Automated Overtaking Decision Maker

Naushad Ahamed M.R[1] Arafa Zain Shariff[2] Azeem Lashkari[3] Zeeshan Asif[4] Neetha Natesh[5]
[1,2,3,4]UG Student [5]Assistant Professor
[1,2,3,4,5]Department of Information Science & Engineering
[1,2,3,4,5]Dr. Ambedkar Institute of Technology, Bangalore, Karnataka

Abstract— AUTOMATED OVERTAKING DECISION MAKER is a very essential part of safety driving system. It is very helpful as it informs the driver the conditions that occur during driving, the intrusion detection and prediction of the collision with other vehicles and preventing it. AODM includes the sensors like infrared sensors along with wi-fi tethering techniques. These types of techniques are very useful and cost effective. Hence, it is used widely. The occurrences of interferences between the vehicles are very minimal as they approach to overtake the other moving vehicles.

Key words: AODM, Safety Driving System

I. INTRODUCTION

The process of overtaking of a vehicle is one of the important actions which the driver performs. the actions of the driver during the travel in highways. Any kind of improper decision made by the driver's negligence to properly understand the information of the other approaching vehicles has led to disastrous and severe accidents. The system remove the errors and ensure the safety of the vehicle, the vehicles that are going to be developed in future should inculcate such appropriate algorithms which will help them to calculate all the different aspects changing the lane or the overtaking process. Various real-time issues should be put forth and examined.

1) To develop the trajectories that are safe and optimal
2) Calculating the proximities of the surrounding vehicles.
3) Implicitly determine when the process of lane change should start.

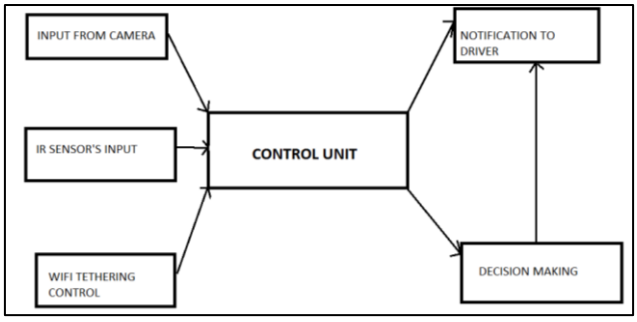

Fig. 1: Block Diagram of Automated Overtaking Decision Maker

Now we are going to consider a simple situation on a high way where vehicle need to overtake: for example, let the vehicle1 driving on a high way having a certain velocity and another vehicle2 moving at a slower pace than the first vehicle .There is no obstacle or vehicle intrusion in the passing lane which might effect the overtaking process. This can be performed by the driver1 in three different phases.

Move and over take from the lane in which the driver is driving to the other passing lane

1) To travel in the lane which the vehicle has to pass and hence,
2) Return back to the driving lane

In a situation which is more complex the driver should also consider one more obstacle that could possibly be present in the passing lane and therefore might advise the driver 1 to overtake the vehicle 2 because of the safety consideration. In this kind of case, extra velocity – adjustment phase should be added. While this phase is going on, the driver1 should make changes to the moving velocity in accordance to the velocity of vehicle 2 and wait till the passing lane does not contain any obstacle during the overtaking process.

II. GENERAL INSTRUCTION

This paper includes the consolidated system and emphasis is given to the algorithm of the decision making that put forth the convenient and safe decision of overtaking instead of using many sensors

1) The camera that is being attached to the vehicle that in front of the overtaking vehicle that might be moving in front of it and this particular information is transferred in the video format to the vehicle that has to overtake through the WIFI tethering
2) In Automated Overtaking Decision Maker, to measure that distance of the approaching vehicle coming in the opposite direction, the IR sensors are attached to the vehicle.
3) The consolidated system calculates the distance and corresponding speed of the approaching vehicle through the sensors and illuminates the driver whether overtaking decision is safe or not.
4) The system being proposed provides and effective and convenient decision that avoid colliding approaching vehicle in the opposite direction during the overtaking process.
5) Preventing the overtaking of vehicle from a distance which is not safe with the vehicle that which is in the front.
6) In this situation the simulator sends the front laser output to the application and later decides not to overtake the vehicle in front and in turn send appropriate text information via the communication part and these messages shall be displayed on the application window. This test was performed for several time taking different distances between the two vehicles into the consideration where system could give the proper signal to the driver.
7) The application developed gives the information like how much distance the vehicle has to travel so that it can fully overtake the receding vehicles and also calculate the time necessary to overtake. It also provides the information of speed of the approaching vehicle.
8) Hence for all the situation a warning signal to the driver not to proceed the decision when total distance travelled

by the vehicle was less than the actual distance that need to be the travelled.

III. IMPLEMENTATION

A. Variables

l1- Length of Vehicle A
l2- Length of Vehicle B
2w1- Width of Vehicle A
2w2- Width of Vehicle B
A-Distance between Vehicle A & B
B-Distance between Vehicle A & B after overtaking
HW- complete Hardware
S1-Speed of vehicle A
S2-Speed of vehicle B
S3-Speed of vehicle C
C-Distance between moving vehicles(shown in diagram)
m-Slope calculation
D-Distance to travel for overtaking
t-Time

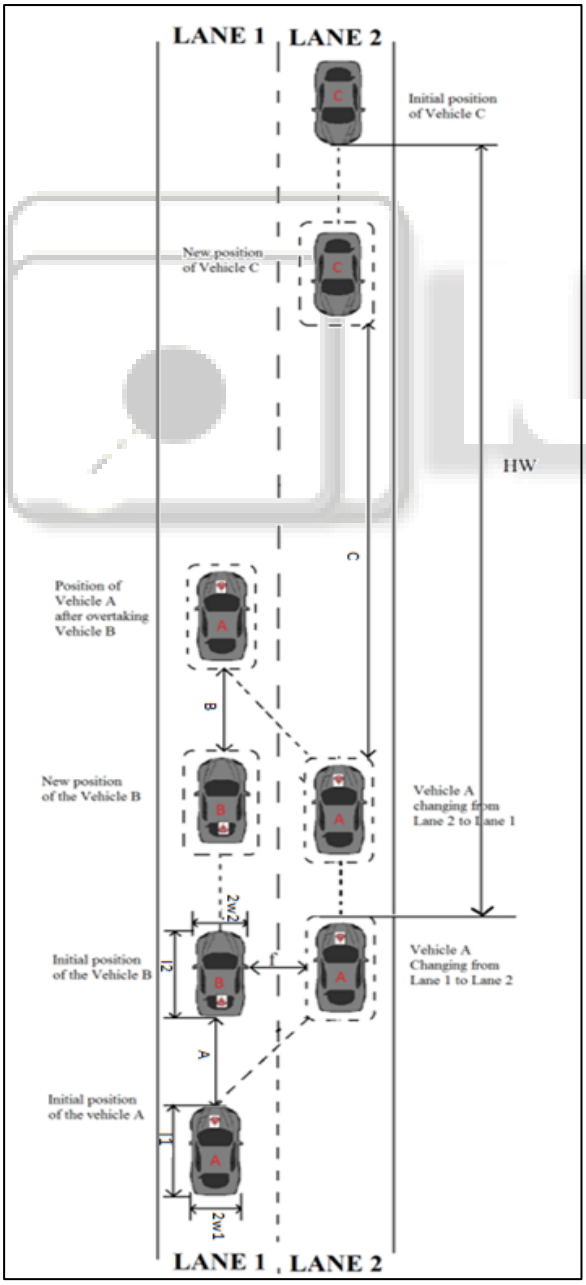

Fig. 2: Implementation Representation

B. Equations

1) Calculating slope:-

$m = \sqrt{(l2 + A)^2 + (3w1 + f)^2 + l2}$

Decision=C-(5 / 18) * (*t*) + *s1* (5 / 18) * (*t* - 0.5) should be more than 50 meter. ie. Vehicle 1 must be 50m away from the vehicle approaching it, say vehicle 3.

$D=\sqrt{((l2+A)^2+(2w1+w2+f)^2)}+\sqrt{((B+l1)^2+(2w1+w2+f)^2)} + l2$

(s1 – s2) t = D

$s3^{|} = \Delta / \Delta t$ *and* $s3 = s3^{|}$ - *s1*

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