Virtually every person who has to commute to work during rush hour has complained about sitting in traffic. The average person in America has a commute to work of 26.1 minutes. This is equivalent to 4.35 hours a week for a full-time employee, or about 9 days per year. Time is wasted during a worker’s commute that could be spent on exercise, time with families, research, or even another job. Aside from the fact that the average person’s commute wastes 9 days of their life per year, the large traffic flow during rush hour causes harm to the environment. A car burns the most fuel, and therefore causes the biggest increase in air pollution when it is accelerating from a stop. This is a very common occurrence whilst sitting in stop and go traffic. Another down fall of driving in general, is the possibility of car accidents. While traffic jams cost $124 billion annually for Americans, $836 billion is spent on traffic accidents. Nearly 165,000 car accidents occurred in intersections in 2018 alone. These intersection car accidents account for about 40 percent of all car accidents, second only to rear endings.

With the many problems that traffic and human-driven cars cause, more and more companies are looking to reduce, and or solve, these problems through self-driving cars. However, most self-driving cars today use cameras to “see” what is in front of them. This can cause issues when there is weather such as rain, snow, or fog, that will block the sight line of the cameras. The blockage of the cameras causes the self-driving cars to not be fully capable of managing an intersection. Researchers at Carnegie Mellon University have developed an algorithm to hopefully solve the self-driving car camera vision problem. This algorithm is called
Virtual Light Technology (VTL).\textsuperscript{4} VTL is an algorithm to allow cars to control themselves at an intersection without the use of traffic lights.\textsuperscript{4} VTL uses vehicle-to-vehicle (V2V) communication to implement the Virtual Traffic Light technology.\textsuperscript{3} As cars with VTL technology approach an intersection they calculate their distance from the intersection and the car furthest from the intersection is chosen as the leader.\textsuperscript{4} The leader then chooses which cars have the right of way, giving them a green light, and which cars do not have the right of way, giving them a red light.\textsuperscript{4} After the leader receives a green light, a car perpendicular to the current leader is given leadership, and the process repeats.\textsuperscript{4} Each car is also safety equipped by sending a safety message and the vehicle’s latitude and longitude coordinates to the other cars around it every tenth of a second.\textsuperscript{4}

In order for the VTL algorithm to be fully implemented, a device called a DSRC transceiver will need to be placed into every car.\textsuperscript{4} A DSRC transceiver is a dedicated short-range communication device that allows for wireless communication between cars.\textsuperscript{4} The wireless communication eliminates the problems that self-driving cars have in relation to the camera sightline being blocked by weather.

Due to Virtual Light Technology being newly developed, it is assumed that not every car on the road will be able to be equipped with a DSRC transceiver. To solve this issue, the researchers at Carnegie Mellon have developed a way to upgrade current traffic lights in a way that the traffic lights can communicate with cars that are equipped with a DSRC transceiver.\textsuperscript{4} The traffic light will allow these equipped cars to control its traffic light cycles.\textsuperscript{4} With the quick solution of upgrading traffic lights, more time is allotted for all cars to eventually be supplied with the DSRC transceiver.
Virtual Traffic Light technology was tested successfully in public for the first time in Saudi Arabia in July 2018. The technology was also simulated for typical rush hour traffic. The results were that the VTL technology caused a 30-60% decrease in commute time. Not only did the tests using Virtual Light technology reduce the worker’s average commute, the tests also predict that VTL will reduce carbon dioxide emissions by 20%, and therefore, reduce the pollution caused by traffic jams.

The Virtual Traffic Light technology has seemingly no disadvantages when compared to current traffic lights and self-driving cars. However, the VTL technology can lead to a large ethical dilemma for today’s drivers when interacting with VTL technology. When analyzing the ethical dilemma is it assumed that once the Virtual Traffic Light is released to the public, it will be law that every new car will be implemented with the DSRC transceiver and every traffic light will also be equipped with this transceiver. It will also be illegal to overpower the DSRC transceiver or to go against the traffic light pattern. With these laws in mind, an ethical dilemma arises for a driver when another car on the road has a malfunctioning device, or if another driver chooses to overpower the device and run a red light. The driver with the functioning VTL device will have to decide whether to override their device to prevent damage to the malfunctioning car, and possibly hurt themselves, or continue to follow the laws of VTL and possibly injure the driver of the malfunctioning car.

To begin the analysis of this ethical dilemma, one can compare the dilemma to the well-known trolley problem discussed in ethics. The thought behind VTL accidents has been compared to the trolley dilemma where a person must choose to ignore a train that is about to run over five people, or the person can choose to turn a lever that will instead kill one person and save the other five. This problem is similar to the VTL ethical dilemma in the case that there is
no good outcome of the problem, it only causes injury to different people while saving the others. In the VTL problem, the five people are represented by the passengers in the car with the malfunctioning DSRC transceiver and the one person is the person driving the car with the functioning device. The person driving the car with the functioning device must choose to do nothing and continue following the laws and possibly injure the other driver, or “flip the lever” and slam on their brakes which could in turn injure themselves or drivers behind them. The difference between the trolley problem and the VTL ethical dilemma is that the driver may not know for a fact whether or not the other car’s passengers will be injured or killed in an accident. It will be up to the driver to try to assess whether they would rather put themselves or the other driver at risk for injury or death.

The answer to the problem will differ person to person. It can depend whether the person’s natural instincts are to help themselves or others. In a study done by a professor from the University of Oregon, the majority of participants expressed that it would be “more morally correct” for the driver to choose to injure themselves and their own passengers, rather than the malfunctioning car’s. Although, this seems like an easy decision in theory, it will not be as easy in the moment. Furthermore, if the driver chooses to ignore the traffic light, they are then breaking the law which can be considered unethical in itself. A further problem that will arise from choosing to injure yourself, is that people may be less willing to buy a car equipped with VTL technology if they risk having to sacrifice themselves if another driver chooses to break the law.

Moreover, although it is arguably simple to say that a driver should choose to injure themselves over another person, it becomes even more complicated when there are multiple people in both cars. It then becomes a question of which group of passenger’s lives have more
value. However, who can decide which group of passengers are more valuable? Each person on earth has an equal right to safety. As written by McPherson and Mladenovic, “if certain degrees of happiness or safety are intrinsically valuable, they are valuable to the same degree whether they accrue to me or you.” This quote means that the value of safety and happiness is equal for every person, no matter what they have done in their life. Therefore, no person can decide which group of passenger’s lives are more valuable. There cannot be a 100 percent correct solution from an ethical point of view.

The ethical dilemma can be further analyzed through western ethical theories. To begin, the consequentialist approach deals with evaluating the dilemma based on the consequences. In other words, the solution to the dilemma is the one where all of the consequences are good. It is hard to look at the VTL dilemma through a consequentialist approach because either solution results in good consequences from one car and bad consequences from the other car. Analyzing the dilemma through this approach depends on which point of view you are looking at the problem from. In this case, the dilemma is looked at from the perspective of the driver with the functioning VTL technology, so the best approach for them would be to protect themselves.

Another western ethical theory is utilitarianism. Utilitarianism deals with analyzing the dilemma by choosing the solution that would increase the total happiness of the universe. From this approach, the solution can be dependent upon which car as more passengers, because saving more than one person can increase the total happiness of the world more than saving one person. However, the analysis can get messy dependent on the amount of family and friends each passenger has, or their contributions to society.

Furthermore, the ethical dilemma can be looked at through the deontological approach. The deontological approach refers to the idea that “certain actions are right or wrong regardless
of the consequences.” Using this idea, it is never morally correct to injure another person, so the driver of the functioning car should never choose to injure the other passenger, regardless of the possibility of injuring themselves.

Finally, the VTL problem can be evaluated from Immanuel Kant’s perspective on ethics. Immanuel Kant’s perspective looks at the idea that ethics deal with “absolute respect of persons.” The theory also looks at the idea that something done to another person cannot be ethically correct if the person “could not possible consent” to the action. From Kant’s theory, the driver of the malfunctioning car has no way of consenting for the driver of the functioning car to choose to injure the driver of the malfunctioning car. Therefore, the driver in the dilemma must choose not to injure the other driver.

Although it may seem clear from certain ethical theories what the solution should be, when the ethical dilemma is analyzed by taking all theories and perspectives into account, there is no clear solution. In the end, a person will not truly know the decision they will make until the situation actually arises. In the new moment, a driver will act on natural instinct and may not have enough time to think through the solution. Perhaps as the Virtual Traffic Light is implemented into society, we will see a solution, or at least see how real people will react to the ethical dilemma surrounding Virtual Traffic Light technology.
References


