A Comparative Study of Pedestrian Identification Approaches for Traffic Light Simulation

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Abstract- **This paper presents the different approaches for the pedestrians (who cross the road), there is different type of systems developed now days for pedestrians and to control the traffic so that time consumption to reaching the destination by road become less. This type of system is very helpful for both, the one who drive on the road or who walk on the road (pedestrians). There are different approaches used for making such related systems like wise an autofocus study of traffic light and using multi-objective optimization to control the traffic lights timing. As we know that the good management of traffic lights system will ensure the good flow of vehicles and it impact on the less traffic jams and less accidents and all other aspects. This paper presents the comparative study on the field of traffic lights simulation for pedestrians in detail in this paper. To identify the pedestrian who walked over the road and accordingly traffic light system will show the light red, green and yellow. To provide overview in this field, we present this paper so that different systems that are developed till today will be reviewed for the improvement of current system.**

Keywords- **Automatic Detection, Graphical Information System, Multi-objective Optimization, Traffic Light Timing, Traffic Video Monitoring System.**

I. INTRODUCTION

Now a days as we seen that the traffic over the road is become major problem for the vehicles and the pedestrians too. Because of traffic to cross the highway road and bridge become a problem for normal people. Hence to reduce or overcome such problems there are multiple systems related to this field is being developed so that a good flow of vehicles and pedestrians developed which results less traffic jams and the reduce delays. A good traffic light system will overcome all such above mentioned problems. As we know that the traditional traffic light system is one which give signals red, green and yellow at the fixed time interval weather the vehicles/pedestrian waiting or not it provides green lights to the one instead of providing the green signal to the other side where a lot of vehicles/pedestrian waiting for the signal. This is the problem related to the traditional traffic light controller system. Now the world become advance and everywhere in the world artificial intelligence techniques are used to reduce the human problem and provide comfort to the humans in their living style. There are different approaches in the world develop to resolve such traffic light system's problem by using the advance new techniques. We discussed all these approaches in this paper in detail in section 2.

TABLE I
LITERATURE SURVEY

Sr. No.	Author's Name	Year	Paper Name	References
1	Wenchen Yang	2012	Urban Traffic Signal Two-Stage Combination Fuzzy Control & Paramics Simulation	[1]
2	Xuehua Song	2012	Detection and Identification in the Intelligent Traffic Video Monitoring System for Pedestrians & Vehicles	[2]
3	Breno C. Costa	2011	Traffic Lights Timing Inside Micro-region Simulator using Multi-objective Optimization	[3]
4	Guido Matrella	2011	An Embedded Video Sensor for a Smart Traffic Light	[4]
5	Franz Huber	2010	Traffic Light an Autofocus Case Study	[5]

II. COMPARATIVE STUDY

There are many approaches for developing traffic light system for vehicles and pedestrians, in the one approach an autofocus case study is used to develop the traffic light controlling system; this system is developed by using embedded system. In this system graphically description is done of the region and then engineering process for the concurrent system is done. This system work like the open system where it directly communicate with the environment and exchanging the signals, it is also called the timed system because its reaction is totally depends on timing of the environment actions, means when any action is noted over the environment then it react accordingly that's why it is called the timed system. And its specialty of controlling and communicating by using the technique of message passing it is called the distributed and concurrent system. This autofocus study having the structured way of describing these as - SSDs, DTDs, STDs, EETs [5]. There is work done in the field of crowd counting for detecting and identifying the people this will helpful in traffic light system to identify the pedestrians

[6]. Another approach to developing traffic light system is by using multi-objective optimization, here traffic light timing using non dominated sorting genetic algorithm. Hence here NSGA II algorithm is used for the traffic timing. A genetic algorithm is used over here for traffic light system. In this approach microregion traffic simulator is being coupled into the geographic information system. In this approach, as we know that the traffic and population over the region is increased day by day and therefore to control such a huge population become so difficult and therefore in this approach they concentrate on the microregion and using the multi-objective optimization technique. A dynamic co-ordination is held with the traffic light. According to its approach traffic light is an agent and behave like a social insect. And the task of such insect is to plan and change the traffic light accordingly. This approach used a software tool GIS (Graphical Information System) [3]. And proposed an algorithm based on genetic algorithm. Another system developed in this field is related to detection and identification in the intelligent video monitoring system [2] for pedestrians & vehicles. People need to travel over the bridges highways and to cross such ways become difficult because of there is not such alarms for abnormity. As we know that the traditional traffic control system only seen the enormity, but never alarm for such abnormity. Hence for this purpose this type of system is being designed which helps for the pedestrians and vehicles for reducing the accidents over the road. In this approach a system is developed where the humans is on the road, a cross way and there is green signal for the vehicles then this system will generate an alarm for the drivers of the vehicles that they should be stopped because someone crossing the road at that time. This approach uses the Gaussian mixture model and support vector machine [2]. Here Gaussian mixture model is used to detect the moving objects and the support vector machine is used to make differentiation between the pedestrians and vehicles. The result of this approach was optimally feasible. There is another approach in the context is by using the embedded video sensor [4] for a smart traffic light. The work of such system is that sensor detects the motion of the object and raise alarm accordingly. Here the system is worked in such a way that when the sensor detect the object if the person is on the crosswalk near the traffic light instead of the signal is being stop for the pedestrians then an alarm is automatically generate to the incoming drivers[7]. But the innovation of this approach is that there is no PC is used to monitor the video or scene only a sensor device is used in this case for the detection of the pedestrians [8]. A region is decided only that region as sensor device will work and able to detect the pedestrian and accordingly signal changes and alarm generates. An embedded system is also used in this technique. There is another system developed in this field which is able to detect the behavior of the pedestrians. A lot of work is being done over the crowd counting field; this will be the innovative version of the crowd counting where the behavior of the mass is noticed or captured by the system. There is an another system to demonstrate the urban traffic signal using two-stage combination fuzzy control and paramics simulation [1]. In this approach a fuzzy controller is used which adopts 0-1 combination depending upon the traffic status at the intersections. The input of the fuzzy controller should be determined by the status of the traffic and its variable's combinations. In this system single stage controller is used or applied when the traffic flow is low and when the traffic flow is high then the two-stage fuzzy controller is used [1]. The differences of the images are used to detect the abnormity [11].

TABLE II
COMPARISON TABLE OF USED SYSTEM IN THE APPLIED APPROACHES

Sr. No.	Author's Name	Approach	Used System
1	Wenchen Yang	Urban Traffic Simulation using Fuzzy Controller and Paramics	Fuzzy Controller System
2	Xuehua Song	Detection and identification of pedestrians and vehicles using intelligent traffic video monitoring system	Video Monitoring System
3	Breno C. Costa	Traffic light simulation using multi-objective optimization	Graphical Information System
4	Guido Matrella	Traffic light simulation using embedded video sensor	Motion Sensor, Embedded System
5	Franz Huber	Traffic light an autofocus case study	Embedded System

III. PRECEDING APPROACHES

Comparison of these different approaches is done on the basis of the techniques which they are used for developing the system. The study of all the approaches in detail is as follows:

A. Autofocus Case Study

In this approach autofocus is used to develop the traffic light controlling system, this system is developed by using embedded system. In this system graphically description is done of the region and then engineering process for the concurrent system is done. This system work like the open system where it directly communicate with the environment and exchanging the signals, it is also called the timed system because its reaction is totally depends on timing of the environment actions, means when any action is noted over the environment then it react accordingly that's why it is called the timed system. And its specialty of controlling and communicating by using the technique of message passing, it is also called as the distributed and concurrent system. This autofocus study having the structured way of describing these as- SSDs, DTDs, STDs, EETs [5].

B. Multi-objective optimization

In this approach towards developing traffic light system, it is done by using multi-objective optimization; here traffic light timing uses a non-dominated sorting genetic algorithm [10]. Hence here NSGA II algorithm is used for the traffic timing. A genetic algorithm is used over here for traffic light system. In this approach microregion traffic simulator is being coupled into the geographic information system. In this approach, as we know that the traffic and population over the region is increased day by day and therefore to control such a huge population become so difficult and therefore in this approach they concentrate on the microregion and using the multi-objective optimization technique. A dynamic co-ordination is held with the traffic light. According to its approach traffic light is an agent and behave like a social insect. And the task of such insect is to plan and change the traffic light accordingly. This approach used a software tool GIS (Graphical Information System) [11]. And proposed an algorithm based on genetic algorithm [3].

C. Intelligent Traffic Video Monitoring System

In this approach system developed in this field is related to detection and identification in the intelligent video monitoring system for pedestrians & vehicles. People need to travel over the bridges, highways and to cross such ways become difficult because of there is not such alarms for abnormity. As we know that the traditional traffic control system only checks the abnormity but never alarm for such abnormity. Hence for this purpose this type of system is being designed which helps for the pedestrians and vehicles for reducing the accidents over the road. In this approach a system is developed where the humans is on the road a cross way and there is green signal for the vehicles then this system will generate an alarm for the drivers of the vehicles that they should be stopped because someone crossing the road at that time. This approach is used the Gaussian mixture model and support vector machine. Here Gaussian mixture model is used to detect the moving objects and the support vector machine is used to make differentiation between the pedestrians and vehicles. The result of such approach was really very good [2].

D. Embedded Video Sensor

There is another one approach is that, by using the embedded video sensor for a smart traffic light. The work of such system is that sensor detects the motion of the object and alarm accordingly. Here the system is worked in such a way that when the sensor detect the object if the person is on the crosswalk near the traffic light instead of the signal is being stop for the pedestrians then an alarm is automatically generate to the incoming drivers. But the innovation of this approach is that there is no PC is used to monitor the video or scene only a sensor device is used in this case for the detection of the pedestrians. A region is decided only that region a sensor device will work and able to detect the pedestrian and accordingly signal changes and alarm generate. An embedded system is used in this technique too [4]. The images are captured by the surveillance footage is being analyzed when any uncertainty is happened [12].

E. Fuzzy Controller

In this approach system is developed to demonstrate the urban traffic signal using two-stage combination fuzzy control and paramics simulation. In this approach a fuzzy controller is used which adopts o-1 combination depending upon the traffic status at the intersections. The input of the fuzzy controller should be determined by the status of the traffic and its variable's combinations. In this system single stage controller is use or applied when the traffic flow is low and when the traffic flow is high then the two-stage fuzzy controller is used [1].

IV. TERMINOLOGY

A. Support Vector Machine

These are supervised learning models which are used with learning algorithms which analyze the data and according to its pattern and data classification is done. A set of training data is given to the machine and by which machine is learned and according to that new data is classified. In the field of traffic light this support vector machine is used to classify the data. Data may be the vehicles car, bike, truck, bus, pedestrian etc. according to the object it classify the data set and accordingly processing is being done of the system [2].

B. Gaussian Mixture Model

Gaussian mixture model is one of the type of density model. Gaussian mixture model is used to detect the moving objects that the object is on the moving position or not [2].

C. Graphical Information System

This is the system which is used to design for the purpose of collecting the geographical data, it is used to capture, analyze, store, manage and manipulating the geographical data [3].

D. Moving Object Detection

It is the technique to detecting the moving object. It became helpful to identify the moving object in the case of identifying the moving vehicles and pedestrians [2].

E. Traffic Light Timing

Traffic light timing [9] is the process where, according to the timing of interval lights of the traffic light is displayed in the traditional traffic light system. The lights could be red, green and yellow. Red light indicates the stop to the vehicles and pedestrians too. Green light indication allowed vehicles and pedestrians to go. And the yellow light indicates that be ready to go [3].

V. CONCLUSION

Presently, when everything is under control of artificial intelligence, presenting a simulated environment for Pedestrians becomes a vital need for traffic simulation and controlling accidents on the road. In this paper, we have gone through various methods till date presented by various researchers which are as: urban traffic signal using two-stage combination fuzzy control & paramics simulation, embedded video sensor(an embedded video sensor is used for a smart traffic light), Gaussian Mixture Model and Support Vector Machine; detection and identification in the intelligent traffic video monitoring system for pedestrians and vehicles, Graphical Information

System; traffic light timing inside micro-region simulation using multi-objective optimization. But the above mentioned system comprises of various flaws such as: constant time interval, a substantial frequency of hit and run, consideration of micro-region etc. Therefore, we need to develop a robust, secured, simulated traffic light system using best techniques to make control over pedestrians and vehicles on the road in order to enhance the civic areas and society welfare through computer vision approaches.

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