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DRIVE SAFE

Over a million people every year die in car crashes globally. This puts vehicular accidents among the leaded causes of death all over the world. This is a statistic that is simply outrageous. In most cases, it is not the vehicles themselves that fail or have something wrong with them, it is user operated error. It is my belief that this can be taken completely out of the equation, which is why I have chosen to make my ideal computing project the automation of vehicles. There are many groups researching this topic already, with plenty of success, so I wish to help finish this technology to the market, and make the world just a little bit safer.

In order for this project to be fully completed, there are several technical goals that need to be reached. All of these technical goals, when completed, will work together to make this a safer and better form of transportation for all people on roads. The first, and probably most important of these technical goals is how we get all of the information we need. This is done by basically creating a virtual environment around the car. By this I mean that we need to take data, which is obtained through the use of sensors, and create almost a bubble around the car, in which we can read and interpret the environment around the car. The best way to do this would be have many sensors around the car, which all feed into a central system to be analyzed by software implemented by the car's system. The way that humans decide how to react to certain situations while driving is based on observing their surroundings. By using our senses, mostly vision, we decide what action we need to take to safely move. Most of the time we are not looking miles ahead. This means, that we would not need to look super far down the road to be able to see if there was impending danger. Most of the dangers for the car itself would be localized to a radius around them. A limitation to this system would be that it would have to be able to work during any weather condition, as well as during the day and night. This means that the sensors on the car

would have to not be so sensitive that it picks up rain or snow, but sensitive enough to pick up cars and pedestrians. This would also need to work during fog and at night, so when actual vision isn't possible for humans (heavy fog), the system would still work fine. Another limitation to this would be the fact that sensors can only see what is directly around them. If there is a sensor to map in front of the car, it will be blocked by the car in front of it, and will not be able to see past obstacles such as cars in front of us. This limitation leads into our next technical goal, which is path planning.

Path planning is another very large step we need to beat in order for these systems to work. Humans can interpret the information around them, and plan accordingly to what they interpret. Using the virtual environment created by the sensors, the car needs to be able to plan ahead, and decide what the best course of action is for the car to take in order to safely traverse the road. Consider the situation of a pedestrian in the crosswalk in front of us. If we as humans see that there is a pedestrian in the crosswalk waiting to cross, we would assume that they are going to cross, so we need to stop for them. The systems implemented by this technology need to interpret the same thing, but better. Another situation would be if there was car parked in front of you, but it was not at any sort of intersection. In our minds, we can look ahead and see that we need to go around this car, so that is what our system needs to be able to do. It needs to be able to read the situation that is at and, and plan a path for the car to go, based on that situation. This is where most of the algorithms and artificial intelligence comes into play, and is probably the hardest part of the entire project. Limitations to this type of thing would be time constraints. All of the information grabbing and algorithms all have to run almost instantly so that the system can respond immediate to what is on its plate, otherwise the entire system fails. If a care was to slam on their breaks in front of you, the car would have to realize that it needs to stop immediately to

avoid a collision. If the system does not realize that it has to stop until after it is too late, then the entire point of making automated cars is pointless. Another software constraint would be that we need the program to basically be able to look ahead in time. If there is a car driving up next to us and is going faster than we are, we realize that we can not merge into the lane in front of them, otherwise there will be a collision. The software has to be able to basically "see the future" like we do, which could be hard, seeing as there could be many objects around it that it has to keep track of all at the same time.

So what is the point of putting all of the work in on this project, in general what will it do for society? The answer to that question is that it will make the roads much safer. Right now, vehicular accidents are one of the top cause of death in the world, with over 1.2 million deaths in the world in 2013. This is a statistic that, if this system is implemented correctly, could eventually make roads far safer for everybody that drives on them. One very positive outcome of this project would be that there would be less crashes. Most crashes are caused by human error, whether they interpret a decision wrong while driving, or they are simply distracted while driving. With a system like this, the system is always running, it will never get distracted, and will be able to respond to the situations presented to it in a faster way than humans can. Humans may not always choose the best choice of action when represented with a car slamming on it's breaks in front of it. Humans may try to swerve out of the way, driving into oncoming traffic, or may swerve and hit somebody that is in the lane next to them. If this software is given all of the information, and creates a virtual space around it, then it will be able to detect the best course of action when given that certain scenario, unlike humans are able to do. This means that it is more likely to choose the best option for an optimal outcome.

Another positive impact of this would be that we could increase the speed limit on most roads. This is because of the fact that this software is able to react quicker than humans are able to react. This means that we would be able to drive faster because we would be able to follow people closer because the software would choose the safest, best option for us to be able to react to situations. This quicker reaction time is the main factor that would be positive in this whole system. Humans have terrible reaction time when compared to machines, especially when machines can take in all of the factors at play, while humans may only be able to think of what is directly in front of them. If somehow all of these systems were linked together as well, then they would be able to talk to each other and do things such as open holes for people who need to merge into a different lane of traffic on the interstate, but that would be an optional thing, which would be a whole new project in itself, so I won't go into that.

With every positive, comes some negatives. The biggest negative of these systems would be the chances that they fail. This is a very important thing that will always happen, but we can try to prevent it as much as possible. If the system fails, it could cause a lot of accidents and could take many peoples' lives. With a lot of different pieces working together, like all of the sensors that feed into one central computer that computes all of the algorithms needed to determine pathing and such, there is a lot of things that could all go wrong. A way to prevent this would be to add some policies and actions to make it safer. One of these policies could be that there has to be a backup system running on each of the cars, which means that there are backup sensors, just incase the main system fails, there is a back up that can take over and be effective. Another could be that they need to have some sort of fail safe fall back, such as feeding all of the information into a "should expect" type of algorithm. This would mean that if it doesn't pass the

should expect type of algorithm, which means that something is going wrong, then the system would pull to the side of the road and make the user take over manually or something.

Another possible negative of this would be if people were to tamper with other peoples' systems. This is always a danger when we go into a world run by computer software. In most cases, it's not that hard to mess with somebody's' system and make it so that it runs incorrectly, or steals information from them. This would be an even bigger deal if the software for each car to talk to each other was implemented as well, because it could be susceptible to a man in the middle like attack and just merge, even if it was told that there was a car next to it. This would mean that we need to determine a way for this machine to not be editable by any external means, which would mean that we make it so that there is no way for people to have direct access to any of the algorithms or software behind the system. There would need to be laws against doing such things as well, as well as maybe have error checking to see if the software has been tampered with at all.

A system like this is not easy to implement. There are many determining factors that will make or break the entire project. It needs to be reliable, and something that people will willingly trust their lives with. There needs to be a strict set of rules that the algorithms will follow in order to make it so that it chooses the correct and best path while driving on the roads. Even when this software starts to get implemented, I don't think that it will happen overnight. It will take time for people to start trusting these machines with their lives going 60 mph down the road. It will be a step by step process, perhaps starting out with simply implementing the fail safe software to a degree behind the scenes on a car that a human has control of. This would make the software soft of like the failsafe and lock the user out if they are doing something that is ruled unsafe by the machine. This could be a first step, which would lead to the overall 100% control of the entire

car by the software in the future. I think that this project, if implemented correctly, could save millions of lives.