Computer Vision Guided Navigation

Team Members:
Alfonso Barbosa, Stacy Blanco, Everardo Bugarin,
Raul Zapata, CJ Evans
Faculty Advisor: Dr. Yi Zhao
Faculty Liaison: Dr. Deborah Won
Department of Electrical Engineering
College of Engineering, Computer Science, and Technology
California State University, Los Angeles

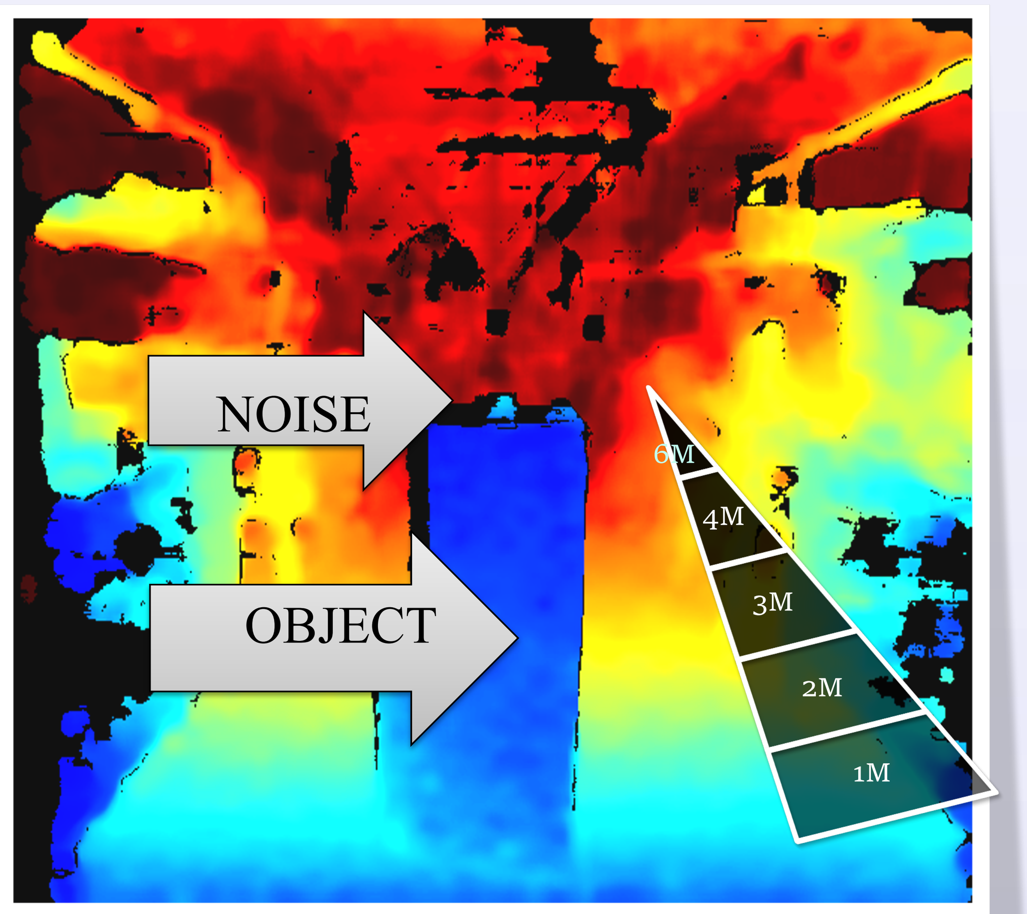
Project Background and Objective

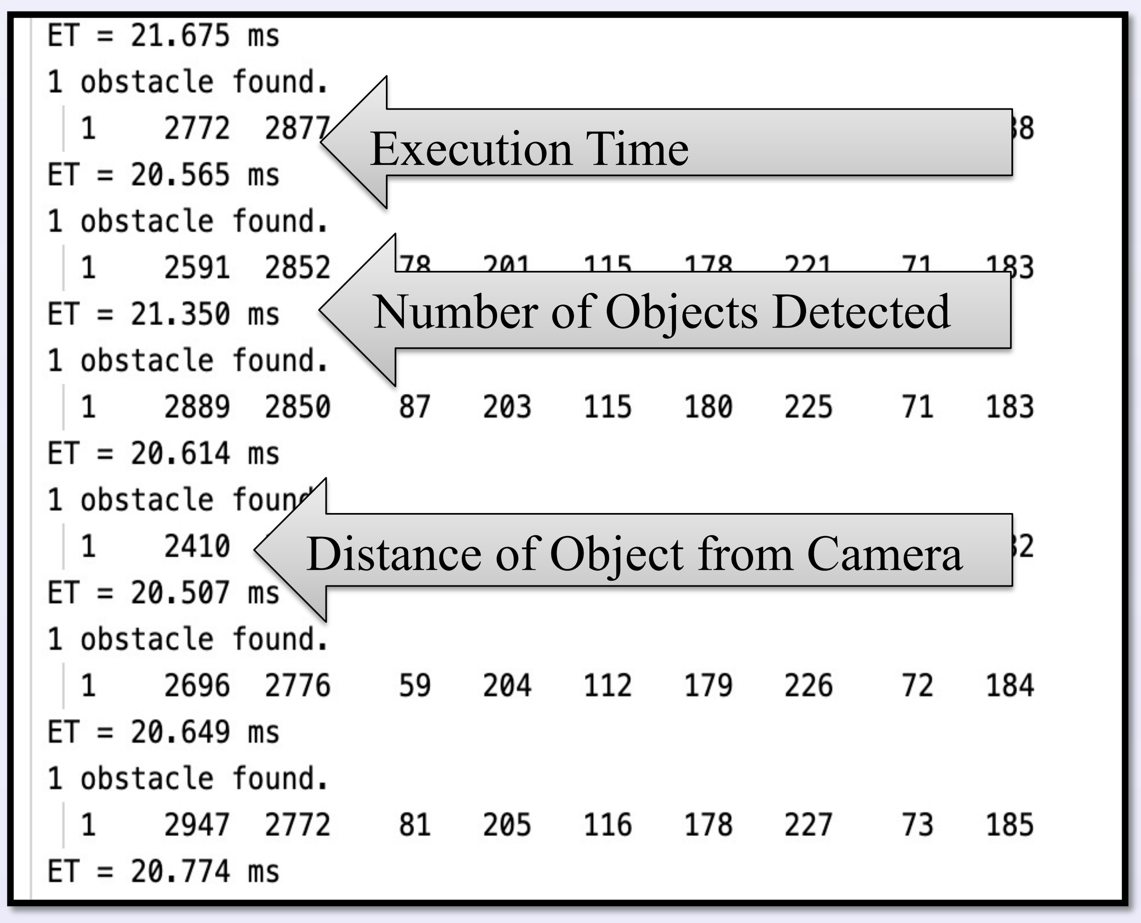
Currently, there are no commercially available systems to assist the visually impaired with computer assisted navigation in the United States. In a world where cars can drive themselves, creating a system to help guide a visually impaired person through an environment seems a likely step to take. However, while the technology to make the system exists, it has not been currently made into a product that specifically caters to this demographic. Many companies make camera glasses and individuals have made DIY systems that can take pictures and relay that information to the user via sound. The program most in use for such functionality is called voice created by Dr. Peter B.L. Meijer. We aim create a system that can take depth images and relay them to the user in a meaningful way. Building on the program built by Dr. Meijer, we focus on creating a basic system that takes the images from a depth camera, that then transmits the information to the user in a series of tonal beeps.

Design Approach

We started off with gathering the components of the system, using the Real Sense Intel camera, Raspberry Pi and Vocal Skull bone induction headphones.

The camera has the best depth ratio that we could use, and for prototyping with the Raspberry Pi it is very versatile with a fully integrated board for sound and AC power with the ability to connect a DC power source system as the design process develops. The VocalSkull headphones were chosen as a cost-efficient set of bone conduction Bluetooth headphones that can relay sound without compromising the hearing of the individual.

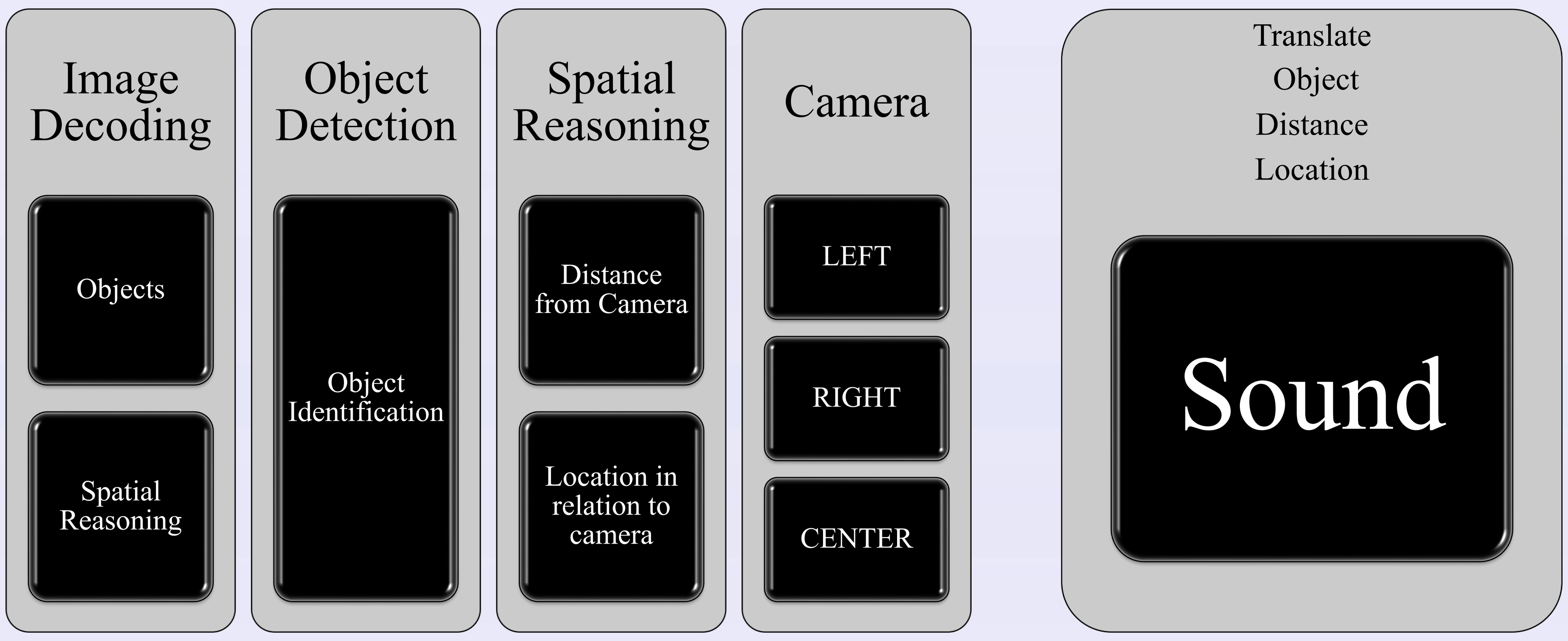


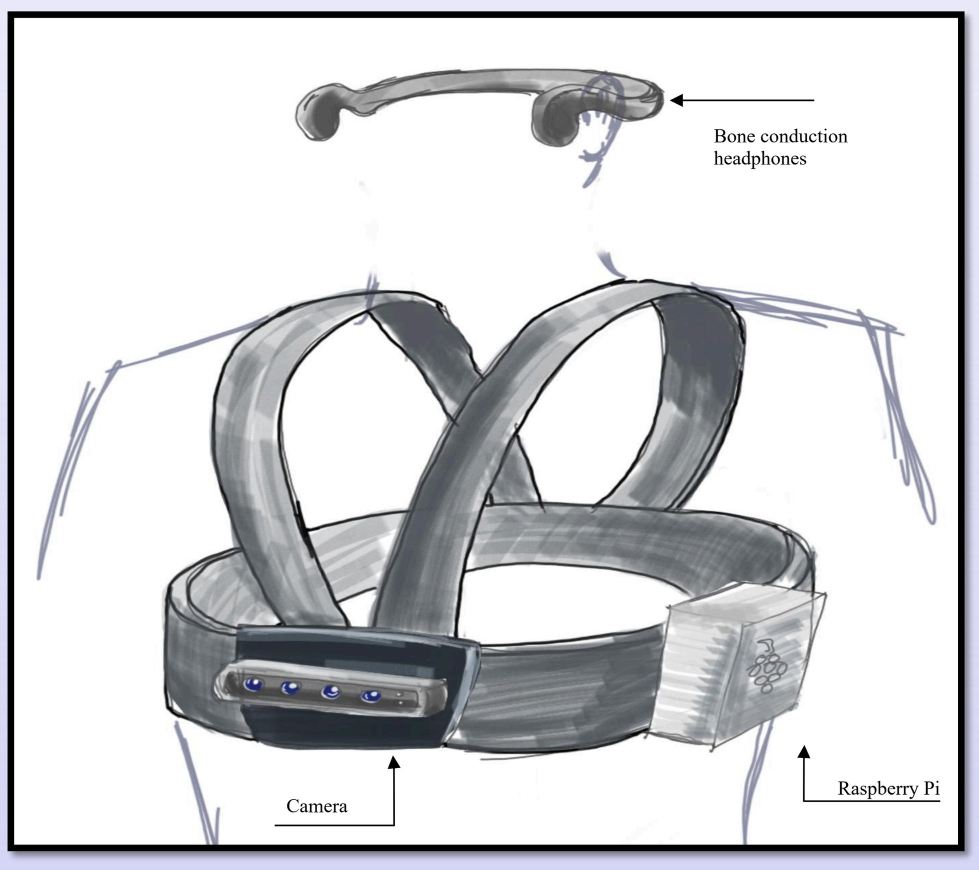


Results:

We encountered initial problems with the developed code, we could gather data, but it was distorted by the noise picked up. Filters were implemented and the execution time were all considered making these changes.

The sound code was modified from using black and white images to reading the depth images, and pixel location of the objects to give a general proximity tone for the location- right, left, center with increased duration of the tone in relation to the distance.





Conclusion

We found that the interface of the RGB camera depth data is attainable with a computer interface using a Raspberry Pi. The images obtained by the camera alone are not a reliable source of object detection due to noise. A filtering process is necessary to better define objects and eliminate any noise or background that hinders both detection and depth of the object. It is important that the depth data attached to an object be defined because the sound signal attached to that data is the user's source of guidance to location. The sound code is formatted to indicate the location of the object(s) via tone and how close the object is via duration of the tone.

Special Thanks to Dr. Peter Meijer for the vOICe program code to work from.