INTEGRATION OF RASPBERRY PI WITH WHITE CANE TO ASSIST THE VISUALLY IMPAIRED

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ABSTRACT

There are at least 2.2 billion people in the world who have near or distant visual impairment according to data from the World Health Organization (WHO). According to the Perkins School for the Blind, only 2% to 8% of blind people use white canes. This is because 90% of them have accidents when using walking sticks. We have Implemeted a system to help the visually-impaired upgrading the white cane by implementing four essential elements: An electrical-setup employing a simple computer board (Raspberry Pi), connected to an HC-SR04 ultrasonic distance sensor that measures the distance to an object using ultrasonic sound waves, and voice feedback that alerts the owner of nearby objects with a speaker. Finally, a Raspberry Pi Camera for real-time object detection using a deep learning algorithm "YOLO" is integrated into our system The elements in the white cane are situated in the blind spots that cause accidents to the owner.

INTRODUCTION

- Out of 2.2billion people who have near or distant visual impairment according to the World Health Organization (WHO)[1], the Perkins School for the Blind states that 2% to 8% use walking stick because of accidents presented[2]
- We have implemented a system to help visually impaired people that is more reliable than using an outdated white cane.
- An ultrasonic sensor that detects an obstacle, and sends a signal to the Raspberry Pi microcontroller where it proceeds to give voice navigation statements through a speaker that alerts the owner.
- A camera programed for object detection connected to a Raspberry Pi, that used pre-trained models to detect objects in various environments[3].
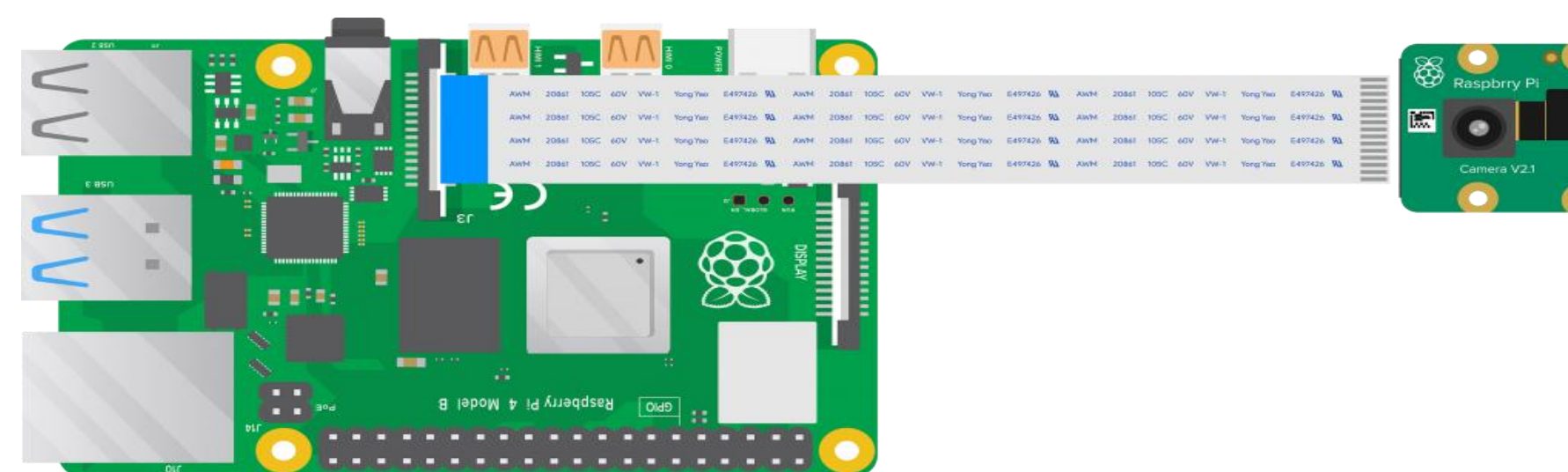
WHITE CANE CONFIGURATION

- A standard White Cane is used by blind people to be able to have independence. It's made of light weight aluminum sections held together by bungie cord.
- This version of the White Cane is used to let people know that the user is blind and alert the user of nearby objects.
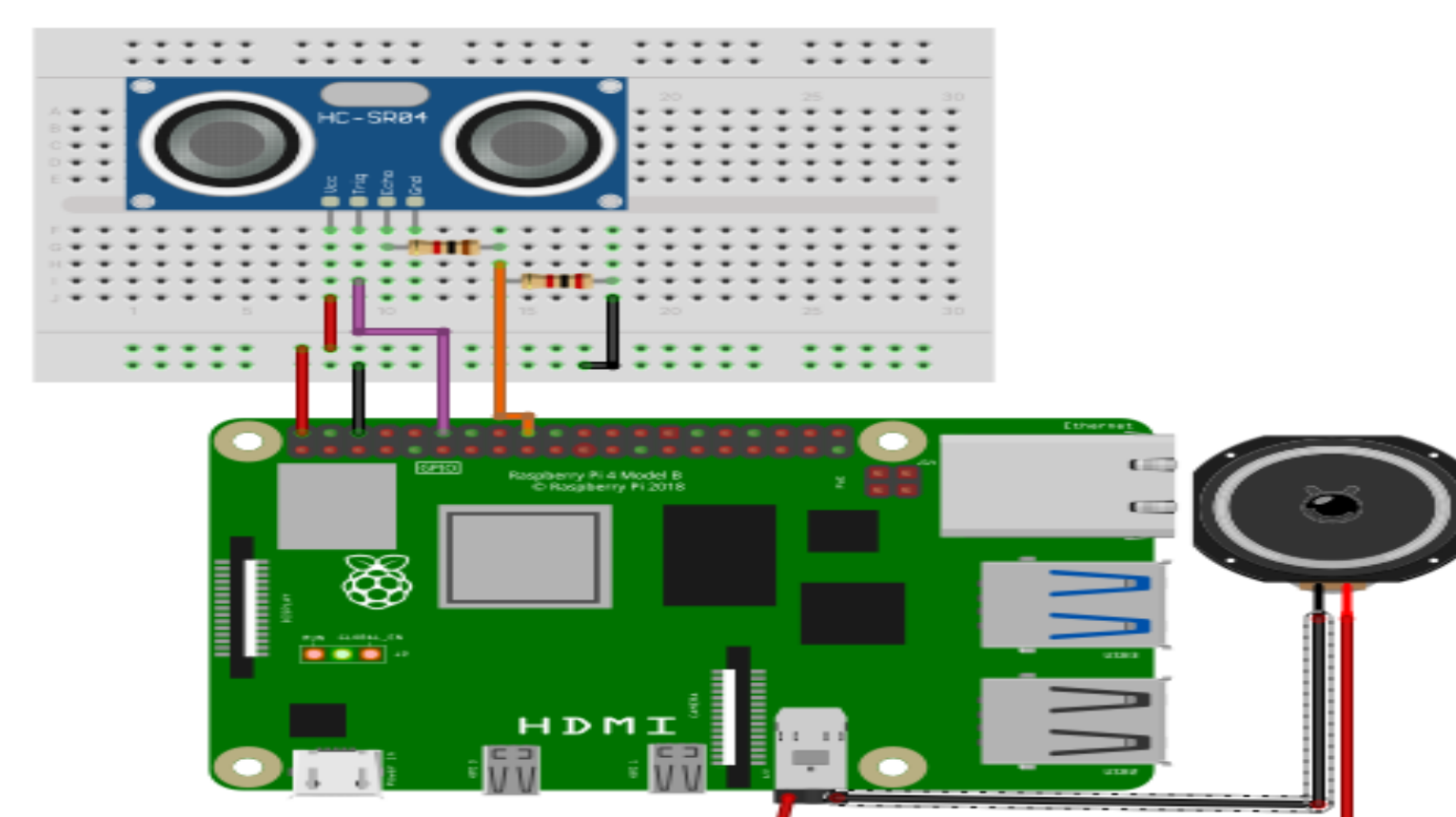

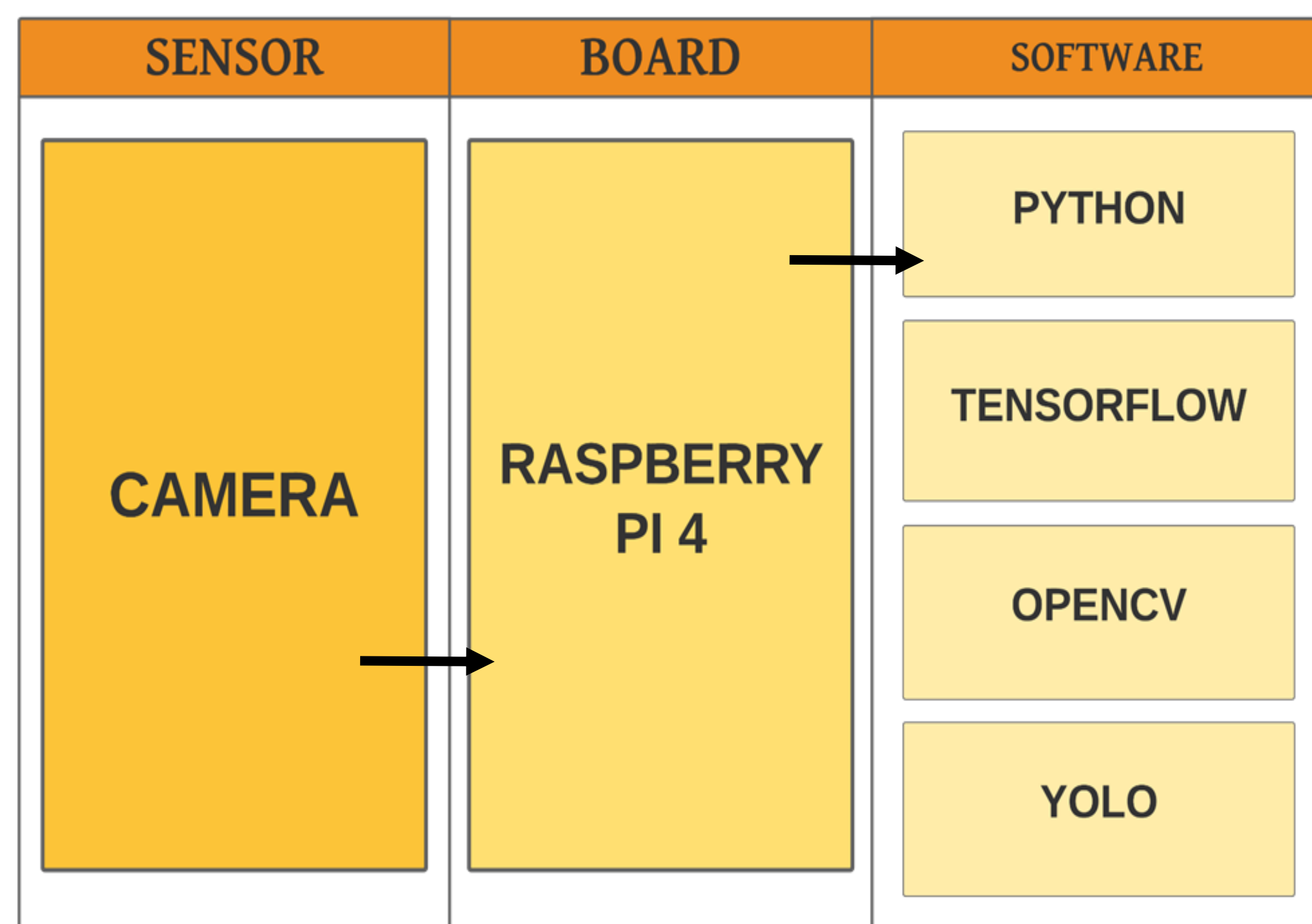❖ **Unfolded White Cane**

CIRCUIT SCHEMATICS

❖ **Object Detection Connection System**

❖ **Ultrasonic Sensor & Speaker Connection System**

FLOWCHART CAMERA

SENSOR	BOARD	SOFTWARE
CAMERA	RASPBERRY PI 4	PYTHON
		TENSORFLOW
		OPENCV
		YOLO

PROJECT RESULTS

This part shows the result of using the White Cane with an Object Detection. When the Camera sees an object the pixel values are obtained and can be manipulated or used for future purposes. These values were used for training, enabling YOLO to detect the object in real time.

CONCLUSION

- The Ultrasonic sensor detection and voice feedback system was connected to the Raspberry pi and worked giving a increase chance of avoiding obstacles.
- Object detection is stzill being calibrated in order to get more accurate results.
- A stabilizing rig may be necessary in order to implement camera to White Cane.

REFERENCES

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[3]TensorFlow-Lite-Object-Detection-on-Android-and-Raspberry-Pi/Raspberry_Pi_Guide.md at master EdjeElectronics/TensorFlow-Lite-Object-Detection-on-Android-and-Raspberry-Pi · GitHub