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Self-Driving Car plus Driver Assistance System **(SDC+DAs)**

By ID

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Abstract

Self-Driving Car + Driver Assistance System is a system that can be installed on different vehicles to assist the driver of the vehicle to drive well and minimize the risk of road traffic accidents. This risk of road traffic accident can be minimized by making the vehicles self-aware and interactive with the environment.

A number of factors contribute to the risk of collision, including vehicle design, speed of operation, road design, road environment, and driver skill, impairment due to alcohol or drugs, and behavior, notably speeding and racing. Even though the factors are very diversified and difficult to tackle, by only adding self-awareness abilities to the vehicles the risk of road traffic accident can be minimized significantly.

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**Introduction and Background**

Self-Driving Car + Driver Assistance System (SDC+DAs) is a system that can be installed on different vehicles to assist the driver of the vehicle to drive well and minimize the risk of road traffic accidents. This risk of road traffic accident can be minimized by making the vehicles self-aware and interactive with the environment.

The primary purpose of this SDC+DAsis to make driving much safer and easier. And the system has a lot to do with a country like Ethiopia. According to the latest WHO data published in May 2014 Road Traffic Accident Deaths in Ethiopia reached 15,015 or 2.50% of total deaths [1]. The age adjusted Death Rate is 20.16 per 100,000 of population ranks Ethiopia 68th in the world. Since the problem related to road traffic accident is so much crucial and needs special attention, building such **SDC+DAs** can significantly reduce the existing road traffic accident that exist in Ethiopia.

Even though it is difficult to fully eradicate each and every road traffic accident using these system, but the system can play a significant role in minimizing the problems. Recent announcements by Google and also by Mercedes and other major automakers indicate the potential for development in this area [].

This SDC+DAs system is designed to make cars safer, and their gradual introduction is improving road safety and imagining new way of transportation. In addition, the driving assistance features represent an evolution in vehicle sensing, intelligence and control that will ultimately lead to self-driving cars.

Thinking at national level, building such system has a lot contribution in developing our own new technology to solve the problems we had faced.

**Problem Statement**

As discussed in introduction part earlier, road traffic accident is a critical issue that should be solved soon enough since lots of people dies because of this road traffic accident and also this road traffic accident adds economical loss too. Deaths from traffic accidents are over 1.2 million worldwide every year [1]. And it could be reduced dramatically, especially since more than 80% of accidents involve human error [1]. It is true that, these problems should be solved soon enough, since the disaster is in wide range. Due to these it appears that new technology is needed to fully eradicate the problem.

The other side is, Imagine if everyone could get around easily and safely, regardless of their ability to drive. Since Self Driving Car + Driver Assistance System can lets cars to be easier to drive by and safer. Since this system lets car to know how to drive on the road while minimizing any risk of collision, the driver is easily assisted by the system.

Observers have noted that Self Driving Car + Driver Assistance System (SDC+DAs) may change not only the way we drive but also how we use time and how urban landscapes are developed, and people are starting to take notice [1].

Motivation

"Safety First"

Safety, most accidents happen because humans are doing something like drinking, doze, texting, checking Social network, tiresome and emotional problem, unlike human SDC’s won't do that. Traffic on the road happens because humans can't communicate with each other on the road. SDC’s would be much more efficient at it than humans. Traffic crashes are the primary cause of death worldwide for people aged 15-24, and during a crash, 40% of drivers never even hit the brakes [1]. We’re barreling around at high speeds in vessels covered in glass, metal, distraction, and death.

"Imagine if everyone could get around easily and safely, regardless of their ability to drive."

This SDC+DAs creates new way of transportation. Since driving becomes easier and safer, regardless of our ability to drive.

**Objective**

The primary purpose of this SDC+DAs is to make driving become much safer and easier and imagining if everyone could get around easily and safely, regardless of their ability to drive. Since Self Driving Car + Driver Assistance System can lets cars to be easier to drive by and safer.

In order to achieve the points stated above, the SDC+DAs has the following objective to be achieved by cars

* Learn by themselves, how to drive on the road.
* Traffic sign recognition to understand the road traffic rules and regulations and act in accordance.
* Be able to predict any risk of road traffic accidents.
* Minimize the number of the road traffic accidents and also the death counts
* Minimize the economic loss that happens because of road traffic accidents
* Understand and act for oncoming cross-traffic
* Lane keep assistance to stay in the center of the lane

**Methodology**

This SDC+DA systemis going to be implemented first for on toy cars and once it is tested and verified then the system will be implemented on a real car. the project mainly code intensive and most part of the project is software implementation.

Most of the software implementation parts are going to be implemented using the python language. This is because of that the system needs real time competition of different machine learning algorithms, computer vision algorithms and some complex mathematical calculation, it is so much important that the development environment should be full of resources, libraries and also the developed software should run fast while using small memory. And parts of the software implementations are going to be held by C. we will use the Pycharm as IDE for python and Atmel Studio for C.

To add abilities like self-driving and assisting the driver while driving, for time being we planned to develop a deep neural network to come up with a learning system. And as input we use computer vision and other sensor values for the deep neural network.

**Resource Requirement and Cost Breakdown**

To implement this SDC+DA systemthe following resources listed in table 1 are needed

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Item# | Resource Requirement | Type | Amount | Cost(birr) |
| 1. | Raspberry -pi | PI2 Model B | 1 | 735.23 |
| 2. | USB Webcam | Normal USB | 1 | 294.09 |
| 3. | H-bridge IC | L293NE | 1 | 59.45 |
| 4. | RC-Toy car | Radio wave | 4 | 420.13 |
| 5. | Ultra sonic sensor | HC-SR04 | 2 | 21.64 |
| 6. | AC power adapter | AC-DC | 1 | 210.06 |
| 7. | Microcontroller | ATmega 1284PU | 1 | 132.13 |
| 8. | Max-232 | RS 232 | 1 | 52.52 |
| 9. | Power bank | DC power battery | 1 | 420.13 |
| TOTAL | | | 13 | 3627.40 |

Table 1:Resource Requirement and Cost Breakdown

**Development Tools**:

1. Pycharm as IDE for python
2. Atmel Studio for C
3. Matlab

**Tentative Project Plan**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Activities | Months | | | | | | | |  |
|  | October | November | December | January | February | March | April | May | June |
| Advisor review and taking supplementary courses |  |  |  |  |  |  |  |  |  |
| Requirement Study analysis |  |  |  |  |  |  |  |  |  |
| Software and hardware Design and implementation |  |  |  |  |  |  |  |  |  |
| Testing the system on RC car |  |  |  |  |  |  |  |  |  |
| Adding More features to the project |  |  |  |  |  |  |  |  |  |
| Draft Thesis Paper preparation and finalizing |  |  |  |  |  |  |  |  |  |
| Demonstration and Final Thesis Paper Submission |  |  |  |  |  |  |  |  |  |
| Demonstration of the system on real car |  |  |  |  |  |  |  |  |  |

Table 2:Tentative project time frame

**Reference**

[1] http://www.worldlifeexpectancy.com/ethiopia-road-traffic-accidents

[2] https://conservancy.umn.edu/bitstream/handle/11299/172958/4%20MJLST\_v162\_Lari\_735-  
 770.pdf?sequence=1&isAllowed=y

[3] http://theoatmeal.com/blog/google\_self\_driving\_car

[4] <http://www.who.int/mediacentre/factsheets/fs358/en/>