Hong Kong Student Science Project Competition 2022

Team Number: SAPE197

Project Title: Traffic Alarm System

Project Type: Invention

To our best knowledge and after thorough literature research, as at 30/06/2022 , there are similar works. If there are, the reference links are as below:

https://create.arduino.cc/projecthub/embeddedlab786/car-speed-detector-d60ea0

I.   Background

Transportation is closely related to our daily life while there are a large number of fatal traffic accidents occurring in recent years. There are several accidents occured in Tai Chung Kiu Road which is near to our school which is a crossroad connecting City One Shatin and Wo Che. Regrettably, all these kinds of traffic accidents look very similar. The main reason for the traffic accident is that drivers didn't pay attention to the road situation and the traffic light system is too complicated so that it will mislead the road users whether they can pass through the crossroad or not. What is more regrettable is that these accidents would have been avoidable. As a result, we plan to tackle this problem in our project.

II.   Objectives

We hope that we can decrease the loss caused by traffic accidents such as loss of life and property. Reducing the number of traffic accidents with the assistance offered by the system is the most effective way. As some workers may die in traffic accidents, our labour force will decrease as the labour supply decreases. Reduction of the loss of productivity would also be one of our objectives.

III.   Methodology

Speed sensors will be the most important equipment in our demo. We will create a programme to allow the display of information of cars on a monitor. With velocity, we can find out lots of information. The slope of the tangent of the curve at a certain time will be the acceleration and the area under the velocity curve will be the displacement. We have set a transport light system to ensure that the system will only work when the green light is off. We are going to use a model car in our experiment to test our system and do experiments. We will control the speed of the car by controlling the pushing strength. The car will pass by the sensors and buzzer and light will function if the speed is too high.

IV.   Design of Invention

We will first create a demo of the system to demonstrate some experiments. The demo system consists of two sensors, a buzzer, a LED light, a LCD monitor and an arduino motherboard. This system will connect to the traffic light system. The system will be turned on when the traffic light on a particular junction is in

the condition that a red light is on, both red and yellow are on when turning green from red. It will also be on when the traffic light switches from green light to red light, which is generally speaking yellow light. The two sensors will be responsible for detecting the speed and distance of cars passby. The LCD monitor will show information about cars on the road such as their speed, acceleration and distance between them and the traffic lights. The programme will be done by using arduino software. The programme controls and gives instructions to the system. Under a few conditions such as the acceleration is too high, the system will be triggered and the alert tools will function. The buzzer will make a long beep sound to alert the driver who is driving dangerously with the LED light flashing. We will also consider different conditions such as rainy days when the roads are slippery. We will decrease the maximum speed limit of speed when the car passes through the system so that the driver can brake earlier to avoid the car slipping out to the way over the white line under the traffic light. Our system is similar to the photo on the right hand side.

V. Application / Market Need

The system can monitor the road data such as the traffic light, speed of cars, deceleration of cars and the likes. Some countermeasures against dangerous driving actions such as breaking the speed limit or running the red light will need to be solved in the system. With assistance provided by the system, drivers can know the road situation better and be cautious of their behaviours, such as an alert sound will be heard when they are going so fast when approaching the traffic light under red light. As a result, less traffic accidents will happen. The system will be installed in traffic black spots to monitor the situation of the road anytime and into the traffic light system. It will collect data including the speed of the car, distance between the traffic lights and the cars, the deceleration rate of the car and the time required for the car to reach the traffic light at regular time intervals. Once it detects the car's speed is too high approaching the traffic light while the red light is on, the system will give an alarm to alert road users including drivers and pedestrians that the driver can have more time to react and respond to brake the car and the pedestrians can realise that there are fast car approaching to prevent being hit. Therefore, the number of traffic accidents can be lowered. So we can save costs on repairing and reduce the loss in productivity. However, it may not be accurate enough as our device is not advanced.

VI. Conclusion

We have found that the driver will need 8.3 centimetre to stop the car when the car is moving at a speed of 0.8 metre per second. We figured out that the driver can brake when our system, which is nearly 10 centicentre before the traffic night, is alarmed. Therefore, we proved that the system is useful during different conditions. We hope that this system can be modified by professionals to act as an immediate solution to the disastrous traffic accident situation.