완전자율주행차의 최적 안전 장치에 대한 연구

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1. Introduction

1.1 Begin With Safety

As humans are facing drastic changes in their lives through developed technological industries, we need to be able to secure our primary motto of our daily lives: *Safety First.* One interesting facet that I'll be focusing/researching on is the safety of, the newly introduced, Fully Autonomous Vehicle (above level 3). I would like to concentrate on how to structure airbags in order to provide safety at any time, any where.

1.2 Why Safety in Fully Autonomous Vehicle?

One question arises in my mind. Are vehicles really safe? The primary goal/objective of the fully autonomous vehicle is to create the safest car possible. As AI will take over the driving portion of the car, it will manage to prevent human errors which, according to *Lawinfo*, a blog conducted by verified lawyers, causes 94% of all of the car accidents. Yet, this also means that if people continuously utilize normal vehicles, human errors will still persist and create further accident even though some people might use fully autonomous vehicles. Therefore, it is critical to have safety procedure for fully autonomous vehicles too.

I will embellish my research plan, mainly about airbags, through the purpose/significance of the study, theoretical possibilities, and long-lasting impact of my study.

2. Purpose and Significance of the Study

2.1 Background Information

We have to consider few basic information before discussing about the significance of my study. In order to evaluate the safety measures, we have to know how these fully autonomous vehicles are going to crash. Thus, it is my job to research about all of those scenarios in order to come up with the best safety tool possible.

However, one thing is very clear. We need safety tools consisted of fundamental technology, such as airbags and seat belts (often called passive safety tech). We would also be required to use Advance Driving Assistance System with active sensors, yet we would need it in a more creative and a newly structured way in order to be prevent detrimental accidents of Fully autonomous vehicle.

Moreover, through Fully autonomous vehicle, drivers and passengers can sit in various positions, and it would be very hard to utilize our normally structured safety measures to fully ensure safety to all of those positions. I would like to consider all of these aspects to create a new safety plan.

2.2 Purpose & Significance

I have two purposes to conduct my study. Broadly saying, it is because my study can support to secure a new method of safety. In depth, it can create a new structure of airbags that considers the speed/time of filling the volume of the airbag, the size of the airbag, and the position of where airbags are going to be located. I also have to consider that these airbags won't be too expensive since the customers then won't buy the fully autonomous vehicle at the first place. Therefore, I will study these criteria in order to offer the best possible airbag positioning.

My study will have one big significance for sure. It will spark the idea of the fittest airbag type with the safest possible structure and offer it to the customers. As my study is only the beginning of safety measurement of fully autonomous vehicles, it will also longly impact other studies that will later regard the safety of fully autonomous vehicles. In order to ensure this significance, I am going to analyze different scenarios of when fully autonomous vehicles can be damaged (roll over, back crash, etc.).

3. Methods of Analysis and Data Collection

3.1 Review of Current Technology

One method of analysis and data collection that I am going to use is the paper studies that are already published. For instance, "Modeling and Numerical Simulation of the Internal Thermochemistry of Automotive Airbag Inflators" published by Barry Butler and Herman Krier could help my study by presenting ideas of ideal airbags. Or the "Fundamentals of Classical Thermodynamics" written by Gordon Wylen and Richard E. Sonntag can teach me the basic knowledge of inflating airbags. Such this, I am going to utilize paper works/books by many other professional experts to sufficiently research my study.

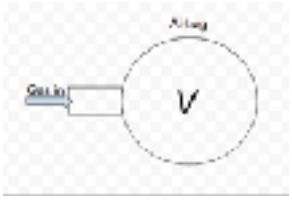
3.2 Vehicle Crashes (Internet Research)

I am also going to explore through the Internet which I already found valuable sites that can support my study. For example, the *Automotivereport* is a site has a plenty of informations about Advance Driving Assistance System; this can help my further research about co-relating airbags to active sensors.

3.3 Passengers Seating Position

By actually considering all the possible seating position in fully autonomous vehicles, I am going to categorize those situations in different areas. For example, one typical position the driver might take is lying down, as they can sleep. Another position might be that one of the passenger next to the driver could be lying down. I would categorize these two different scenarios in to one, which both of them have the solution of using an airbag that manages to secure them when they are lying down. It is merely impossible to go over each and every possible car crashes as there is a limitless amount of possibility; however, if I can categorize them and find the solution for each of those categories, I can create the best safety measure easily and proficiently.

3.4 Theoretical Research



By analyzing the best position of airbags through the steps **3.1~3.3**, I will then have to check my work theoretically, as if the inflation of airbag isn't theoretically valid, the positioning won't be valid either. I will employ the conservation of mass theory, the first law of thermodynamics, and the ideal gas equation to find the required amount of mass of the gas to inflate the airbag. Through these theoretical equations, I will also find the fastest time available to inflate the airbag because if the inflation is too slow, the airbag can't save the person sitting in the car.

4. Expected Results and Impacts

4.1 What I Expect

I don't expect my research to perfectly manage/control all the possibility of the accidents possible as there are so many other experts and knowledgeable professionals who have better understanding of fully autonomous vehicle than I do. However, I did notice that there wasn't a lot of published study of this research area. Therefore, I believe that through my in depth research, I could at least be the starting stepping-stone of this research and widespread this area of study as well.