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AUTOMATIC TRAFFIC RULES ABIDING CONTROL

AN IDEA FOR ACCIDENT-FREE WORLD

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***Abstract*-The World is moving so fast, so that impatience is seen in every sector. This has increased entropy in breaking the rules, and thereby increasing the number of accidents[1]. Hence, to control the accidents, each vehicle is provided with a microcontroller 8051[5][6]. The microcontrollerkit is used to continuously monitor the speed of the vehicle and data is logged for every second. The acceleration of the vehicle is calculated continuously. The Signal status and time is transmittedto the vehicle at a certain distance infront of the signal through RF Transmitter[7]. The microcontroller[5][6] once receiving this data via RF Receiver[7] takes up the current speed and acceleration in the calculation and finds the possible distance which the vehicle can cover with that particular speed and time[2]. This distance is then compared with the *cover distance. Based on the result, the signal is sent to the driver, and a message is displayed in LCD Screen. In the negative case, if the driver doesn't react for 2 seconds the vehicle is made to stop before the signal, by sending an interrupt. Here, in the positive case, the vehicle functions as such manual drive. If the driver has reacted, then the control remains with the driver. With the control being automated, the fuel supplied to the vehicle is reduced[8]. By this way, the power driving the vehicle is cut. Based on the load in the vehicle, the brakes are applied automatically[3][4]. The connection with each controller is cut as soon as it crosses the signal. The range of the transmission is set such. By this way, the drivers are made to abide by the rules, and hence the accidents can be prevented in the real world. The work is most successful in the case of electric vehicles, where the speed of the vehicle is reduced just by decreasing the supply to the motor[5]. An intermediate module is used to control the speed by varying the supply.**

***Keywords*-**microcontroller 8051[5][6]; Signal transmission; braking assembly; accident-free;LCD Display**.**

***cover distance – the distance between the moving vehicle and signal junction.**

I. INTRODUCTION

Every year, we find more and more road accidents[1] due to increased traffic on the roads, And if you see the statistics, you will find that the causalities are more every year than that of 1970 Indo -Pak war. The frequency of traffic collisions in India is amongst the highest in the world In New Delhi;the frequency of traffic collisions is 40 times higher than the rate in London, the capital of the United Kingdom. The "GlobStatus Report on Road Safety" listed by the WHO (World Health Organization) identified the major causes of traffic collisions as driving over the speed limit and trespassing the traffic rules. A National Crime Records Bureau (NCRB) report revealed that every year, more than 135,000 traffic collision-related deaths occur in India. The total number of accidents in 2015 is 67,250 and the persons killed are 95,343[1]. Hence, it has become an important problem to deal with. The accidents[1] happen either due to the miscalculation of the driver or the haste. All the possible cases will be considered and programmed. The Vehicle on reaching the transmission region receives the data and goes for calculating the possible distance which the vehicle can cover. If the possible distance is greater than the cover distance, the vehicle can cross the signal on its own and hence the vehicle remains undisturbed. In case, if the possible distance is lesser than the cover distance the control is automated, and the vehicle is made to stop if driver doesn't respond. Thus, this project makes a stand here in preventing the accidents. The emergency vehicles like Ambulance and Police Vehicles are given exception to this system

II. PROBLEM STATEMENT

The main objective of this project includes creating an environment accident-free with not compromising on the quality and standard of living. There is no system to regulate the vehicle according to the rules and regulations. To make the system easy to implement without many alternations in the infrastructure and at low cost.

III. AUTOMATION OF VEHICLE CONTROL

The automation of the vehicle suggested since drivers in haste try to trespass the signal at the tail end, which leads to the accidents[1].Since the distance which the vehicle could cover is found the drivers can be indicated of their possibility to cross. This improves the quality of driving. When this system implemented, the hastiness avoided. Therefore, the miscalculations in driving can avoid which in turn reduces the death. The proposed system can implement with theaddition of microcontroller 8051[5][6]. Thus, it is cost efficient and easy for implementation.

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IV. PROPOSED AREA

This System mainly implemented in the junctions. It has avariety of applications. This system can also be used to control the speed of the vehicle in the traffic prone area and school zones and can be used to indicate the driver the hospital area and temples when integrated along with the GPS. The LCD Display indicates the driver all the information.

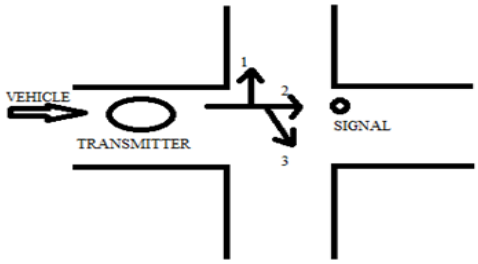

Fig 1. Area of Proposal

- Left turn (free)
- Straight Road
- Right turn

When the vehicle moves as shown in fig 1. The Vehicle receives the data in the transmitter region. The vehicle can either be automated or remain in amanual mode based on the condition. This is the main area of theproposal. This can be linked along with apps like Hyderabad Traffic live, Google Maps, etc., for wide use.

V. FEASIBILITY STUDY

Table1.EconomicFeasibility

S.No	Components	No. of Units	Cost (in rupees)
1.	ATMEL Microcontroller Board[5][6]	1	450
2.	LCD Display	1	180
3.	Driver Circuit	1	150
4.	DC Motor[5]	2	300
5.	Wire and Other Peripherals	-	400
6.	Lead Screw	1	500
	Total Cost	-	1980

From the above cost estimation on Table 1, it is found that it is feasible to implement the system without many constraints.

VI. OPERATIONAL FEASIBILITY

The proposed model is fabricated using ATMEL Microcontroller[5][6] based motor[5], which is attached to the throttle valve. Thisregulates the fuel[8] entering the engine. The controller itself does the calculations. The electrical components used can also couple with the Microcontroller[5][6]. Thus, the controller based Vehicle Control is feasible. This controller can add as a slave to the ECU Unit of the Vehicle. Theydon't require any manual interaction since it starts once the vehicle reaches the Transmitter region. It gets turned off along with the vehicle. The battery provides the power to the controller. Thus, this project is operationally feasible.

VII. TECHNICAL FEASIBILITY

First and foremost, the most basic mechanical and electrical components are assembled to develop the prototype. All the component like DC Motor, electronics component like ATMEL Microcontroller[5][6], Driver Circuit and electrical component like LCD Display are easily available. The points mentioned above serve as suitable arguments to show the technical feasibility of the model. The technical constraints of the project that aids in control could be easily deployed with the help of Microcontroller[5][6] and lead screw action.

VIII. DESIGN CALCULATION

A. Mechanical Design

B. MaterialUse

- Lead Screw – Mild Steel
- Designcalculations
- MotorCalculation

Load

Weight = mass * gravity = 0.2*9.8 = 1.96 N

MotorTorque

Torque T = Force * radius = 1.96 * 0.015

T = 0.0294 Nm

Speed

Velocity V = 0.03 m/s

Diameter of roller D = 0.032 m

Velocity V = $(\pi DN)/60$

$0.03 = (\pi * 0.032 * N)/60$

N = 17.91 rpm = 20 rpm

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Power

Power P = $(2\pi NT)/60$

= (2*3.14*20*0.0294)/60

Power P = 0.062 W

IX. DISTANCE CALCULATION

Distance S = ((u*t)-(0.5*a*t*t))

Speed of the Vehicle u = x (data from the vehicle)

Acceleration a = y (data from the vehicle)

Time t = z (data received to the vehicle)

Assume x = 30 km/hr = 8 m/s

Time for the signal to get switched over t = 15 sec

Acceleration a = 0.00426 m/s^2

Possible Distance S=((8*15)-(0.5*0.00426*15*15))

S=119.52 m.

X. ELECTRICALDESIGN

Proteussimulation

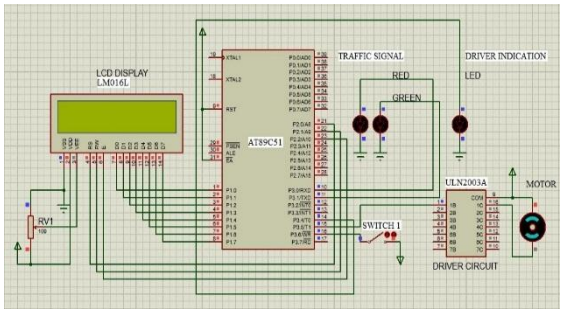

Fig 2. Proteus Simulation

The above fig 2shows the simulation of thecontrol circuit as mentioned in the proposed model using Proteus Software. It depicts the Signal status, as well as the **, LED and the ***motor.

**LED – LED intimates the driver whether he can cross or not. It will display in the Dashboard.

***Motor – The motor indicates the Vehicle status. If the status is high, it states that vehicle can accelerate. If the state is low, it cannot accelerate.

XI. SEQUENCEOFOPERATION

The electrical setup shown in fig 2is mounted in the Vehicle. The power is provided from the battery. The Setup turns on once the vehicle is started and continuously monitors the speed of the vehicle. With this data, the acceleration of the vehicle found for every second. The RF***[7]*** Transmitters willbe placed at the certain distance before the signal as shown in fig 1. The Vehicle on reaching the particular area receives the time and signal status. The distance which the vehicle can cover at that instant of time with that speed and time found. There stand three cases for decision.

- Red Light
- Green Light – Coverable
- Green Light – Not-Coverable

When the Signal Status is Red, the vehicle should not attempt to cross the signal at any stage.

When the signal status is Green, there exist two states where one is the vehicle can cross the signal with the specified time; while the other is the vehicle cannot cover up the distance in the period. Here, the updated speed and acceleration taken so that on decelerating the vehicle near the signal also considered for decision making.

Case 1

In this case, no vehicle should cross. Hence, an indication will be given to the driver that the signal is Red and he should not cross the signal. Further, if he accelerates the vehicle, the fuel[8]is cut-off so that the vehicle doesn't support acceleration even if he attempts.

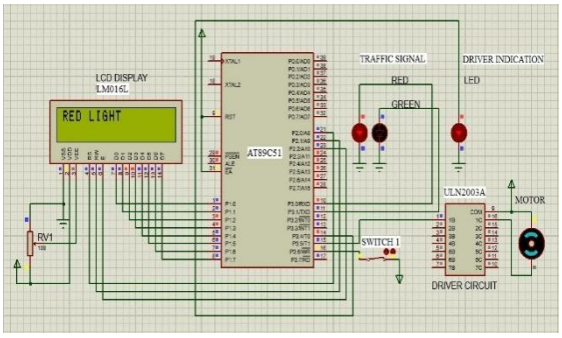

Fig 3. Red Light

Thus, the vehicle will be made to stop before the Signal****. The Proteus simulation for that case shown in fig 3. This clearly explains the state.

Case 2

In this case, the distance which the vehicle could cover is found. Since the vehicle could cross over the signal at the present speed.This state is explained in the fig 4. Here, the

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vehicle remains in the driver control. The Vehicle and the privacy of the driver remain undisturbed.

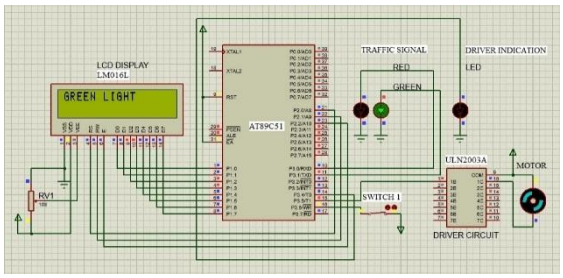

Fig 4. Green Light – Coverable

Case 3

In this case, the distance which the vehicle could cover is found. The distance is lesser than the cover distance. So a LED Indicator isindicated stating the driver that he cannot cover the distance with the available time. When the driver doesn't respond accordingly for 2 seconds, the vehicle is made to stop automatically.

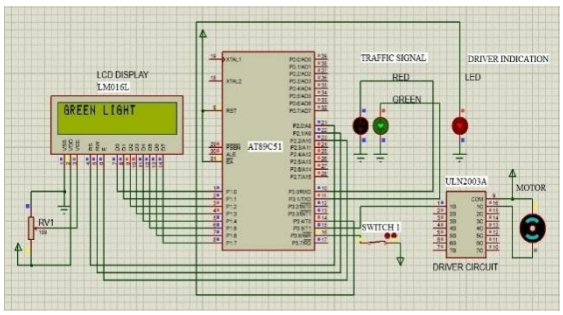

Fig 5. Green Light – Not-Coverable

Fig 4 visualizes the condition. Here, the vehicle will be made to stop before the Signal****.

****Vehicle will be made to stop before the signal–

The motor[5] (20 rpm) attached along with lead screw arrangement. This motor[5] on rotating makes the fuel regulator[8] plate attached to the lead screw to move forward, which cuts the fuel supply[8]. The motor[5]not shown in the simulation. The brakes[3][4] are also applied to halt the vehicle. In this way, the vehicle is made to stop.

The supply from the microcontroller[5][6] fed into the driver circuit which provides the operating voltage and current to the motor[5] for rotation.

XII. EXEMPTIONS

The Vehicle which take free left or right need not stand on the signal. Here, the indicators are used to find the directions. When the driver takes afree turn, the data not processed so that the vehicle remains in manual mode. The driver on taking either the straight or right turn, the vehicle comes with the system. Thechange in state of the indicator is sensed and is used to turn on or off the SWITCH 1 shown in the fig1. The manual control of the switch 1 provided with the Ambulance and Patrol Vehicle.

XIII. FABRICATED MODEL

The above fig 6 represents the prototype of the vehicle. The model implemented with 8051 microcontroller[5][6],LCD Display, LED's and driver circuit. The messages are displayed in the LCD Screen and LED to indicate the status of the vehicle to the driver. The motors are placed to indicate the motion of the vehicle.

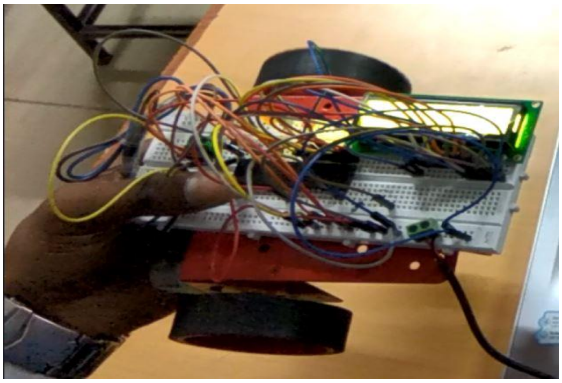

Fig 6. Fabricated Model

The power supply (5V) is provided externally using the adapter. The motor[5] which controls the fuel[8] are capable of bi-directional rotation. This helps in opening and closing of the throttle valve.

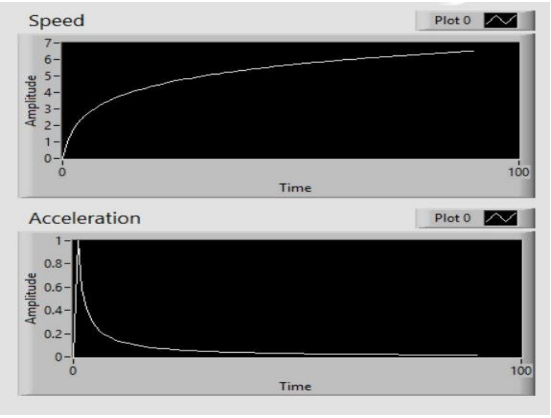

Fig 7. Speed and Acceleration graph

The above fig 7 represents the data recorded in the vehicles graphically. The first chart represents the speeds at which the vehicle has travelled. The second chart represents the

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acceleration of the vehicle. The data is logged which is shown below in fig 8.

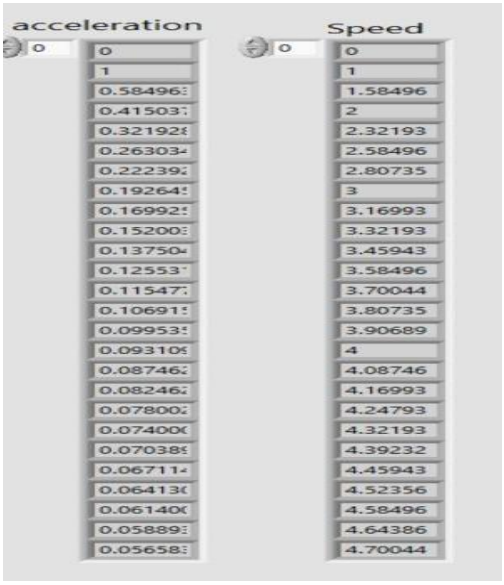

Fig 8. Numeric representation of speed and acceleration.

These data are recorded and displayed using different software. These data are used to calculate the possible distance.

XIV. RESULT

The advantages of the system can be understood from the above passage. Even parental control can be implied over the vehicle. The world can be made accident-free. The program is based on the embedded programming, and it is flexible. The diagnosis of theproblem is quite easy and adaptive in nature. The speed control of the vehicle is also possible according to the region. This system ensures the safe and calm journey throughout the travel.

XV. CONCLUSION AND FUTURE SCOPE

Conclusion

- Thus, the design and modeling of the system are calculated and with the reference of these calculations the working model has been made.
- Size and cost of this system are less and its implementation is easy. Just an integration of this setup along with the available ECU Unit will leave stones turned.
- Thus the Automatic Traffic Rules Abiding Control to control the accidents is successfully fabricated and the necessary requirements are met.

XVI. FUTURE SCOPE

- The project can be integrated along with the GPS Satellites and apps like Hyderabad Traffic Live, Traffic Speed Monitoring Speed, etc., so that the data transmission could be made from the Satellites.
- The Vehicles can be interconnected using IOT, so that the traffic over the particular region can be monitored.
- The Security system may be strengthened which helps in preventing the theft and other anti-social activities.

REFERENCES

[1]. "Accident details for Tamil Nadu in certain years" (PDF). State transport authority, Government of Tamil Nadu. 2013. Retrieved 22 March 2014.

[2]. Hanrahan, Val; Porkess, R (2003). Additional Mathematics for OCR. London: Hodder & Stoughton. p. 219. ISBN 0-340-86960-7.

[3]. Automated emergency Brake systems: Technical requirements, costs and benefits. C Grover, I Knight,I Simmons, G Couper, P Massie and B Smith, PPR 227, TRL Limited.

[4]. Automatic Speed Indication and Braking System. http://iosrjournals.org/iosr-jece/papers/Vol.%209%20Issue%203/Version-5/A09350107.pdf

[5]. Mr. P Balamurugan (Oct 2014), "Speed Control of DC Motor" using Microcontroller 8051.

[6]. Ayala K.J (1997) "8051 Microcontroller Architecture, Programming and Application", Penram International Publishing (India) Pvt. Ltd, Second Edition.

[7]. F Egan, William (2003). Practical RF System Design. Wiley-IEEE Press. ISBN 978-0-9537231-0-2

[8]. Control Apparatus for Internal Combustion Engine by Norihisa Nakagawa, Takashi Nishikiori. Patent Number. 8918267. December 23, 2014.

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