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VEHICLE SPEED CONTROL IN RESTRICTED AREAS BY USING RFID DEVICE

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Abstract - These days, mass-produced vehicles benefit from research on Intelligent Transportation System (ITS). One prime example of ITS is vehicle Cruise Control (CC), which allows it to maintain a pre-defined reference speed, to economize on fuel or energy consumption, to avoid speeding fines, or to focus all of the driver's attention on the steering of the vehicle. However, achieving efficient Cruise Control is not easy in roads or urban streets where sudden changes of the speed limit can happen, due to the presence of unexpected obstacles or maintenance work, causing, in inattentive drivers, traffic accidents. In this communication we present a new Infrastructure to Vehicles (I2V) communication and control system for intelligent speed control, which is based upon Radio Frequency Identification (RFID) technology for identification of traffic signals on the road, and high accuracy vehicle speed measurement with a Hall effect-based sensor. A fuzzy logic controller, based on sensor fusion of the information provided by the I2V infrastructure, allows the efficient adaptation of the speed of the vehicle to the circumstances of the road. The performance of the system is checked empirically, with promising results.

Key Words: automotive sensors, sensorial fusion, RFID, autonomous vehicle

1. INTRODUCTION

Road plays an important role in the transportation field in Malaysia. At the same time, the field of transportation has an irreplaceable role in coordinating all countries ' development plan. Activities indirectly increases the need of human beings for various kinds of vehicles. Simultaneously, the demand for various kinds of vehicles caused the number of vehicles on the road increased. The rise in the number of vehicles in Malaysia directly led to various kinds of traffic issues especially in road crashes. Excessive speed when driving on the road is one of the factors that led to a car accident. In Malaysia, AES system is implemented in order to capture the picture of vehicles which violating the speed limits. These AES cameras are usually installed on the roadside so the daily user of these roads can easily to aware them. After certain time, the drivers will come in mind the locations of the AES cameras. This may lead to a very dangerous traffic situation. For example, when the drivers approaching the enforcement zone, they will suddenly decelerate the vehicle speed and only to accelerate again after passed through the enforcement zone and the problem remains as it is. Besides, the drivers that aware the locations of the fixed cameras may use the other roads in order to prevent the cameras, which may lead to traffic accident on the other roads. In this project, radio frequency identification (RFID) technology is proposed to solve the speeding violations issue. The main reason for choosing the RFID technology is because RFID technology is more difficult to aware by the drivers and this will cause the drivers to reduce the vehicle speed in order to avoid being fined

PROBLEM STATEMENT

Many of the mishaps happen due to violation of this rule in Schools, Hospitals, villages etc.

Hence we are focusing on developing a Project that is RFID Based speed control system.

Road fatalities are a major concern in the developed world. Recent studies show that a third of the number of fatal or serious accidents are associated with excessive or inappropriate speed, as well as changes in the roadway (like the presence of road-work or unexpected obstacles). Reduction of the number of accidents and mitigation of their consequences are a big concern for traffic authorities, the automotive industry and transport research groups. One important line of action consists in the use of advanced driver assistance systems (ADAS), which are acoustic, haptic or visual signals produced by the vehicle itself to communicate to the driver the possibility of a collision. These systems are somewhat available in commercial vehicles today, and future trends indicate that higher safety will be achieved by

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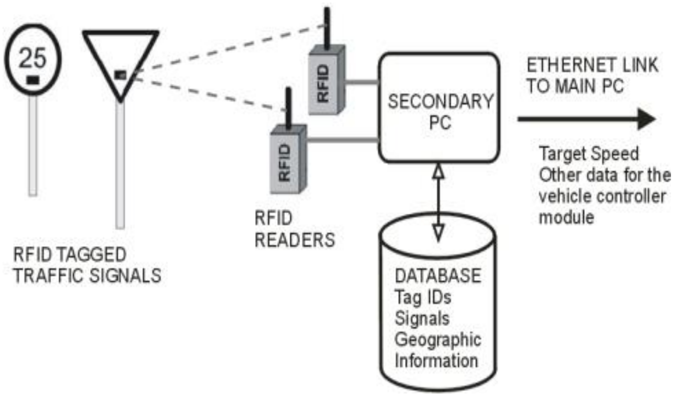
automatic driving controls and a growing number of sensors both on the road infrastructure and the vehicle itself.

A prime example of driver assistance systems is cruise control (CC), which has the capability of maintaining a constant user-preset speed, and its evolution, the adaptive cruise control (ACC), which adds to CC the capability of keeping a safe distance from the preceding vehicle. A drawback of these systems is that they are not independently capable of distinguishing between straight and curved parts of the road, where the speed has to be lowered to avoid accidents. However, curve warning systems (CWS) have been recently developed that use a combination of global positioning systems (GPS) and digital maps obtained from a Geographical Information System (GIS), to assess threat levels for a driver approaching a curve too quickly; likewise, intelligent speed assistance (ISA) systems warn the driver when the vehicle's velocity is inappropriate, using GPS in combination with a digital road map containing information about the speed limits. However useful, these systems are inoperative in case of unexpected road circumstances (like roadwork, road diversions, accidents, etc.), which would need the use of dynamically generated digital maps. The key idea offered by This Project is to use Radio Frequency Identification (RFID) technology to tag the warning signals placed in the dangerous portions of the road. While artificial vision-based recognition of traffic signals might fail if visibility is poor (by preceding vehicles), RF signals might still be transmitted reliably.

This Project in organized as follows :

A description of the sensors installed in vehicle and infrastructure is provided in Section 2. This includes the RFID traffic identification tags and the placement of the detector readers in the vehicle; the differential Hall Effect sensor installed in the vehicle's wheels for better longitudinal speed control and the DGPS (Differential GPS). Section 3 discusses the system architecture, covering sensor data fusion, decision and control stages, followed by an explanation of the Cruise Control (CC) algorithm based in fuzzy logic in Section 4. Experimental demonstrations of the system in a test circuit in our institute's grounds are described in Section 5. The paper ends with a discussion of the results in Section 6.

The operation of the RFID subsystem onboard the vehicle is described with the block diagram of Figure.



Ordinary traffic signals equipped with RFID tags transmit their identification code and are detected by the RFID readers onboard the vehicle. The information is transmitted to a PC, which determines the correspondence between tag IDs to traffic signals in a database (which may also contain geographic information about the area where the signals are situated). This secondary PC communicates the new target speed as well as other relevant data for the control of the vehicle to the main PC through an Ethernet connection.

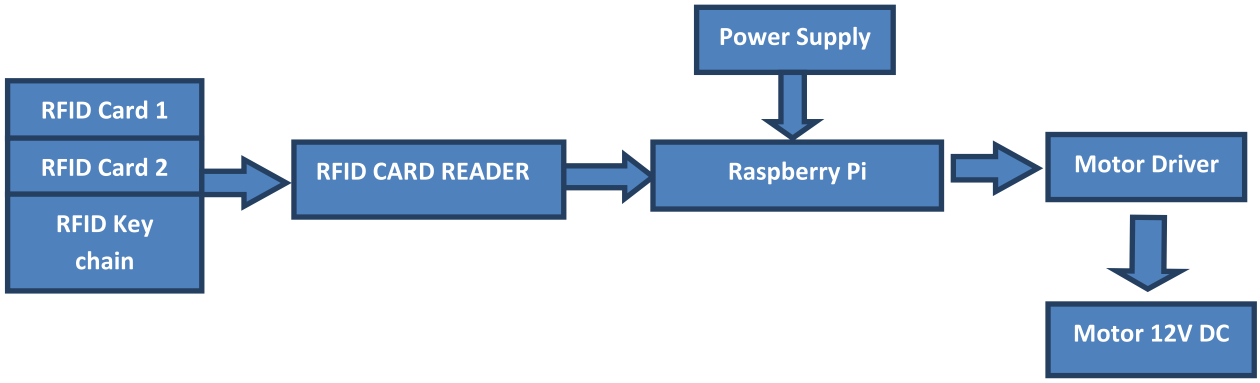
About the RFID Technology-

Radio Frequency Identification (RFID) Sensors :

An RFID system consists in a set of emitters or tags which, periodically or upon interrogation, transmit a short digital radiofrequency message containing an identification code (unique to each tag) as well as some data stored in the tag's memory. These data can be obtained remotely by a computer equipped with an RFID reader. Besides the tag ID, which confirms the presence of the tag within the detecting range of the reader, the RFID reader measures the received signal strength (RSSI) of the RF signal, which is an indicator of the range from tag to reader.

The main advantage of RFID systems—with respect to other RF technologies, which could be used for infrastructure-to-vehicle (I2V) communications—is its low cost and minimum infrastructure maintenance, which results in a high scalability and easy deployment of the infrastructure. The kind of active RFID tags used in this research are cheap (10–20 Euros each), can be easily attached to the traffic signals and last for at least five years. The right side part of Figure 1 shows the RFID tags placed on the traffic signals.

BLOCK DIAGRAM AND DESCRIPTION OF PROPOSED WORK



For this application we have chosen RFID equipment provided by Wave trend Inc. We use TG800 active tags, emitting identification signals regularly every 1.5 s at an RF carrier frequency of 433 MHz. These tags are rugged and are powered by their own batteries. Two model RX-201 RFID readers are placed on the right side of the computer controlled vehicle, and are polled by a PC through the serial port (two independent readers are used for redundancy, since occasionally tag detections might be missed by one reader).

RFID data are transmitted upon detection through an Ethernet connection. It is convenient that the RF signals from the tags placed in the traffic signals are detected from a distance large enough that timely control actions might be taken over the car. Physically, the transmitting range of an RF system is limited by the interference of the wave transmitted directly from emitter to reader, and the one reflected by the ground plane [Rapa port 1996]. For ranges larger than a critical distance, these two waves cancel each other out, and the received signal strength decreases sharply. An approximation to the useful range of a RF transmitting system is given by:

$$d_T = 2\pi h_T\, h_R/\lambda$$

Throttle Automation :

The throttle is controlled with an analogue signal that represents the pressure on the pedal, generated with an I/O digital-analogue CAN card. A switch is used to commute between the original circuit of the throttle pedal and the autonomous system. We use a NI USB-6008 National Instrument card to decode the speed, directly from the Hall Effect sensor, establishing the analogical value corresponding to the desired level of pushing in the throttle pedal via an analogue CAN card.

Brake Automation :

The brake action is the most critical, since it must be able to stop the car in case of a failure of the autonomous system. For robustness and safety, we mounted an electro-hydraulic braking system in parallel with the original one provided by the car manufacturer. Two shuttle valves are connected to the input of the braking system in order to keep the two circuits independent. Each valve permits flow from either of two inlet ports to a common outlet by means of a free-floating metal ball that shuttles back-and-forth according to the relative pressures at the two inlets. One of the inlets is connected to the electro-hydraulic braking system and the other to the original one. These valves permit the two braking systems to coexist, but independently of each other.

A pressure limiter tube set at 120 bars is installed in the system to avoid damage to the circuits. Two more valves were installed to control the system: a voltage-controlled electro-proportional pilot to regulate the applied pressure, and a spool directional valve to control the activation of the electro-hydraulic system by means of a digital signal. These two valves are controlled via the same I/O digital-analogue CAN card that the throttle.

Radio Frequency Identification (RFID) is the wireless non-contact use of radiofrequency waves to transfer data. Readers, also called interrogators, are devices that transmit and receive radio waves in order to communicate with RFID tags.

ADVANTAGES

- Fully automated Application
- Lots of Mishaps can be Avoided
- Simple and efficient
- Compact Design

APPLICATIONS

- School
- Colleges
- Hospitals
- Religious Places

CONCLUSIONS

The conclusion of is that we can use Raspberry Pi Controller to control the System without Human Interference and can even monitor the System on Mobile App. Various Functions can be added to make the system more advanced and reliance for commercial use.

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