

Hong Kong Student Science Project Competition 2022

Team Number: JAPE290

Project Title: aEye

Project Type: Invention

To our best knowledge and after thorough literature research, as at 29/6/2022, there are / are no* similar works. If there are, the reference links are as below:

<https://www.orcam.com/en/myeye2/>

The enhancement our project has made for the existing related products or research is summarized as below:

Our enhancements are mainly centred around the fact that our project has a substantially lower cost compared to existing related products. The expected price of our product is a tiny fraction compared to all similar projects in this field. Due to the massive prices of these products, they are not relevant options to consumers. Our project changes that.

I. Background

This project addresses those who are blind and visually impaired. Blind and visually impaired people struggle in many ways in modern society. A great example is online education. It is arduous for children who are subject to these horrible disabilities. Without help, these children cannot learn effectively. Another example is elderly. Visually impaired elderly have a hard time reading simple yet incredibly important signs on streets. Our project attempts to fix these problems and more. It is a small, portable system for blind and visually impaired people to blend into society. The system has many features, including object recognition, colour recognition, text to voice, and barcode scanning. Our audience needs a way to escape the boundaries of their disabilities. However, currently available products such as the OrCam MyEye are much too expensive. Hence, we would like to fill the gap that is affordable gadgets for the blind and visually impaired.

II. Objectives

The main aim of this project is to create a functional, user-friendly, and versatile system to improve the lives of the visually impaired. We would like to give visually impaired people affordable access to help. Moving forward, our ultimate goal is to allow them to do the large majority of things that they have not been able to do because of their disability.

III. Methodology

Testing was conducted regarding the final accuracy of the artificial intelligence model for object detection paired with the camera. Although there is lots of testing done on the internet that assisted us in choosing our choice of artificial intelligence frameworks and models. We still wanted to get a general idea of how well the artificial intelligence model would do when paired with our specific camera. The images we used were common objects found in many homes, as well as other miscellaneous things found commonly

outside. We first hypothesised that the performance hit would be minimal because the code already downscales the images to a lower resolution before processing for performance reasons. Ultimately, the performance hit was only slightly noticeable. In conclusion, the camera we used had adequate processing and barely affected the output of the object detection feature in our system.

IV. Design of Invention

In this image, we have some parts of our system. The black box on the bottom houses a Raspberry Pi, which is what we used for our first prototype. However, it was slow and heavy. The Raspberry Pi was not made to run artificial intelligence programs, which are much more intensive. Therefore, we switched to the Coral Dev Board Mini. The Coral Dev Board Mini is a board from Google. It is a small board specifically optimized for artificial intelligence, making it a much better choice for this project. As you can see, this project also uses standard earbuds to communicate with the user. We decided against using wireless earbuds due to the possibility of the user losing them, as well as having a bad experience with pairing. Next to the Pi, you can also see the Coral Camera. It is just a small camera from Coral. However, we are currently not using it yet. Our current camera which is not shown in the image is the Logitech C270. This has been our choice because of its affordability, it will only be used in these prototyping stages, since we have confirmed that it does not meaningfully affect the accuracy. All of these parts (except the C270) have been optimized for affordability and portability.

V. Application / Market Need

Our invention is a simple gadget to improve the lives of those who are visually impaired. Currently, the market is lacking a gadget that is affordable. The invention would allow the target audience to get features they would currently have to pay multiple tens of thousands of dollars for with a tenth of the price. A limitation of our project is that we are not able to design everything ourselves and make sure it revolves around the aims of our project. Instead, we must piece together other pieces of technology that may not fit perfectly together to create our project. A big problem of this is the visual appearance of our project is not pleasing.

VI. Conclusion

When put into the hands of a visually impaired person, the project fully achieves the goal that is to help the visually impaired blend into society with sight powered by artificial intelligence. It is able to detect 80 classes in total. In the future, the visual appearance of this project could definitely be improved.