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Feature Selection Method For Single Target Tracking Based On Object Interaction Models

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Abstract
For single-target tracking problem Kernel-based method has been proved to be effective. A tracker which takes advantage of contextual information to incorporate general constraints on the shape and motion of objects will usually perform better when compare to the one that does not exploit this information. This is due to the reason that a tracker designed to give the best average performance in a variety of scenarios can be less accurate for a particular scene than a tracker that is attuned (by exploiting context) to the characteristics of that scene. The use of a particular feature set for tracking will also greatly affect the performance. Generally, the features that best discriminate between multiple objects and, between the object and background are also best for tracking the object.

Keywords: Kernel, tracker, feature, tracking, object

I. INTRODUCTION

As the technology was rapidly improving ,the traffic was also highly developed now, and it became more and more convenient for us to travel .However, traffic accidents also happen every day .According to the public sector statistics ,hundreds of people lose their lives every day .As data from ministry of health shows in 1000 accident injured ,only 14.3 percent are sent to hospitals by ambulance.

In addition, only 40 percent of people die at the scene, and the remaining ones die on the way to hospitals or in hospitals. About 30 percent of the death is due to the absence of timely rescue .For people who travel at night or on countryside road, once accidents happen ,they are often killed for not being able to call for help immediately.

In the past methods, the vehicle tracking is not mainly used for accidental case since there is no technology improvement and not much of the vehicles used comparing today .If a crash accours suddenly,the reaction of the emergency services now becomes a race between life and death. Now the world of wireless has inspired an entirely new way of managing and minimizing the death rate due to auto crashes.

This paper proposes a work for single target tracking. This paper will further organized as introduction in section I, overview of vehicle tracking systems in section II ,proposed system in section III, methodology in section IV ,software in section v followed by results in section VI, conclusion in section VII and finally section VIII future scope concludes the work.

II. OVERVIEW OF VEHICLE TRACKING SYSTEMS:

Vehicle tracking systems was basically started for shipping industry. when large fleet of vehicles were spread out over the vast expenses of ocean, the owner corporations often found it difficult to keep track of what was happening. they required some sort of system to determine where each vehicle was at any given time and for how long it travelled. The need of vehicle tracking in consumer's vehicle rose to prevent any kind of theft because police can use tracking reports to locate the stolen vehicle. Initially vehicle tracking systems developed for fleet management were passive tracking system .In passive tracking system a hardware device installed in the vehicle store GPS location ,speed, heading and a trigger event such as key on/off ,door open/closed. when vehicle returns a specific location device is removed and data downloaded to computer.

Vehicle tracking systems are widely used by fleet operators for fleet management functions. Fleet management function include fleet tracking, routing, dispatching, on board information and security. This system is used generally to implement stop announcements(triggered by the opening of the bus's door)at a bus stop, announcing the vehicles route number& destination especially for the benefit of the visually impaired customers or to internal announcements (to passengers already on board)identifying the next stop, as the bus approaches the stop or both.

Data collected following vehicle route is after continuously fed in to a computer program. It compares the vehicle actual location and time with schedule. Then it frequently update the display based

on the above comparison for the purpose of telling to the driver, how early or late the driver is at any given time. This will help the driver to make the vehicle more closely to the published schedule. Such programs will also help the customers to get the real time information i.e waiting time until arrival of the next bus or tram or street car at a given stop based on the nearest vehicle's actual progress irrespective of giving information as per schedule time of the next arrival.

Transit systems assigns a unique number to each step for providing this kind of information. passengers those who are waiting can obtain information by entering the stop number in to an automated telephone system or in any application on the transit systems. There are some transit agencies that provide a virtual map on their website. The icons in that virtual map depicts the current locations of the buses in service on each route for the purpose of customer's information, whereas others provide such information only to dispatchers or to other employee's. There are other applications that monitors the driving behavior for example an employer of an employee, a parent with teen driver.

Transit systems are also popular in theft prevention of consumer vehicles, monitoring and retrieval device. To locate the stolen vehicle, police simply follow the signal emitted by the tracking system. Vehicle tracking systems when used as a security system will serve as either an addition or replacement for a traditional car alarm. Some vehicle tracking systems controls the vehicle remotely i.e blocking the doors or engine in case of emergency. Therefore the existence of vehicle tracking device reduces the insurance cost significantly because the loss risk of the vehicle reduces.

In layered approach which was proposed by NICB(National Insurance Crime Bureau) for vehicle protection ,vehicle tracking systems became an integrated part .Based on the risk factors corresponding to a specific vehicle ,layered approach provides four layers of security. According to NICB, vehicle tracking system which is one layer in the layered approach, is very effective in recovering the stolen vehicle by the police. Some vehicle tracking systems are integrated in several security systems for example if an alarm is removed from the vehicle without authorization or when it leaves or enters a geophone sends an automatic alert to a phone or email.

III. PROPOSED SYSTEM:

The objects can be easily distinguished in the feature space since the most desirable property of a visual feature is its uniqueness. Feature selection method for single target tracking based on object interaction models is proposed to track the single target continuously and accurately measure the distance moved by the target and velocity of the target.

An example of interaction model generally observed in streets, airports, stations etc is shown below.

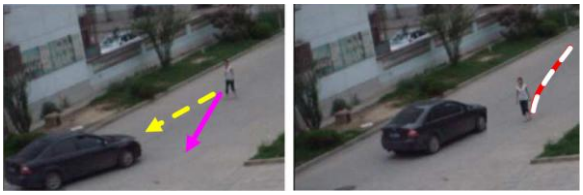

Fig 1: Interaction model

In this example a car is coming fastly in the street, wants to turn right and a pedestrian walks in the street. In this case to avoid the oncoming car, the pedestrian will normally turn around instead of continuing to walk forward where as the car before taking right turn will first slow down to let the pedestrian pass as shown in the right image. Generally the car would just turn right keeping its original speed ,if there was no pedestrian. In the same way the pedestrian would just walk following the yellow line, if there was no car. From this example we can observe the interaction happened between objects. Based on this observation we developed a novel interaction model. It achieves superior performance compare with existing approaches.

IV. METHODOLOGY

The objective of single target tracking is to track the single target continuously and accurately measure the distance moved by the target and velocity of the target and acceleration of the target.

ALGORITHM

Step 1:Read the video file.

Step 2: Divide the video file in to frames

For single target tracking there is need to associate target object in consecutive video frames. This association becomes difficult when the object move very fast compare to the frame rate. If the tracked object changes angle orientation over time, in that case also the association becomes complex. For this type of cases usually Video tracking systems employ a motion model. That describes how the image of the target might change for different possible motions of the object.

Step 3: Extract objects from the video frame

Gaussian background model which is a method of separation is used to separate the back ground and foreground objects. For separation a set of frames are taken. Then the mean and variance at each pixel position is calculated and by using threshold function the separation is performed.

Step 4: consider the centroid of the object in each frame.

Step 5: consider first and second frame.

Step 6: calculate the change in the centroid position of the object between the frames.

The change in the centroid position of the object is calculated by using the Euclidean distance formula.The variables for this formula are the pixel positions of the moving object.

Algorithm for calculating the change in the centroid position is as follows

1. Read the centroid position of each image.
2. Calculate the distance between two centroid images.
3. for (present position=initial value: final value) of X resolution.
4. for (present position=initial value: final value) of Y resolution
5. Calculate change in distance by distance =sqrt((X2:X1)2+(Y2:Y1)2).

Where X1=previous pixel position and X2=present pixel position in width,Y1=previous pixel position and Y2= present pixel position in height.

Step 7: Store the change in the centroid position in an array.

Step 8: Next consider second and third frame.
Repeat step 6 &7.

Step 9: In the same fashion Repeat step 6 &7 until the completion of all frames.

Step 10: To calculate the distance moved by the object, sum up all the values in an array.

Step 11: The velocity of the moving object is calculated by the distance it travelled with respect to time.

we can also calculate the acceleration of moving object. The velocity of the moving object is calculated by the distance it travelled with respect to time. velocity of the moving object is in 2-dimension(since camera is static). The velocity of moving object in the sequence frames is defined in pixels / second.

V. SOFTWARE

The MATLAB version 8.0 or later is suitable for this system.MATLAB provides extensive image processing toolbox library suitable for our work.

VI. RESULTS

We tested the software reliability to increasing the performance of target tracking images, which is used for measuring the quality. For testing several video files are considered.one video file among them corresponds to the movement of the object chair,to which the following results are obtained. Here the value of s1 represents the number of pixels by which the centroid position of the object changed between frames & sp1 represents the velocity of moving object defined in pixels/sec.Figure represents the extracted object from frames.

s1 = 70.8471
s1 = 71.6021
s1 = 70.2031
s1 = 68.8741
s1 = 66.9554
s1 = 69.7623
s1 = 70.0118
s1 = 71.2034
s1 = 73.0570
s1 = 75.4330
s1 = 72.5084
sp1 = 183.1020

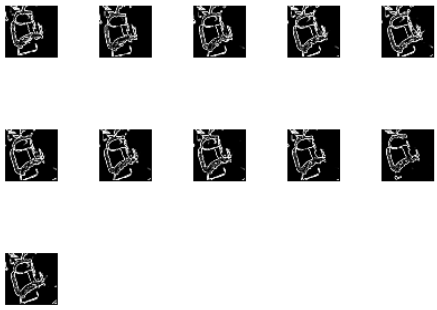

Fig 2: Extracted object from video frames

VII. CONCLUSION

Single target tracking which finds application mainly in security surveillance and vision analysis is evaluated on simulation. The object is extracted from its background and foreground objects. Then its centroid is calculated. Thereafter the distance moved by the moving object between frame to frame is calculated. Using this velocity of moving object defined in pixels/sec is calculated . Hence we have traced moving object by proposed algorithm and the velocity of the object is also determined.

VIII. FUTURE SCOPE:

Classical kernel methods are effective and give robust performance for single target tracking.But when these methods are applied for multi target tracking ,the tracker get failure.This is because the tracker will track each target independently and will not take in to consideration the interaction happened among different objects.

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