Vehicle-pedestrian Awareness Enhancer at Intersections

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1. Abstract

Nowadays, people cannot avoid crossing the intersections when they are walking. But there are many hidden dangers when people are crossing the intersections. Every year thousands of pedestrians are killed by motor vehicles when they are crossing the intersections. So we want to enhance current intersection signal system by creating a new system that can not only warn pedestrians when there are cars heading towards them, but also can warn cars when there are pedestrians in their turning directions. Our project will basically have two systems. The first one is vehicle and pedestrian sensors accompanied with vehicle and pedestrian signs. Another one is camera system which can detect the movement of pedestrians and vehicles. Based on the movement of objects, the system can then determine the length of each signal to make objects crossing the street more smoothly and safely. Our goal is to decrease accidents in intersection in a 60%. The time to install each system will be 3-4 labor days, with a total cost of $12,000 per intersection.

2. Project Description

At the moment there are a variety of resources that believe that vehicles are dangerous and a change should be made. A study from the NHTSA show that in 2011, motor vehicle crashes represented the 12th leading cause of death on the US also, according to a recent report from the National Complete Streets Coalition, every year more than 4500 pedestrians are killed by motor vehicles when they are crossing the street in an intersection, and this takes up 20 percent of a total 1.24 million traffic fatalities. Even though most intersections are equipped with traffic lights, there are not enough signs to warn both cars and pedestrians when cars are turning to the pedestrian’s direction.

To achieve this goal, we want to build a system which is about two related subsystems, the first one will detect a car that wants to take a turn using road band sensors (3 in the entrance and 1 at the end so it detects when a car is there, and when it has already left), and alert the pedestrians using a luminous sign and an alert sound. The second system will use a movement sensor to detect pedestrians crossing, and will warn the car wanting to take a turn through another luminous sign. In order to turn the signs on, the both sensors have to be active at the same time. Also our system is a smart system for two main reasons, the vehicle sign will warn at different frequencies depending the car’s velocity. As for the detection of pedestrians, we are going to use 2 Megapixel quality cameras, making sure the image is clear and can be inputted flawlessly.

Security in intersections has been a difficult issue to improve for a long time. Many actions had been taken trying to make crossroads more safety. Actually, lights have been implemented to more intersections in order to improve brightness at night or bad conditions. However these actions are not enough to ensure safety.

Many fatalities between cars and vehicles can be avoided with an effective solution, we want our system to decrease by 60% accidents at intersections. By comparing the actual overall of crashes in one crossway with the past numbers, we will see if our system is effective. And if not, we will continue improving our system to minimize the injuries.
3. Team

Our team is composed of Haoyong Lan, Electrical Engineer with excellent circuit building skill and some programming skills; Jaime Masia Mechanical Engineer with outstanding structural construction skills. One major in electrical with another one major in mechanical makes a perfect combination to conduct this project. We both are specially interested in the detection of moving objects and how to modify their behaviour, and we would like to use our capacities to improve safety in the public area.

4. The Ask

We are asking our funding agency especially local transportation administration to give us total budget about $12000 per intersection including $7500 for labor and $5000 for parts. We also need authorization to renew the current intersection traffic lights. Funding agency should also provide us tools if necessary when building the new system. Finally, we need information access to local intersections situation so that we can determine which intersection should be mounted our new system according to traffic flow amounts.

What we will deliver to the funding agency especially for the department responsible for the intersection safety is actually a brand improved system that can detect movements of vehicles and pedestrians. Then the system can warn pedestrians and vehicles at the same time according to their moving tendencies and velocities.

5. Budget And Timeline

Our budget includes labor and parts costs plus some additional costs such as electricity and health care. For labor parts, our group is composed of two people. After calculating human labors and health care, we estimated each one has an hourly rate at about 30$ per person with total working hours nearly 50 hours. After calculation, the result is then timed by 2.5 from ECE Illinois, we get $3750 per person. Timing 2, the final labor cost is 7500$.

For parts, the first one is camera system from IB8367 Vivotek with $826 each. We need 4 of them, so the total is $3304. Then we will use BP5837 current converter with price $30. One power supply at $100. And the rest is traffic signal accessories. Adding the parts costs together, we finally calculated the parts cost at around $4500. So our grand total is around $1200.

For schedule, we will split the work to finish project more efficiently. We will first buy all the required parts in one month. Then in the following month first week, Jaime will first mount camera and signal systems supports. Then in the next week, Haoyong will assemble inner system such as cables and wires into the right place. Jaime will then start building pedestrian and vehicles signs and sensors. Haoyong will finally connect all of units using fibers with CPU to finish the building process. After finish building the system, all of team members will inspect all the system parts and do the mock-up to test integrated system.
6. Long-Term Impact/Conclusion

Following this round of funding, we will continue refining our intersection system. We will ask feedback of pedestrians and drivers. Then we will make slight change of our system. We will move the road band sensors to optimized position that can best detect the movement and velocity of vehicles. We will also improve software inside the camera system to let it respond to the inputs more quickly. We believe in improving our project, the intersections safety will be largely enhanced and in the near future, pedestrians and vehicles can freely cross the intersections without any doubt.

Reference

