Journal of Scientific Research and Development 2 (4): 65-69, 2015
Available online at www.jsrad.org
ISSN 1115-7569

Smart Safety System

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Abstract: In recent years, many attempts have been made to the design and manufacture of electronic systems and vehicle safety. Many attempts are to design a system compatible with the driver and the driver's skill. In addition to increasing the adaptability of the system welcomed by consumers, the system also increases efficiency. In this paper, a dynamic and intelligent system safety compliant driver's skill is introduced. In the proposed system, at first due to the characteristics of vehicle, safety restrictions apply. Over time, due to driver behavior at critical moments and learn the relative skill of the driver, the driver's behavior and skills will be accommodated by the system. Characteristics and capabilities of the car have basic knowledge of system and system performance over time and according to the knowledge and skill of the driver is updated. Accelerations along the x, y, speed and steering angle input and output of the system at each moment are based on the feature of this system is the speed limit of the car, the driver's skill and environmental conditions. The speed limit at any time by the system, predicts a high risk situation somewhat. Implementation of the proposed system is tested in a simple experiment.

Key words: Safety system; Vehicle; Driver skill; Adaptive; Neural network

1. Introduction

In today's world, shipping industry is the largest industry experts and car designers are always trying to find ways to increase safety and reduce traffic accidents as much as have. Based on research done in our country every year about 27,000 thousand people lose their lives in accidents. These investigations led to the design and manufacture vehicles in recent years, which was higher than the quality of parts and the use of devices, intelligent control and warning of vehicles, the level of safety they greatly enhanced, for example, a decision-making system is designed to prevent accidents (Gustafsson and Jansson, 2005) which the system uses to communicate at a frequency of 5/8 GHz between cars equipped with this system, the driver will be warned before the accident and the driver there will be aware of other vehicles.

The system is able to warn and not doing anything in order to prevent accidents. Also, one of the main problems when it becomes clear that other vehicles are not equipped with this system or any other car of the system fails, in this case the system is completely unsafe and unreliable, and so the use of this system would be

Unreliable in general. In another study done jointly between the University Lynkvpyng and Volvo was conducted in 2005, Another system was provided, which enables the possibility of an accident with a car in front as much as 5 percent to reduce the heavy traffic. Usually these accidents are not an accident that resulted in death. This system uses radar and a processor is able to detect the car in front and try to keep as low a certain distance from the vehicle. The main problem with this approach is that it may overtake when approaching the vehicle ahead; the system will avoid the mistake of taking precedence.

Another problem is that the system can determine the maximum safe speed and does not interfere with the driver in the normal driving decisions and in situations where there is risk of a fatal accident › first warn and then assessed and appropriate measures to prevent accidents are on. Paper presented at the first performance of the proposed system is described, and the structure of the system is investigated and the results are presented in the final section.

2. Smart System Safety

One of the main features of the proposed system makes it superior than other systems, the ability to learn the skills of the driver's skill and limitations of the driver. As seen in Figure 1, the preprocessing has four entrances.

The input sensors and interface circuits installed in the vehicle are read. In the pre-processing read data in the manner required by other parts ready to be placed at their disposal? The decision to set the speed limit by an artificial neural network system is done but since the performance of network in the city and road is different, first must determine motor

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areas (cities or roads) and then based on the motion field, relevant knowledge (which is the weighted network) of network load. Motion detection area by changing the steering angle and acceleration given by the pre-processing and based on the GPS coordinates will be announced. Thus the weight of the corresponding motion detection area for the proper functioning of the network is loaded.

After loading the appropriate weights, the network will start up. Inputs have been prepared by the pre-processing given to the network which based on the knowledge and skill of the driver and the environment, will determine the speed limit and the speed control system reports. Along with the vehicle's current coordinates network activities in hazardous areas (which have already been identified), and the vehicle is at a distance of less than one thousand and five hundred meters from dangerous areas, the situation is reported to driver and If do not pay attention and continue to move with speed The situation is reported to the control system, the control system is able to react quickly.

Speed control system according to the instructions and information received from other parts, and by reading the amount of pressure that the driver pushes the pedal, commands to the motor to adjust the vehicle throttle to proper levels. In the event that an emergency requires an uncontrolled speed (speed unlimited) (such as emergency situations or otherwise) by pressing the emergency button, the system allows us without limitation to increases the speed. But the number of times the key is pressed is recorded and can be viewed by the police or other authorities. The system is able to update its knowledge in critical situations, based on the reaction of drivers. Therefore, based on the pre-processed data when acceleration of change is more than a certain limit, the system detects a critical situation. If an accident occurs in a critical condition, after registration system parameters, the network is retrained in order to reduce the driver's skill. Parameters recorded during the accident act like a black box and help the police or legal authorities in a simulated accident scene. But if an accident does not occur at the critical moment demonstrate the skill of the driver and Network in order to confirm and refine the skills of driver retraining For crash detection, in critical situations the number of sensors embedded in different parts of the vehicle used. Due to this sensor output and changes in vehicle acceleration, can be detected by accident or no accident. This method is the same as a method which use by Airbag sensor for detecting accident. (Fig8, 7, 6)

2.1. Artificial neural network system (ANN)

Despite all the advances in today's computers, there are still problems that computers cannot calculate it. Recent studies indicate that the human brain stores and processes information in the form template Computers in dealing with complex issues like mass calculations are very fast. Also, the instructions that are given to them by the program exactly do But in some cases, such as dealing with noisy data or data that are taken from the environment, working in parallel with the large volume of data, the error limit and adapt to the new situation, do not respond properly. Computers also are unable to recognize a simple pattern and its generalizations. While the human brain or even a pet can easily recognize things like this. How to learn the brain is not yet fully characterized. Neural networks are poorly modeled on the human brain learning methods.

Relationship between linear and nonlinear data that are modeled. When Traditional linear models are used for data which have the non-linear characteristics are very unfit. In this system, there is the number of input data and a specific output of the system is expected but there is no logical relationship between the input and output.

In the following description of the two main parts of the system has been provided:

Neural networks with using data that they are given to them learn the model, and then can be used to detect these patterns. They also have the power to generalizations. These networks have been able to develop an intelligent system that can acts as the human brain. The true power and advantage of neural networks lies in their ability to show the relationship between linear and nonlinear data that are modeled. When Traditional linear models are used for data which have the non-linear characteristics are very unfit. In this system, there is the number of input data and a specific output of the system is expected but there is no logical relationship between the input and output.

One of the ways is to use a synthetic network. A network used in this project is a MLP with the following characteristics:

1- Has 4 entries.

2 - Has 12 neurons in the hidden layer.

3 - Has 12 neurons in the output layer, each of which is representative of a speed.

4 - Use Sygmvyd function or tgh (Sygmvyd function in this system is used by implementing the lookup table method).

5 - The use of two different learning rates for the hidden layer and output layer.

As can be seen in figures 2 to 5, for different η network is simulated and the best performance was in 21, 33 $^{-}\eta$ Out 0, η Hide 0.

2.2. Detection of hazardous areas

The design of a GPS Garmin (8) with an accuracy of 1 to 5 m is used and the GPS gives coordinates for any point in the direction of X and Y to the system and systems for their decisions to take advantage of it. GPS through a serial port, protocol RTCM / TEXT speed Mb / S 9600 is connected to the microcontroller and coordinates of speed, altitude and other parameters can be declared at any moment. System is designed for two main uses of the GPS data; first gives announced GPS coordinates and

other information, the steering angle, speed, and acceleration of the separation ability of the system to the road.

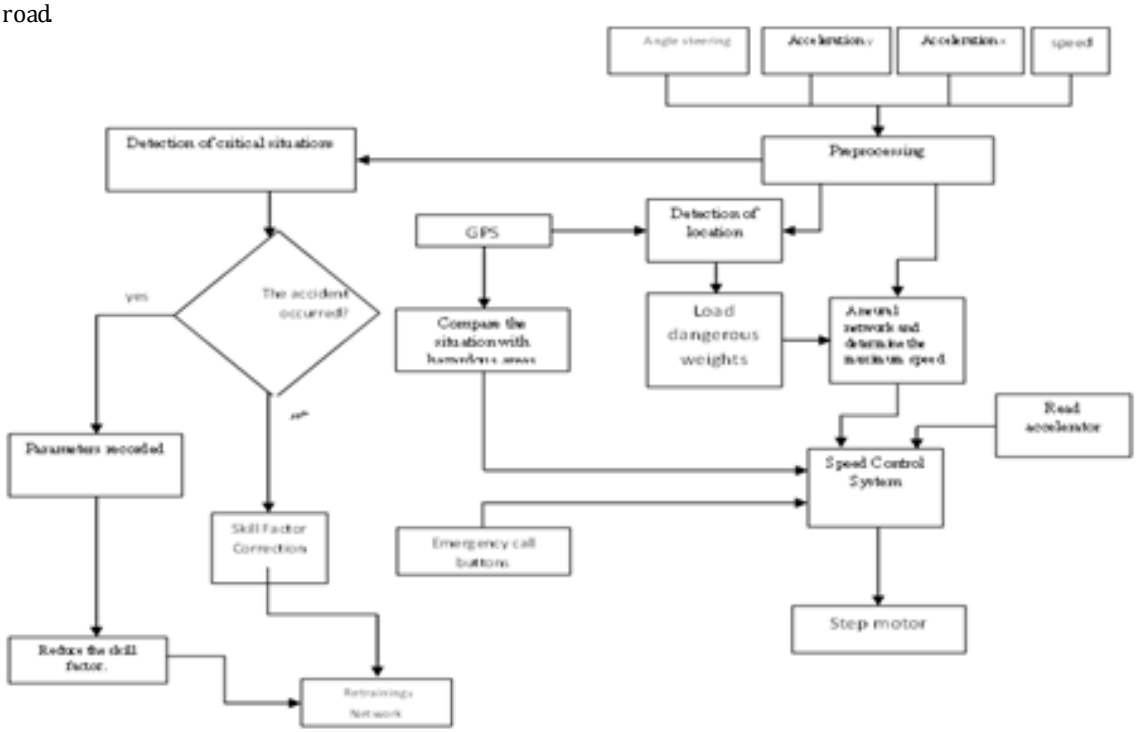

Fig. 1: General diagram of smart safety system

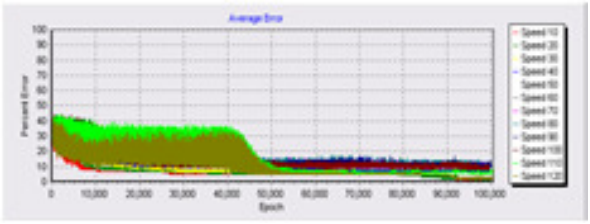

Fig. 2: Graph error Epoch - η Hide 0.3 - η Out 0.2**10000**

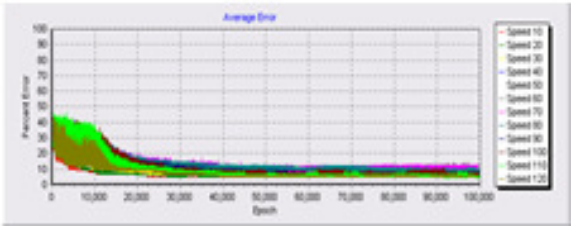

Fig. 3: Graph error Epoch - η Hide 0.33 - η Out 0.2110000

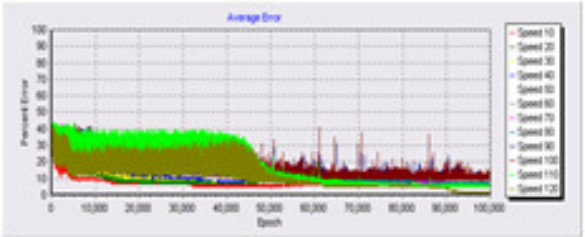

Fig. 4: Graph error Epoch - η Hide 0.33 - η Out 0.3310000

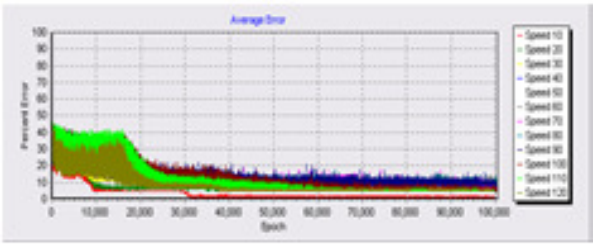

Fig 5: Graph error Epoch - η Hide 0.45 - η Out 0.25**10000**

Secondly, if the car on the road, then the car's coordinates is compared with the characteristics of hazardous locations and if the vehicle is at a distance of less than one thousand and five hundred of a dangerous point condition is reported. Since about 3000 dangerous point takes a great amount, so this information should be placed somewhere other than the main memory microcontroller, therefore, an MMC is used to store these points. This memory in addition to the detection of hazardous points, at different times can store information about the car and used in the black box. The other hand, since a search in these points should have done in the high speed, points are ordered according to the coordinates x and during the search, binary search algorithm is used to find the point and if all the coordinates of x, y coordinates are checked and if they match, it gives a command to the control system speed. Since the vehicle speed must be controlled

before they reach a dangerous point, to search for the dangerous point used the comparative period and a half thousand meters.

Limit ← | D (x, y) - D (XT, YT) |< 1500 If

D (x, y): Current position of the vehicle

D (x t, y t): Dangerous point coordinates

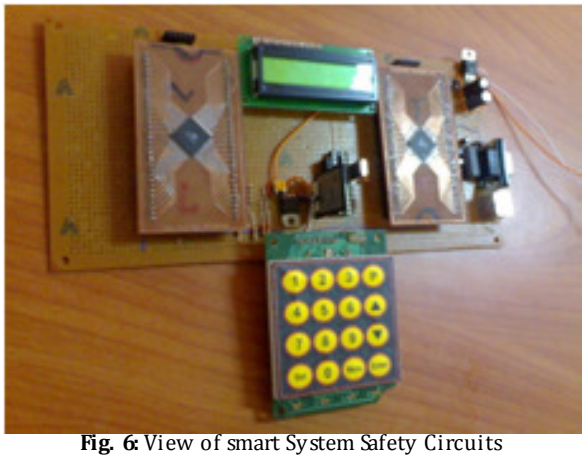

Fig. 6: View of smart System Safety Circuits

Fig. 7: View of the installation of the proposed system on a car

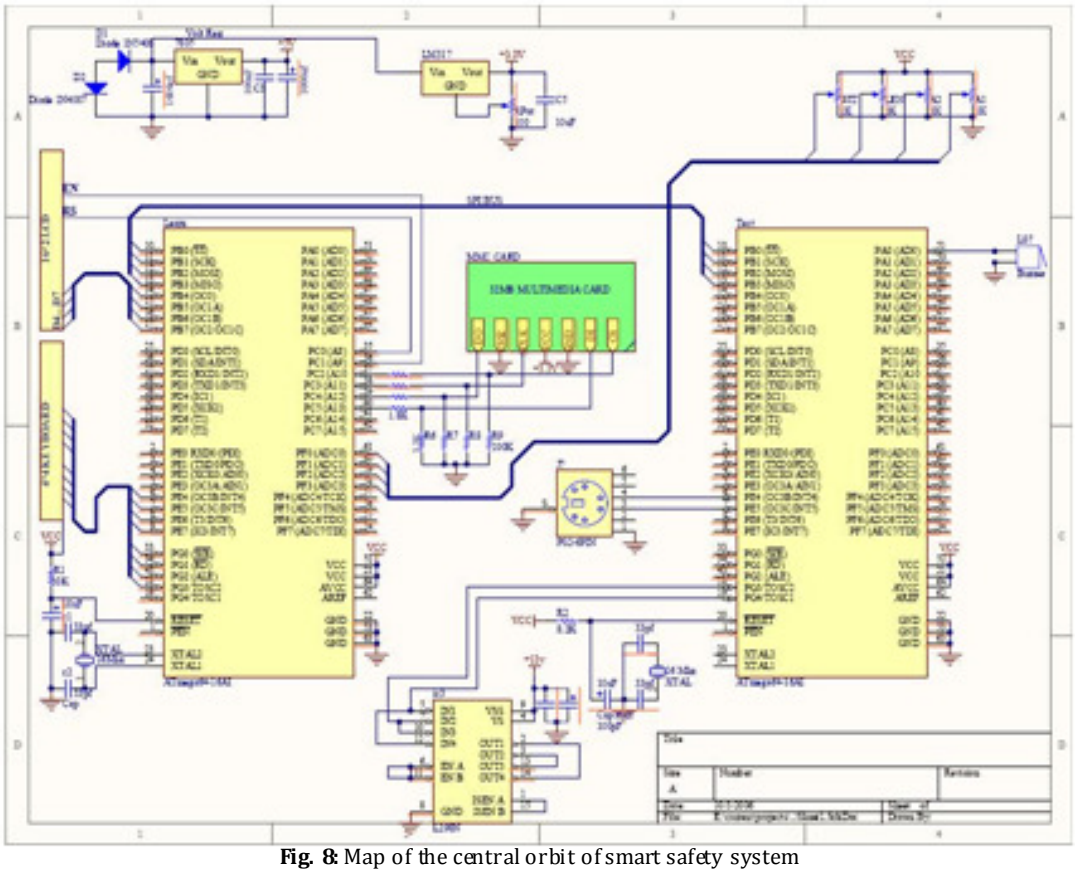

Fig. 8: Map of the central orbit of smart safety system

3. Conclusion

Experiments and results show that intelligent safety system in comparison with other safety systems benefit from the ability to dynamically adapt to the car and the driver's skill and in practice can be used efficiently and effectively and thereby reduce fatal accidents.

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