Introduction to product development and management for engineers and computer scientists - GNG2101

Rear View Camera
User Manual

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Abstract

For this project, our goal was to help our client, who is wheelchair bound, with their spatial awareness issue. Their main complaint/ issue was that they had trouble backing which would lead them to bumping into objects and people in some instances. We decided to produce a rear-view camera to help the client with this issue by granting them a view behind that would allow them to maneuver better. We used the iterative Engineering process taught to us in class to help with the projects organization and to make the entire process more coherent. This lead us to making 3 functional prototypes. Our final product consists of a camera that would be mounted on the back of the wheelchair by a 3D printed case that would wirelessly connect to the phone which was secured to the chair via another 3D printed phone mount. This would not only allow the user to see a live feed of what's behind them but it could also be used on any wheelchair as its design allows it to be used with any wheelchair. Our fully functional product will change the lives of many wheelchair users worldwide.

Table of Contents

- List of Figures
- List of Tables
- Introduction
- Discussion
- Conclusion
- Bibliography

List of Figures

Figure 1 : Camera inside camera mount with hose clamp attached

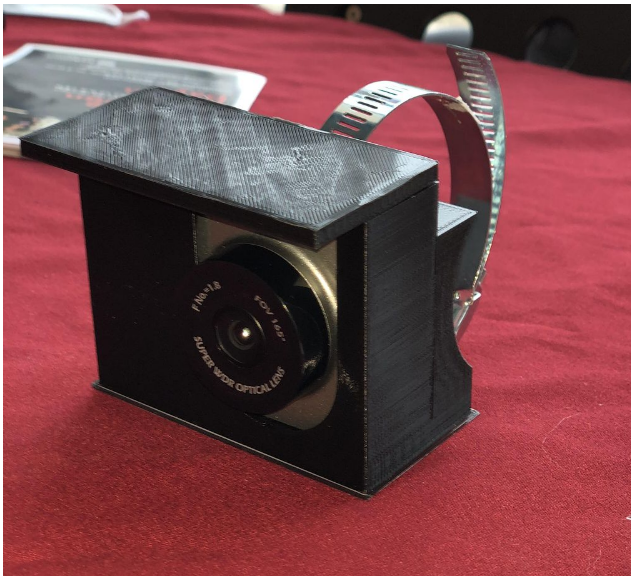


Figure 2 : Phone mount with phone attached

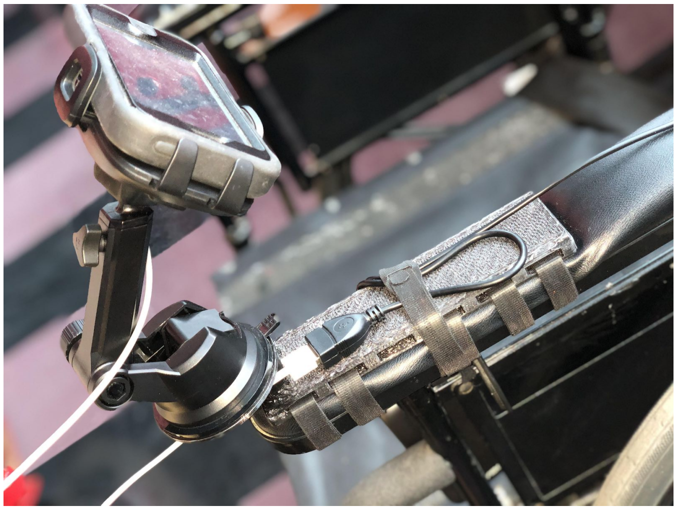


Figure 3 : CAD prototype of Phone Mount

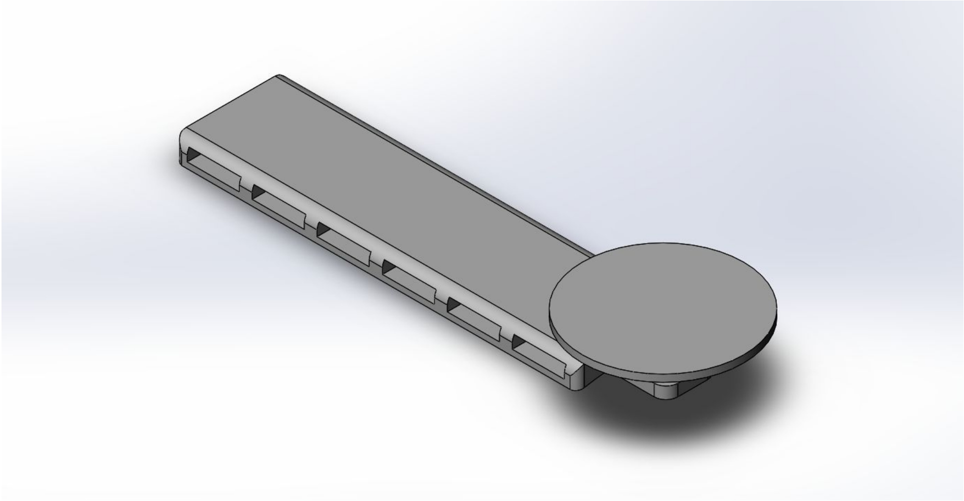
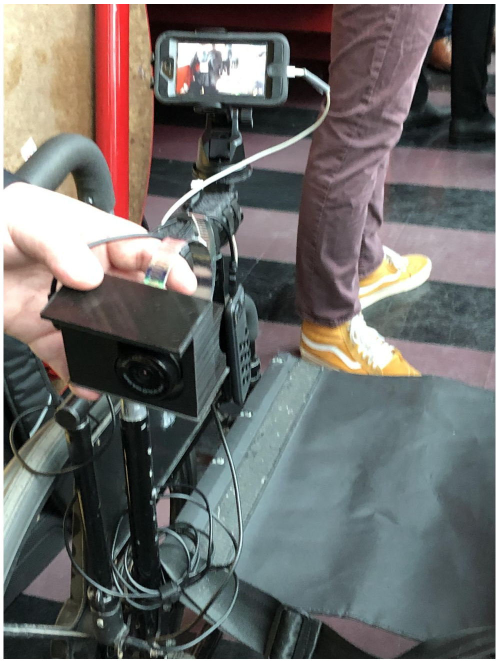


Figure 4: Working prototype



Introduction

In Canada, 1% of Canadians are confined to a wheelchair and most of which have limited mobility. As such, visibility behind the wheelchair for most people can be uncomfortable, difficult or impossible. When backing up, it can be difficult to avoid bumping into walls and objects, while turing can be hazardous by accidentally cutting off bikers and walkers. In order to give wheelchair users better spatial awareness and improve safety, they need better visibility around them.

The solution to this issue is a rear view camera that produces a live feed to any smartphone using a wifi hotspot. The product includes a camera in a protective case and a phone mount that straps on to an arm rest. The product requires a usb power supply or any other power supply which allows a usb adapter. The camera includes a 165° wide view, night vision and 1080p, 60fps video feed. The camera can also connect to both apple and android smartphones.

Currently in the market, there are very few products that are designed to help with rear view visibility for wheelchairs. Most products only work with specific wheelchair models or come with there own screens. However, our product can work on all wheelchair models as long as they have a crossbar, a power supply and room to install the phone mount. Furthermore, our model uses the customers smartphone to view the video feed, which allows us to save the cost of the addition of a screen, allowing our product to stay competitive on the market.

Discussion

The rear view camera essentially allows the user to see behind them. Using a real time video feed which is directly connected to the phone. The user is able to see any objects behind he or she on their phone without having to look back. The phone is attached to a mount which is strapped on to the arm of the wheelchair.

How It Works/Install

- Feed the velcro through the strapping holes underneath the phone mount.
- Clamp the camera mount onto the back of the wheelchair
- Then insert the camera into the mount.
- Then strap down the phone mount onto the wheelchair arm
- Then attach one's phone to the mount.
- Download App from app store
- Connect iphone to app
- Lastly, using a usb splitter the user can power both the camera and their phone.

How it was built

The phone mount was created by 3D printing a plate that includes holes that allow Velcro straps to be fed through. The plate includes a round base that connects the phone mount. The phone mount is an adjustable smartphone holder with a suction cup at one end. This suction cup was glued to the round base connected to the 3D plate.

The camera is a YI Smart Dash Camera. This camera is powered by a usb. The camera uses a wifi hotspot to connect to a smart phone through an app. A case was built around the camera to protect it and to allow it to be mounted on surfaces. The case was 3D printed with a round imprint on the back to allow it to mounted on a bar. This was done using a hose clamp. A hole on the side of the box was included to allow the camera to be powered. The top of the box fits snuggly in the box and prevents rain from getting on the lens of the camera.

Health and Safety

Certain parts of the project have rough and sharp edges be careful not to injure yourself.

Makerrepo submission, includes prototypes, CAD files, and detailed description of the project

https://makerepo.com/AnujanT/gng2101b1arear-view-camera-

Conclusion

In the future, multiple improvements should be implemented. For starters, the product is not completely waterproof. Since all of the wires are exposed, the usb splitter and the camera's power cord can be exposed to rain and be damaged. The camera case was also designed with our clients chair in mind, however, it should be designed so any chair can use the camera. Currently, the camera can only work on a chair with a horizontal crossbar. This should be improved upon so that any crossbar will be sufficient. There is also an issue with ventilation. It was found that running the camera for longer than 20 minutes causes a concerning amount of heat build up, however, we could not find a solution that would solve the heat issue without compromising the waterproofing of the camera. Finally, using the app that came with the camera can be somewhat frustrating. Everytime you turn off the camera or use wifi for internet, you must go back into the settings of your phone to set the wifi back to the camera. This can be quite time consuming and would be better if the app was always connected. As such, bluetooth most likely would have been a better connecting method then the wifi hotspot.