Available online at www.sciencedirect.com

ScienceDirect

Procedia Manufacturing 13 (2017) 1360–1364

Procedia MANUFACTURING

www.elsevier.com/locate/procedia

Manufacturing Engineering Society International Conference 2017, MESIC 2017, 28-30 June 2017, Vigo (Pontevedra), Spain

# Process and method for the reduction of car accidents due to the while driving

G. Espinosa-Garza[a,*], I. Loera-Hernández[a] , N. Antonyan[b]

[a]*ITESM, Av Eugenio Garza Sada 2501 Monterrey 64849, México*
[b]*ITESM, Calle del puente 222, Tlalpan Mexico D.F. 14380, México*

**Abstract**

This investigation has developed a new process and mechanism that inhibits wireless connectivity to the passengers and driver in a moving vehicle. However, it will allow wired connectivity only to the passengers; the driver will not have access to this feature (wired connectivity). This assignment will grant a reduction in car accidents caused using a smartphone while driving. The process consists in a smartphone application that interferes with wireless connectivity when it detects a speed of over 20 km/h. Nevertheless, the application will transmit in a wired connectivity exclusively to the passengers. Once the application detects by GPS that the speed in which the user is moving exceeds 20 km/h, the system will activate. One operation that will make a difference from any other available systems in the market is that the driver cannot intervene in its functioning. This project is currently in the process of publishing a patent.


Peer-review under responsibility of the scientific committee of the Manufacturing Engineering Society International Conference 2017.

*Keywords:* Inhibits; smartphone application; connectivity; vehicle.

## 1. Introduction

The increasing technological development in relation with cellphones is changing the social behavior in a variety of ways all over the world. Some of these changes can break determined rules and standards and they cannot be omitted by the increasing technological advance. Social networks, communication through multiple chats and the use of cellphones in general is the reality in which we are living nowadays. The use of mobile phones while driving is a

* Corresponding author. Tel.: +52 81 8358 2000
*E-mail address:* gespinos@itesm.mx

2351-9789 
Peer-review under responsibility of the scientific committee of the Manufacturing Engineering Society International Conference 2017.
10.1016/j.promfg.2017.09.117

new common behavior. It is usually used for either personal or work issues and according to statistics, it is one of main causes of car accidents. Even though several laws that prohibit text messages and cellphone conversations while driving have even imposed in many states of the Mexican Republic, the problem is yet to be resolved. Car accidents caused by the usage of mobile phones while driving are still incrementing. Laws that prohibit the use of cellphones while driving have not caused a significant impact on society to decrease car accidents caused by this phenomenon. In this survey realized in 2016 to students in a university in Monterrey, Mexico, more than 80% of drivers admitted of using their smartphone while driving. According to Strayer [5], the distraction caused by using a cellphone while driving is almost equivalent to driving in a drunk state.

In our research surveys, 82% uses their cellphone while driving and 35% of the people involved in this poll have relatives who have suffered from a car accident that was caused by the distraction of using their cellphones while driving. Another interesting fact consists that approximately 80% of the drivers surveyed agreed in on a blockade system to their cellphones while they are driving.

The main objective of this research was the development of an equipment to reduce the number of car accidents caused by using a mobile phone while driving. This device works through an application that inhibits the wireless access of a cellphone while the user is driving. The innovation of the present work consists in providing a wired connectivity to the passengers while the car is being driven and limiting it to the driver. For this mark, the corresponding wiring and accessories is describe later.

The device is composed of a mobile application that controls the blockade signal of the cellphone and a router that activates the communication functions through a wired connection. The cable entrances are located just beside the passenger seat. The cables have a limited size and they are not extensible with the purpose that the driver cannot reach it unless he/she stop driving.

## 2. Existent applications

In the actual market, there are already applications related with to the connectivity blockade of mobile phones. However, this these block/unlock functions can be activated or deactivated by the phone user.

DriveSafe.ly is an application that reads to the user the received messages of on the phone (avoiding the user the need to do so). Phoneguard is another application that blocks the mobile phone functions when a speed of 10 mph is detected. This same application is also capable of sending warning messages when exceeding the speed limits. AT&T Drive and ZoomSafer inhibits the cellphone's functions and send answers to text messages. These applications are activated when the GPS detects a speed of 15 mph and it turns off two or three minutes after it detects speeds lower than this. Textecution and Text.Star disable the function of receiving or sending text messages if the driver is going over 17 kilometers per hour.

There are other applications that at the moment are still being developed. For example, Anti Sleep sends each determined moment questions to the user that is driving in order to ensure a safe and uninterrupted driving time. Other applications send hearable alerts when the driver changes lanes or when the driver is approaching the sidewalk too much. There are also many devices and processes patents that have been registered to accomplish the same goals. All the Apps that have been designed to prevent the use of cellphones in a moving vehicle can achieve it as long as the vehicle is moving. However, it's their functionalities depend on their activation by the user.

## 3. Development

The objective of this research paper was the design of an application for the controlled use of a cellphone while driving. The designed application fulfills with the determined characteristics as a result of a series of surveys done. The sample size complies with the following equation.

$$n = \frac{N\, Z_a^2\, p\, q}{d^2\,(N-1) + \; Z_a^2\, p\, q} \tag{1}$$

Where

$n =$ The simple size that we want to calculate

$N =$ Universe size

$Z =$ Deviation of the average value that was accepted to achieve the desired level of confidence

$d =$ Error

$P =$ Probability of only one incidence

$q =$ Probability on one omission

The obtained value is n= 385

Table 1. Results of the survey applied to 385 users.

| Gender | Quantity | 18-24 years | 25-39 years | Uses phone while driving |
|---|---|---|---|---|
| Masculine | 53.2% | 7% | 42.5 | 39% |
| Feminine | 46.8% | 4.2% | 41.1 | 42% |

As it can be seen on Table 1, the values of those who are above 40 years old were eliminated since the aim of the study were college teenagers.

The results of the survey demonstrate that the percentages of users that utilize their mobile phone while driving are exceedingly high and for this reason it is necessary to introduce tools that can decrease the number of accidents caused by this type of driving.

The main operation of the developed app is to block the cellphones connectivity while driving. This application will be integrated in the mobile phone with the purpose of making the blockade system imperative to the driver. The blockade system activates when a speed of over 20 kilometers per hour is detected by the GPS. The application can enable connectivity after three minutes that the car has been driven under this speed. The speed of 20 kilometers per hour was determined considering that the accidents provoked by going at this speed can could cause a contusion or injury to the driver.

The cable design that establishes the communication between the router and the cellphone integrate a special HC1 connector (see Fig. 1). The cable that can be used are the UTP, STP and FTP. However, the Unshielded twisted pair UTP were chosen for being more economic. These cables are made-up as the yarn filaments to ease the crosstalk and interferences. It can reach network speed up to 100 Mbps and transmit voice and data with frequencies of over 100 Mhz.

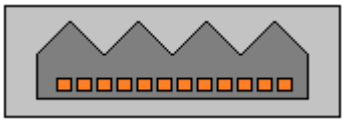

Fig. 1. Frontal view of the HC1 connector.

The HCI design connector pretends the unification of the communication between the router and the cellphone. The male C1 plug, as shown on Fig. 2, is plugged to the female connector to establish communication between the router and the mobile phone. The designs of these conductors in this moment are in the status of patent request in Mexico. Additionally, the male connector is connected with a limited length cable and possesses the termination for a cellphone. The objective of this connection is that it can only be used by passengers and not the driver.

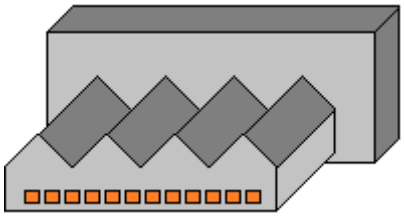

Fig. 2. View of the male C1 connector.

The mechanism and the application that have been developed are being shown on Fig. 3. It is recommended to place the router in the front or back part of the car, depending on the characteristics of each car in particular. The HC1 connectors are settled next to the seat of each passenger, except the driver's.

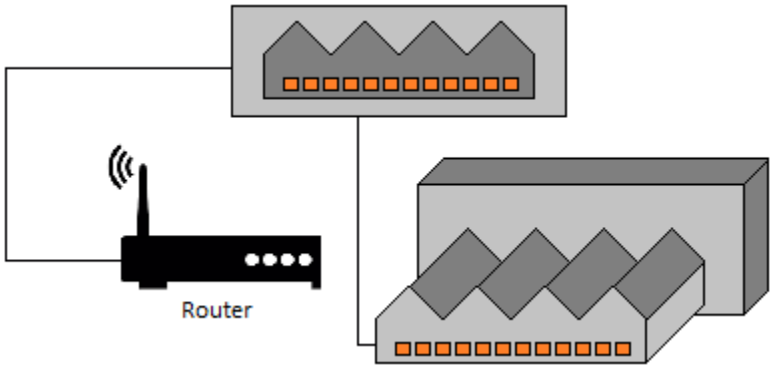


Fig. 3. Wired connectivity scheme.

It is well known that the Unshielded twisted pair cables are built by four pairs of specified cables of multiple colors. In the telephone, the cables are assembled only by two pair and two strings, one that emits and other that receives. It was decided to use a cable of pairs of four or two strings with the RJ11 connector of the router to the location of the Red telephony (see Fig. 4).

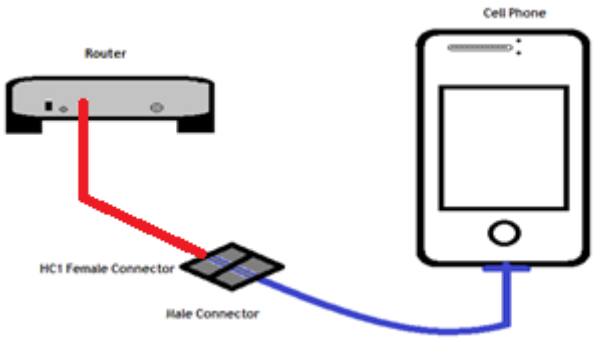


Fig. 4. Figure shows the connection of cable C1 from router to cell phone.

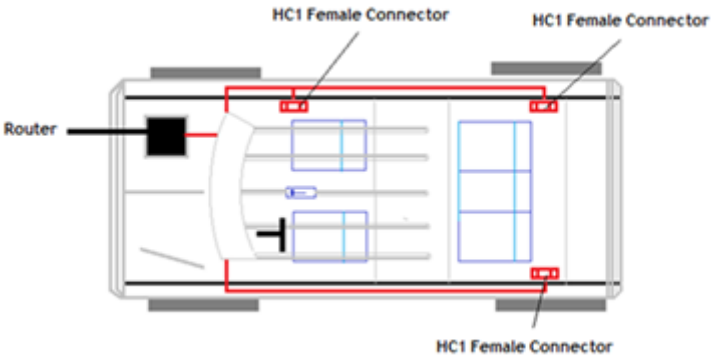


Fig. 5. Wired conectivity scheme.

The Fig. 5 shows a diagram of the aerial view of the device installed in a car that includes a router which will receive the signal wirelessly, and will distribute it across a wiring to HC1 female connectors located at passenger sites.

## 4. Conclusions

The invention presented in this research (nowadays it is in a patent request in Mexico) requires the integration of several participants in order to reach success. On the government side, it is necessary to implement the management and standardization of rules and laws that guarantee the citizen's safety.

Allowing the use of modern technologies with control and moderation. On the other side, the private companies should adopt and promote the implementation of new technologies and tools that can provide competitive advantages against the competition.

This research work proposes a connectivity blockade to cellphones as an alternative solution to the rising number of car accidents caused by a driver using its cellphone. The most relevant and fundamental difference between this invention and others is that this one does allow connectivity but its usage is safe. Bellow follows the literature we have used during the preparation of the paper.

## Referencies

[1] D. Agüero, G. Almeida, M. Espitia, A. Flores, H. Espig, Salus. 18 (2) (2014) 27-34.
[2] L. S. Angell, H.P. Flanigan. 19 (4) (2011) 28-29.
[3] C. Cheng, Economic Inquiry. 53 (3) (2015) 1420-1436.
[4] G. Espinosa-Garza, I.J Loera-Hernández, C. Treviño-López, M. Guzmán-Briones, A. Tobías-Guevara, O. Castro-Parra, I. Silva-Gutiérrez, H. García-Reyes, L.E. Cárdenas-Barrón, Strategic application to decrease car accidents while driving, IIE Anual Conference and Expo 2016, USA.
[5] D.L. Strayer, F-A. Drews, D.J. Crouch, Hum. Factors J. Hum. Factors Ergon. Soc. 48(2) (2006) 381-391.
[6] E. Tivesten, y M. Dozza, J. Safety Res. 53 (2015) 87-96.
[7] G. Espinosa, I.J. Loera, C. Treviño, M. Guzmán, A. Tobías, O. Castro, I Silva, H. García, L. E. Cárdenas; C. G. Espinosa. dispositivo y metodo para bloquear el uso del telefono celular a los conductores de vehiculos. Patent MX/a/2016/007009.