3rd Eye: A Smart EyeGlass for the Blind

Group 2

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Contents

Chapter 1

Introduction

People born with disabilities are unfortunate as they cannot live the life of a normal person. For example, a blind person needs the support of someone else to do something or to go somewhere so that he is not hurt by any obstacle. The objective of this project is to build a Smart Glass for the blind so that the blind person will be informed of any obstacle beforehand and he can save himself from being hurt and also he will not need the support of someone else. This project is important because Smart glasses available in the market are expensive which cannot be afforded by everyone. We tried to build a product which will be helpful for the blind and also affordable.

The **3rd Eye** will have an attached camera to the glasses and a button. When the button is clicked, the camera will take a picture of the surrounding in front of the person. The glasses will then perform object detection on the picture and inform the person the names of the objects in the picture through a headphone attached to the glasses.We approached this project through several steps. First we conducted research on the project, searched for previous related works. Then we collected the hardware components required. Then we started coding and building up the glasses.

This report talks about our planning, process and the end result of our project. It also discusses the challenges faced by us during the working of the project like budget challenges, time limitation etc.

Chapter 2

Related Works

Our work is influenced by SIGHT on the website **hackster.io**. [1].

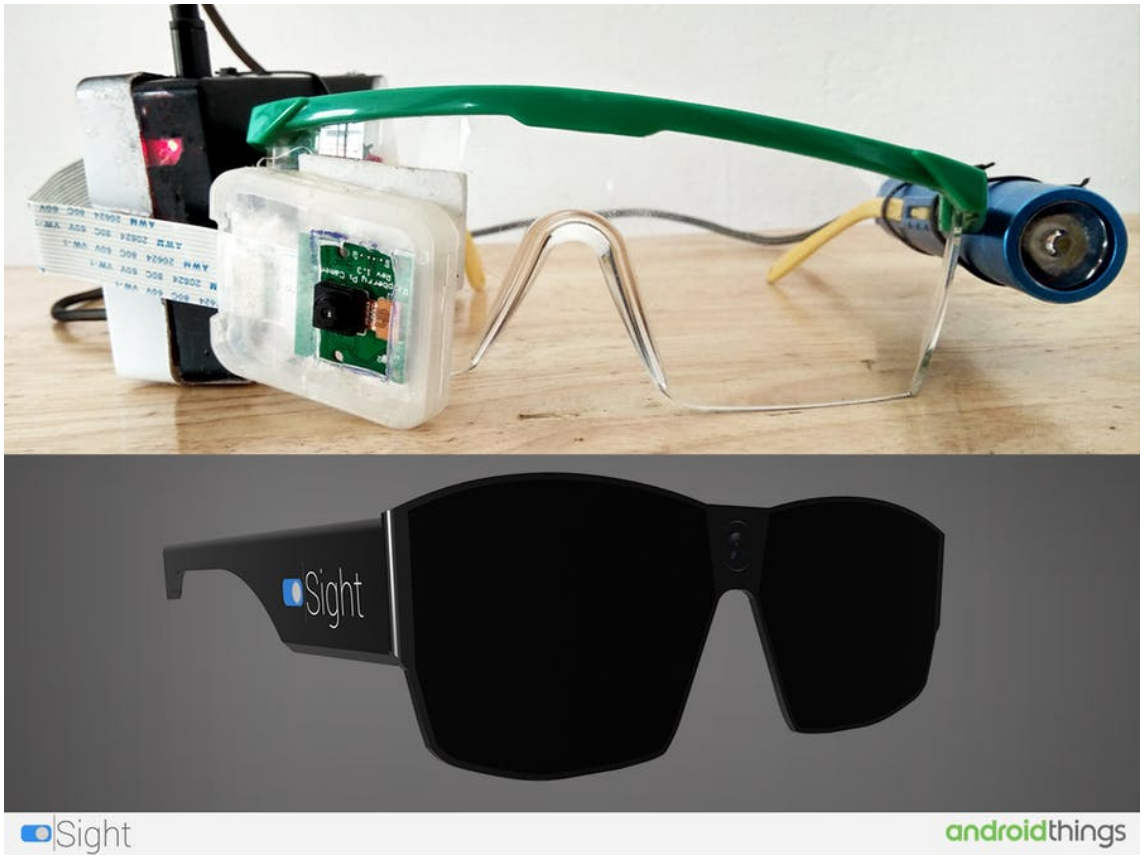

Figure 2.1: Sight: For the Blind

The SIGHT: for the blind is a smart glass for the blind built on TensorFlow and Android Things. But there are some limitations to the SIGHT. The glasses will not work with old Raspberry Pi Versions, like Raspberry Pi Zero, as Google Android Things is not supported by the old Raspberry Pi microprocessors.

Figure 2.2: OrCam MyEye Pro

There are smart glasses available in the market. **OrCam MyEye Pro**. [2]-The Most Advanced Wearable Device for the blind and visually impaired, which can be attached to a eyeglass featuring Smart Reading, Face Recognition, Color and Product Identification is a smart glass available in Amazon.com which costs around $4000.

Chapter 3

Solutions & Methods

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3.1 System Overview

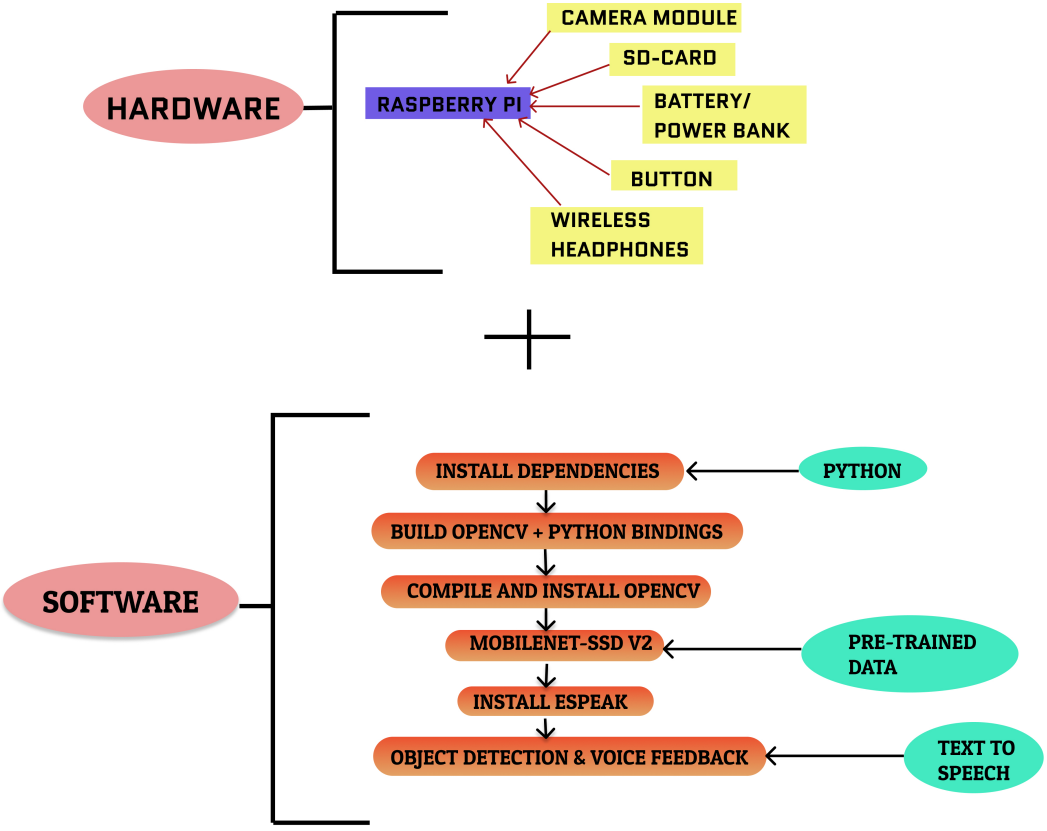

Figure 3.1: Architecture

3.1.1 Hardware Components

The 3rd Eye consists of a Raspberry Pi, Camera Module, SD card, Battery, a push button and a wireless headphone.

1. **Raspberry PI 3**

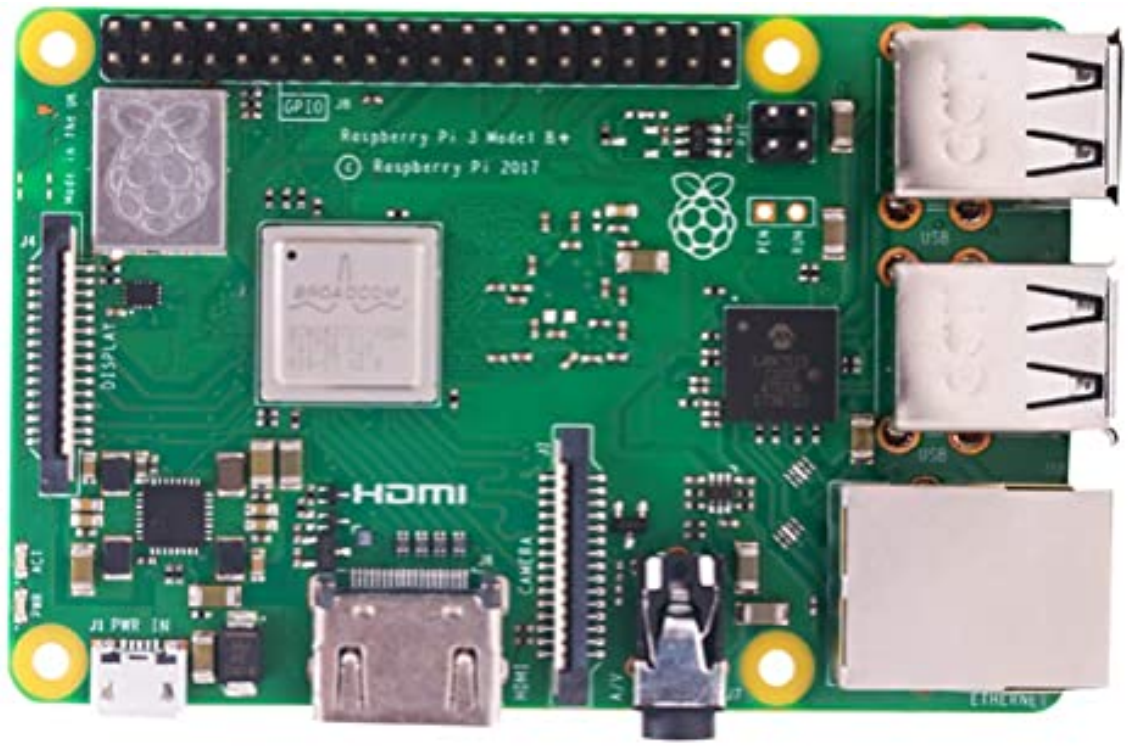

Figure 3.2: Raspberry Pi 3

Raspberry PI 3 is the processor of our system. It is an ARM based credit card sized SBC(Single Board Computer) created by Raspberry Pi Foundation. Raspberry Pi runs Debian based GNU/Linux operating system Raspbian and ports of many other OSes exist for this SBC.

2. **Camera Module**

The Pi camera module is a portable light weight camera that supports Raspberry Pi. It communicates with Pi using the MIPI camera serial interface protocol. All current models of Raspberry Pi have a port for connecting the Camera Module. The camera module is attached to our glasses to take pictures for image detection.

3. **SD Card**

The SD card is a key part of the Raspberry Pi; it provides the initial storage for the Operating System and files. Storage can be extended through many types of USB connected peripherals.

4. **Battery/Power Bank**

To power up the Raspberry pi, we use a power bank and connect it via a USB port. We can also use batteries.

Figure 3.3: Camera Module

5. **Wireless Headphone**

   A wireless headphone is attache through which the person will be able to hear the names of the detected objects.

6. **Push Button**

   The push button acts as a trigger for the camera to click a picture. When the push button is pressed first, it starts the camera module and pressed once more, the camera takes a picture.

3.1.2 Implementation Methods

1. **Python 3**

   The Programming Language we have used is Python 3.

Figure 3.4: Push Button

Python is an interpreted, high-level, general-purpose programming language. Its language constructs and object-oriented approach aim to help programmers write clear, logical code for small and large-scale projects.

2. **OpenCV**

   We used the OpenCV(Open source computer vision) with Python to build our project.

   OpenCV is a library of programming functions mainly aimed at real-time computer vision. The library is cross-platform and free for use under the open-source BSD license. OpenCV supports some models from deep learning frameworks like TensorFlow, Torch, PyTorch.

3. **Dataset**

   We used the pre-trained dataset called **Mobilenet SSD V2** using which we have trained our own dataset for object detection.

3.1.3 Final Product

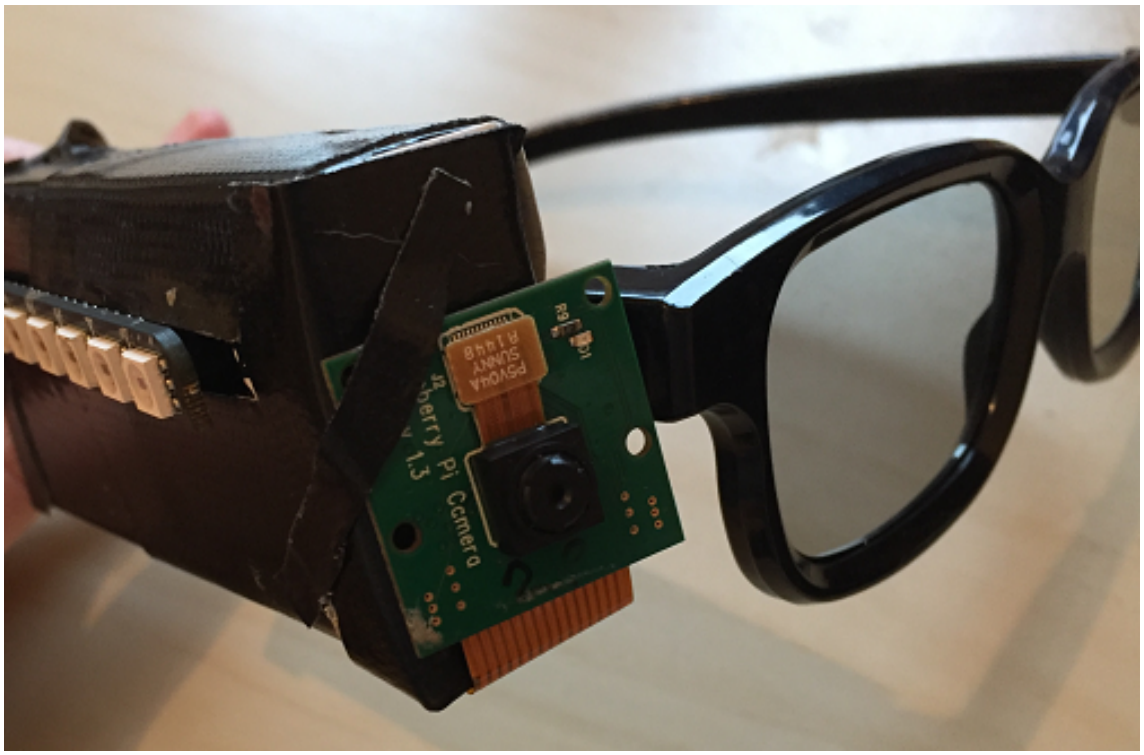

Figure 3.5: 3rd Eye: Smart Glass for the blind

Chapter 4

Limitations & Challenges

4.1 Budget

Price List		
Item	Quantity	Price
Raspberry Pi 3 Model B	1	Tk. 4,500
Transcend 32GB MicroSD Card	1	Tk 400
Raspberry Pi Camera Module V2 - 8	1	Tk 1,200
HDMI Cable	1	Tk 200
Push Button, Wires	3, 1 Set	Tk 100
OTG Cable	1	Tk 200

4.2 TimeLine

Project Timeline			
SL	Date	Task(s)	Responsible Person(s)
1	Week 1	Push Button Coding	Marjan
2	Week 2	Object Detection Coding	Marjan
3	Week 3	Object Detection Coding	Marjan
4	Week 4	Multiple object detection	Marjan
5	Week 5	Image Detection from the video	Keya
6	Week 6	Tried to implement detection from video in Raspberry Pi	Keya,Marjan
7	Week 7	Solved object detection error	Marjan
8	Week 8	Image to Speech Coding	Marjan
8	Week 8	Final report Writing	Keya

4.3 Overheads

We had to face many challenges during the working of the project. Our Raspberry Pi 3 was damaged, so we had to buy another one. Also, due to the Covid-19 Pandemic, group members could not gather together and work on the project. But we tried to communicate virtually and tried finishing the project on time.

Chapter 5

Conclusion

The 3rd Eye Smart Glass is an user-friendly glass for the disabled, especially the blind. When a person pushes the button, the camera attached to the glasses takes image and detects objects from the image and the person wearing it will be able to hear the name of the object through the wireless headphone. We worked hard and tried making the project a successful one. In the future, we will try integrating facial recognition feature to the glasses so that the glasses will be able to detect faces of persons and tell the name of the person, if known.

Bibliography

[1] hackster.io. Sight: for the blind.

[2] amazon.com. Orcam myeye pro.