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Car Communication/Identification and Warning System for Safety and Road Rules

Yusuf Saleh, Mahmood Abdulhameed
Department of Electrical and Electronics Engineering
Abubakar Tafawa Balewa University, Bauchi, Bauchi State, Nigeria
Email- suprayodic@gmail.com
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Abstract: **Driving safe is to reduce accident risk due to over-speeding, distractions, by diversion during invisibility in bad weathers, on bridges, sharp bends and hilly roads. Also accidents caused by late identification of vehicles. Alert/warning can be used to avoid unnecessary diversion. Speed limit signs are missed by road users to regulate speed in sensitive areas and bad weather. Lane guidance practice is a line to separate lanes, sign boards used for sharp bends and speed limits and car lights and horn for identification between vehicles (all conditional). New technology alerts driver when off his lane by line sensing in those conditions and areas, alert other road users and also sharp bend warning included with signs/indications in the car. Speed limit built in the car for attention of drivers in all conditions of the road, it is activated to indicate zone speed limit in the car and all road signs can also be built in the car. Vehicles identify each other at six (6) kilometer by their type (ID), count and distance. Also ID used as tracking for traffic control/data and security. A car is to demonstrate the proposed technology with devices/sensors to activate functions above.**

Keywords: **Safe, Accident, Vehicle, Diversion, Alert, Speed limit, Identification, Activate.**

1. INTRODUCTION

The figures below describe or show case possible accident risk scenarios. Fig. 1 shows a dense traffic on a flyover, which is of high accident risk on diversion, invisibility and over speeding. Fig. 2 shows potential accident risk due to hilly and curvy terrain and Fig. 3 shows sharp bends on bridges/flyovers as risk of accident. This proves that simple technology is required to overcome or minimise/reduce such potential accident risk.

2. WHAT IS THE PROBLEM OR SITUATION TO IMPROVE

Figure 1. Dense traffic as accident risk on flyovers

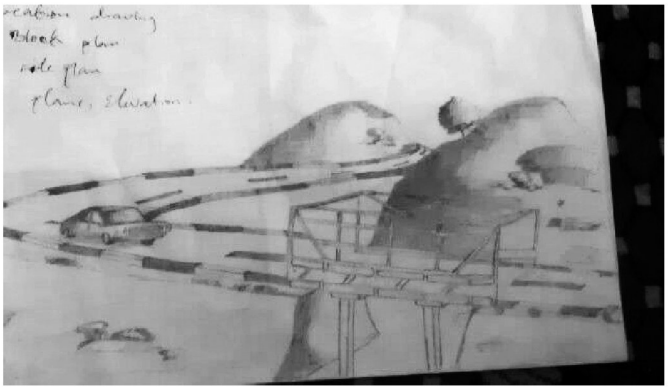

Figure 2. Potential accident risk on curvy and hilly terrain

Figure 3. Possible accident risk at sharp bend on bridges [1]

Safe driving is essential to minimize the risk of accidents due to noncompliance to road rules by over- speeding, distractions (drunk), poor driving skills (careless) and other forms as high risk of accident. Diversion from lane during invisibility in critical weather (snow, rainy, frost), on bridges, sharp bends (curvy/hilly), on flyovers and other sensitive areas or conditions may lead to accident [2]. Proposed technology will warn driver when off his lane in the mention conditions and areas, and alert other road users including sharp bend warning. Such problem is unsafe due to invisibility of vehicles in critical weathers and terrain, in which map navigation is costly.

Over speeding in speed limit zones (30km/hr, 40 km/hr), like schools, hospitals, hilly/mountain areas cause lots of accidents. Speed limit signs are not enough to alert road users to regulate speed in sensitive areas and critical weather conditions (skip attention of users). Smart signs/alerts need to be implemented to

ease driving in bad weather, hilly terrains, and roads familiar or unfamiliar to users, its make driving easy in any condition [3].

Unidentified approaching vehicles like tankers, trucks (loaded or not), pose risk of accident in bad weathers, on highways, sharp bends and bridges. The proposed technology allows continuous identification of each and every vehicle type. Anticipation of vehicle raises level of alertness and information to the driver, other road users and for cautious driving to reduce risk of accident.

3. CURRENT SOLUTION IF ANY

The common practice for lane guidance is white lines or bolted plates to separate cars parallel to each other in same or opposite direction, but this can lead to accident during distracted and careless driving. Strict adherence to lane in sharp bend, bridges and bad weathers is required or paramount. Existing solution to sharp bend alert/ warning is navigation on road map via GPS (Global Positioning Satellite) and warning sign boards.

Over speeding as a frequent cause of accident is handled by speed limit sign boards and police chase as the common practice. Such signs of speed limit in speed limit zones like schools, hospitals and other specified areas might skip attention of drivers on the road. The police chase on violation of speed limit can be additional risk of accident on chasing the victim [4].

Also the most common practice of detection and communication between vehicles is horn and car lights (back, brake and headlights). The horn and car lights alert drivers on road as mode of detection, identification and communication between vehicles. Also used to alert incoming vehicles at sharp bends or identify cars ahead. Such practice is not sufficient to overcome risk of accident because is based on individual judgment to use the horn or headlight to alert other drivers on the road (conditional). Vehicle detection/identification/ communication should be made easier at all times (unconditional).

4. PROPOSED SOLUTIONS

The proposed technologies will improve safety on the road and reduce the risk of accidents especially on highways. We employ the technologies of lane guidance and warning including sharp bend, speed limit warning and vehicle detection/identification/ communication for road safety and rules. The proposed lane detection and warning including sharp bend warning/alert will solve the problem of diversion from lane in bad weather, on curvy terrains (hills), bridges, flyovers, drunk and distracted driving to reduce risk of accident and unsafe driving due to lack of visibility of vehicles in such critical weathers and terrains. Prior alert/warning will avoid unnecessary diversion. It will warn driver when off his lane in the mention conditions and areas and alert other road users including sharp bend warning. Devices (sensors) on the highway, bridge, mountain areas will be installed to activate the car to sense the continuous marked white line or plates on the road to give sound and a warning light marked diversion from lane with picture sign of diversion on dash board of the car. A loud sound and car traffic lightning upon departure from lane for three (3) minutes will be activated (enough time to make overtake), which will sound and light to display and alert other road users in all conditions of the road. After three (3) minutes (counter/555 timer) a louder sound is activated to disturb the driver to go back to his lane. Such sensing by the car is activated by the device on the road to cover sharp bends and hilly areas. Warning is ON upon diversion from lane.

Also at sharp bends includes picture alerts/warning sign of sharp bend on the dash board for cautious driving in other conditions like bad weather, when activated by devices installed on the road at sharp bend. This warning for sharp bend will be approximately at 500meter to the bend on the road. Such sound, sign and lights will avoid distracted driving, unnecessary change of lane in critical weathers and terrains (visibility problems). This guides the driver on dangerous bend to reduce risk of accident. It is deactivated by the device when out of range or not required.

To use smart signs for easy driving, signs of speed limit on the road will be replaced by devices to activate warning/alert in the car, indicating the speed limit required. Signs for speed limit need new technique for attention of drivers in all conditions of the road. This will be built in the car and activated to indicate required speed limit in the zone (40km/hr, 50km/hr and 100km/hr). Installed devices will be at speed limit zones with the specified speed limit detected from it and deactivated on moving out of the zone. The car warning system of speed limit will never skip attention of driver either in bad weathers or unfamiliar roads. The alert will be built in the car as warning signs/pictures with sound and light indicating speed limit required and other road signs, which would cover unfamiliar roads to users in all conditions. For speed limit activation on bridges, flyovers and hilly roads with lane detection is always active.

Also continuous identification of each and every vehicle type, backward and forward is to reduce risk of accident. Vehicle detection/identification at distance of six (6) kilometer by each and every vehicle (tankers, bus, trucks, cars, motorbikes) will raise driver's level of alertness and a cautious driving ahead by identifying the type of approaching vehicle. The car will identify the vehicles on the road by detecting the devices installed on each vehicle and giving a sign of the type (A,B,C) of vehicle on same or opposite direction and backward or forward. Type of vehicle is indicated by sign/picture based on ID (type) received. The car will have two (2) installed devices (back and front), the back is only for detection/reception of vehicles ID backward and the front will have the car ID and detection forward. Distance and count of vehicles indication also included. At a distance of six (6) kilometer is expected that a driver gets information of the type of vehicle (car, bus, tanker, and truck e.t.c.), their counts and distance of closest vehicle. Such detection, identification, and communication will help the

driver a lot to reduce risk of accident whether or not in critical weathers, curvy and hilly roads. Also ID used as tracking for traffic control/data and security.

Installed devices (sensors) on the road at the required zones, highways, hills, bridges or specified roads will be sensed by the car to activate those functions. The devices will carry the required functions to activate at the required place (lane, sharp bends, speed limits and identification warnings) and deactivate them as required. The introduction of smart roads and intelligent highways will make it possible and easier to improve road rules and reduce accident risk (safety) via the installed devices on the road to activate such functions and features in the car.

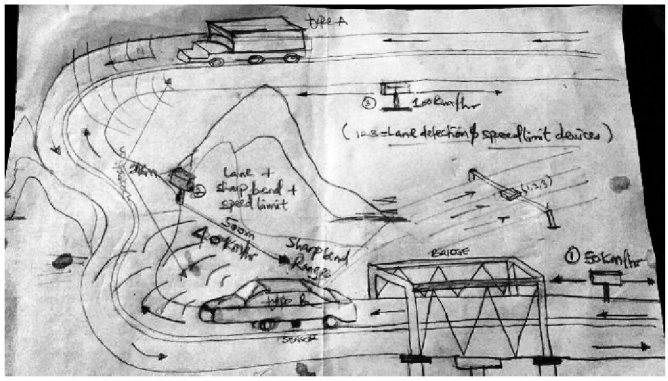

Figure 4. Description of proposed technology for implementation (proposed solutions)

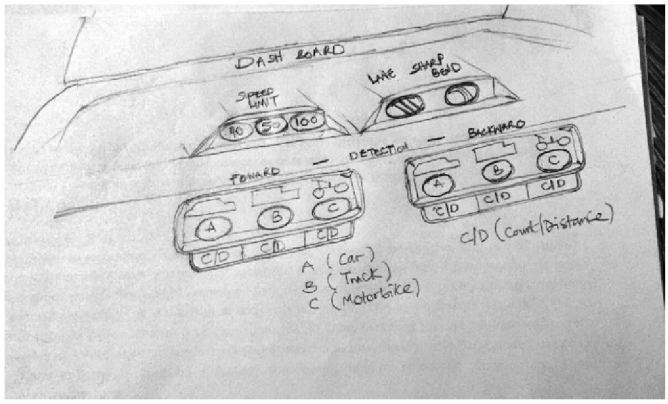

Figure 5. In- built car warning system (dash board)

TABLE I. ACTIVATION OF FEATURES

Category	Activation		Function
Zone	1. (x1/x2 MHz)		Lane Detection/ Sharp Bend
Zone	2. (y1/y2 MHz)		Speed Limit (30/50km/hr)
Non Zone	F (MHz)	B (MHz)	Vehicle detection and communication
	A1A2	A2	
	B1B2	B2	
	C1C2	C2	

F= Forward direction= Receive/Transmit (R/T)

B= Backward= Receive (R)

A1A2= Type A vehicle

TABLE II. DESCRIPTION OF ACTIVATION

Activation	Function
Activation/detection	Count of vehicles
Signal strength	Distance of vehicles

5. IMPLEMENTATION

A car will be used to demonstrate the proposed technology. The devices required to activate car warning/alert system for lane detection (to activate line sensor on the car), sharp bend, speed limit will be installed on the road, then the car will be driven to test the system. For vehicle identification, devices are installed on the car to detect vehicles at the back and front. Such devices will have the required function to activate. All warning and alert system will be displayed on the dash board of the car. Lane diversion will have a sign or picture indicating lane diversion with sound and car lights, sharp bend warning or alert will be indicated with sharp bend sign or picture and light to replace sign boards, speed limits (40km/hr, 50km/hr, 100 km/hr) are indicated with sign or picture and light, and vehicles detection or identification are indicated with picture of vehicle type, count and distance. All this functions will be activated by the devices installed on the road with the required functions at the required place or zone. The prototype will be the real car fixed with the technology and the accepted system will be manufactured and built in the car. A prototype smart road can be used for the demonstration before use on the main road and other vehicles for detection can all be motorbikes taking the different IDs/vehicle types (on device) for test. This makes it easier to evaluate how it will improve road rules and reduce risk of accident by the installed devices and alert system.

The figures below demonstrate the system to be implemented. Fig. 6 shows the scenario to test such proposed technology, Fig. 7 shows in-built warning system and Fig. 8 displays the whole proposed technology system with device functions activation.

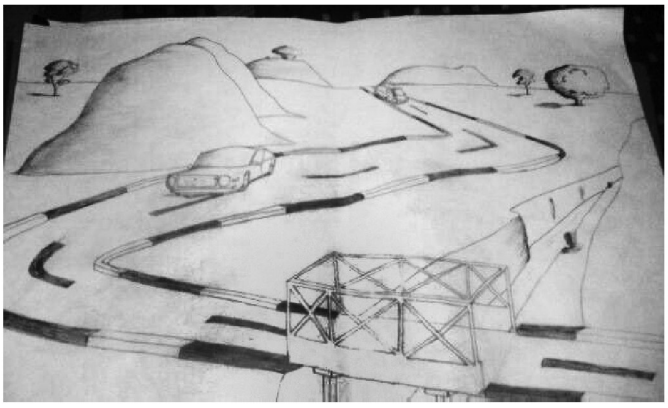

Figure 6. Scenario of problem to tackle during implementation

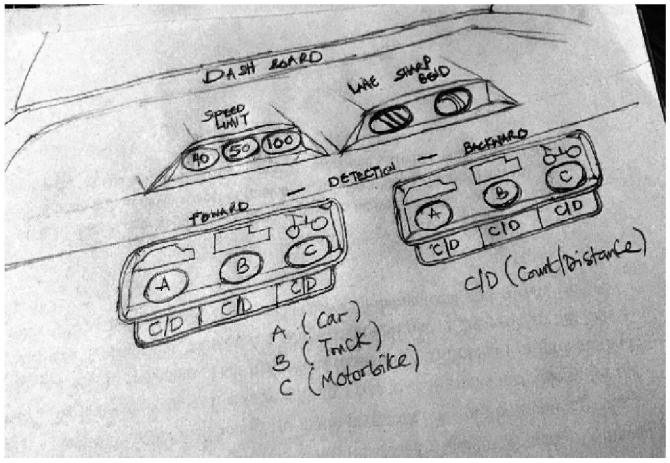

Figure 7. In-built warning system

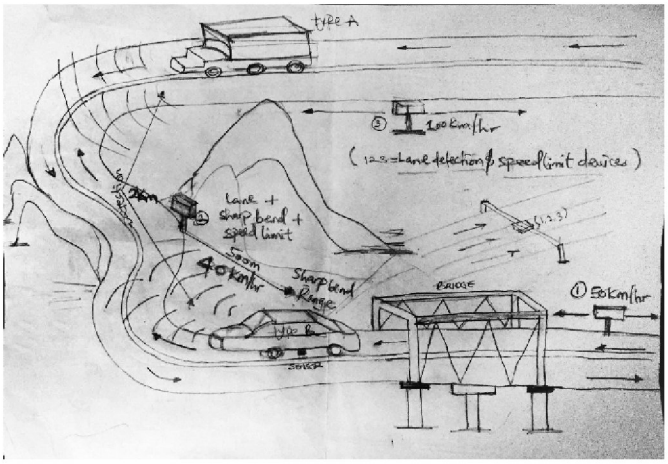

Figure 8. Full system implementation

6. CONCLUSION

The future of safety on the road should be made affordable and simple [5]. With this system, it is general and simple technology to all vehicles on the road and can be induced and accommodated on the road gradually over the years by phasing out the existing vehicles and manufacture those with such functions.

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