), u(k), w(k))$$

$$y(k) = h(x(k), v(k))$$

IV.RESULTS

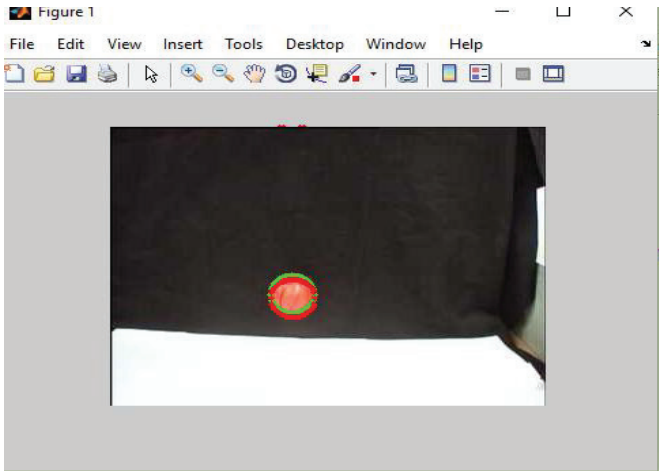

Fig 3: Experimental simulation snapshot

Above Fig. 3 shows the input ball moving from top to bottom on the floor. In simulation snapshot the red colour are indicates the pixels, which are detected by using foreground detector methods.

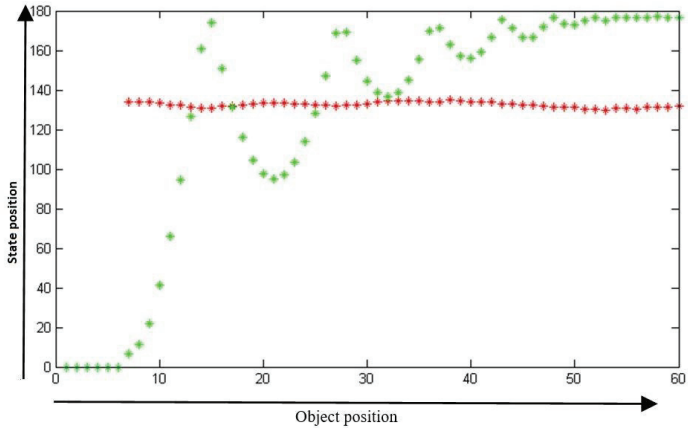

Fig 4: Experimental simulation snapshot

Above Fig. 4 shows the experimental results. The X axis shows the horizontal & y axis shows vertical position. The ball moving from top to bottom which is tracked by using kalman filter. By using background subtraction methods to find out the contrast between ball and floor.

When ball is detected then kalman filter shows it's predicts current state.

When ball is missing then kalman filter solely relies on the previous state and predicts the ball current location. So find out the actual position of the ball.

V. CONCLUSION

We have proposed an algorithm for segmentation and detecting an object by using Kalman filters. It is observed that less the error good are the results and we also observed that when we achieve less error value, very fine object is detected.

The Kalman filter is used for prediction and filtering Algorithm. The additional conditions are included on system; this system is nothing but the dynamics system. The Kalman filter is also called as the steady-state filter. So, to find out the error between actual position of the ball and estimated position value with the help of this filter.

When ball is missing then kalman filter solely relies on the previous state and predicts the ball current location. So, find out the actual position of the ball.

This proposed system is used for the navigation for security system.

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