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Product Identification System for Visually Impaired Person in Supermarkets

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Abstract: Now in this living era where everything, every process in each sector is being automated. Automation frees human workers to handle the imaginative side of things, leading to better product variety. Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects (things) through the Internet. The system focuses on building a gadget that makes use of the barcode, the user scans for the barcode and the product is predicted and converted from text to speech using raspberry pi. The alert is sent as soon as the barcode is scanned. If the details of the product are obtained after scanning, then it is outputted through microphone. Otherwise, if only the product ID is obtained, the information is obtained through web scraping.

Keywords: Internet of Things, Barcode, Raspberry pi, Microphone.

I. INTRODUCTION

There exist over 285 million visually impaired people worldwide, of which 39 million are completely blind, and around 246 million have low vision, according to the WHO. For them, a major part of their daily responsibilities is a challenge, including independent grocery shopping. Service delays because of rush hour or other myriads of reasons (be human inefficiency or technological inefficiencies) making their shopping experience uneasy. Visually Impaired (VI) who lives alone faces problems in knowing the contents of packaged products, at home and also at stores. For a visually impaired person, shopping itself is a monumental task. They also face social scrutiny from the masses that may not understand their plights and consider them an inconvenience. This may lead to a negative impact on a visually impaired person.

II. IMPORTANCE OF PRODUCT RECOGNITION

An effective product identification allows improved efficiency which means the right product reaches the right consumer at the right time. By using barcode on the products uniquely, they become easily differentiable, increasing the product recognisability. Every product must have a distinct identity to avoid counterfeit, and product identification allows achieving this goal. In short, it provides a means of identifying individuals or a lot of products resulting product identification and traceability

III. OBJECTIVES

The main objective of the project is to ease the shopping experience of the visually impaired people by providing a device that helps them to shop things easily and independently.

- To develop an efficient product recognition system to assist blind by scanning technique.
- To identify the product in the supermarkets by scanning barcode.
- To trigger a confirmation sound for detection of barcode.
- To fetch the selected product details either through information present in the barcode or through web scraping.
- To send speech updates of the recognized through connected microphones

IV. METHODOLOGY

Barcodes are graphical representation of the product that are used to store information regarding the product such as MRP, type of the product, name of the product, name of the company, quantity etc. this information is then used by the retailers to manage and track inventory, update stock, apply discounts etc. There are various types of barcodes for example UPC-A, UPC-E, Code 128, EAN-13, EAN-8, code 39 etc. Out of this UPC and EAN are most used barcode scanners.

Product Identification System where the user scans for the barcode which is present on the product rotates the product if necessary. The product identification system comprises of the following components- Raspberry Pi, Functional Pi Camera, Bluetooth Speakers or Earphones, LCD display. Barcodes are printed on products that are useful to store information that can be later used in identifying product. They are used in retail stores and in warehouses to keep track of

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inventory, and on invoices to assist in keeping status and details track. Most products carry a simple barcode known as the UPC (Universal Product Code)—a line of vertical stripes with a set of numbers printed underneath it. It is called a 2D (two-dimensional) barcode. A barcode is used to encode information in a visual pattern readable by a machine. Camera-based barcode scanners perform complex operations when reading a barcode. After acquiring an image, a digital camera sends it to the software. Here, a program pre-processes the image to prepare it for a further analysis. This stage usually includes converting to greyscale and applying various filters to reduce image noise and enhance barcode edges. After that, in most cases, binarization is performed, which means that only black and white pixels remain in the image. The decoding process consists of two major steps: the barcodes location and decoding as such. During the first step, software recognizes and extracts the barcode part from the complex image acquired by the camera. It means that, on the one hand, image analysis-based scanners do not need prior knowledge of barcode location; and on the other hand, they can locate multiple barcodes at once.

If the barcode is obtained on the product, then a beep sound is obtained indicating the presence of barcode. If the barcode is not detected, again the user scans for barcode. Later, the barcode is obtained and processed for further analysis. If all the product details are obtained on the barcode, the product details are fetched. If only the product ID is obtained, then the information about the product is obtained through the process of web scraping.

V. DESIGN OF PRODUCT IDENTIFICATION SYSTEM

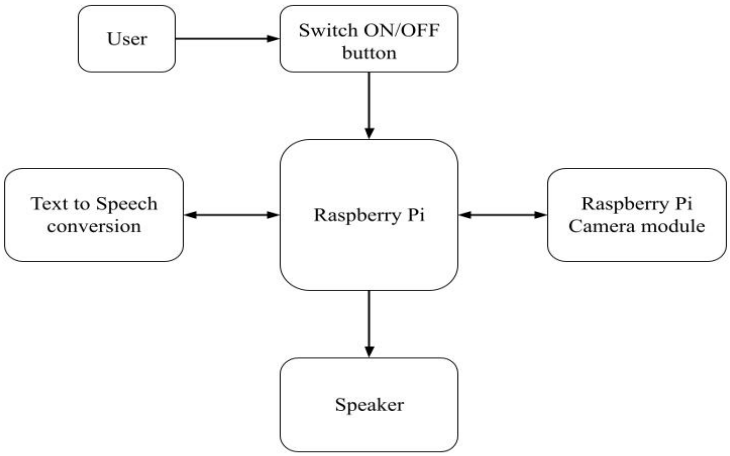

Fig I. Product Identification System Design

The Fig I. shows the working model of the system, the user switches ON the system where it is connected to the raspberry pi. Camera Module is connected to the raspberry pi which is used to scan the barcode present on the product. The fetched information is then converted from text to speech in the raspberry pi then the speaker connected will output the result in the form of speech.

In Fig II. Shows flow diagram, Product Recognition works on a principle where the user scans for the barcode, which is present on the product, rotates the product if necessary. Most products carry a simple barcode known as the UPC (Universal Product Code)—a line of vertical stripes with a set of numbers printed underneath it. It's called a 2D (two-dimensional) barcode. If the barcode is obtained on the product, then a beep sound is obtained indicating the presence of barcode. If the barcode is not detected, again the user scans for barcode. Later, the barcode is obtained and processed for further analysis. If all the product details are obtained on the barcode, the product details are fetched. If only the product ID is obtained, then the information about the product is obtained through the process of web scraping.

Python is the most popular language for web scraping as it can handle most of the processes easily. Scrapy is a very popular open-source web crawling framework that is written in Python. It is ideal for web scraping as well as extracting data using APIs. Beautiful soup is a Python library that is used here which is highly suitable for Web Scraping. It creates a parse tree that can be used to extract data from HTML on a website. Web Scraping is used to scrap the product data such as brand name, product name, price, and net weight for their products. Then the information scraped is converted from text to speech and passed through speakers/headphones to the user.

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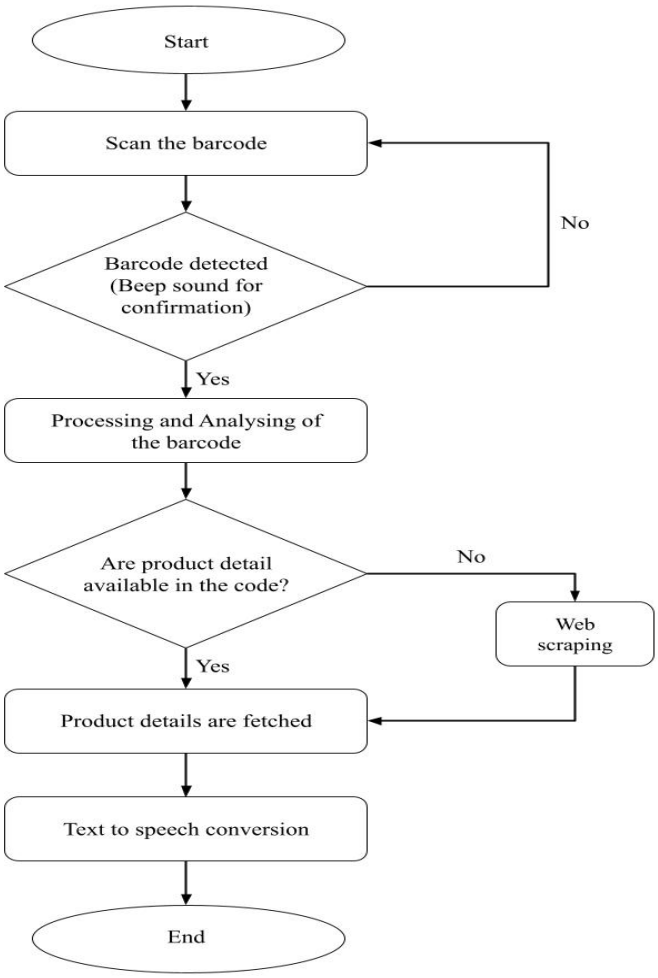

Fig II. Flow Diagram Product Recognition Using Barcodes

VI. RESULTS

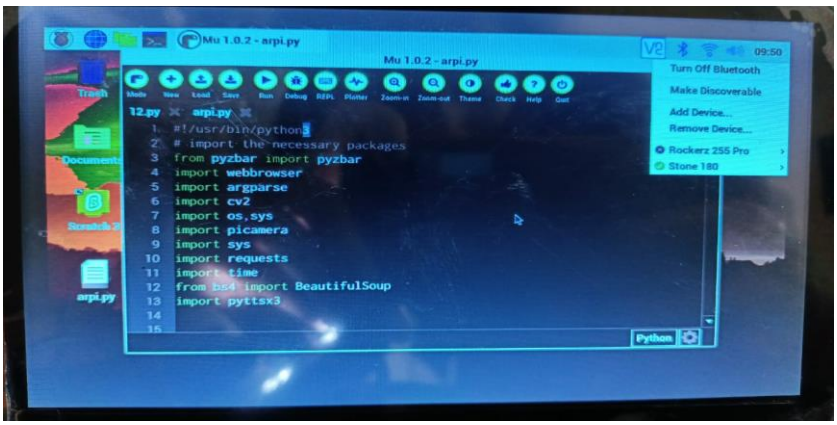

Fig III. Bluetooth connection to the raspberry pi interface

The Fig III. shows the various Bluetooth connections available. To connect to the network, connect to the desired network available.

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Fig IV. Scanning barcode on the product through webcam

Fig IV. shows the scanning of barcode available on the product through the webcam which is connected to the raspberry pi

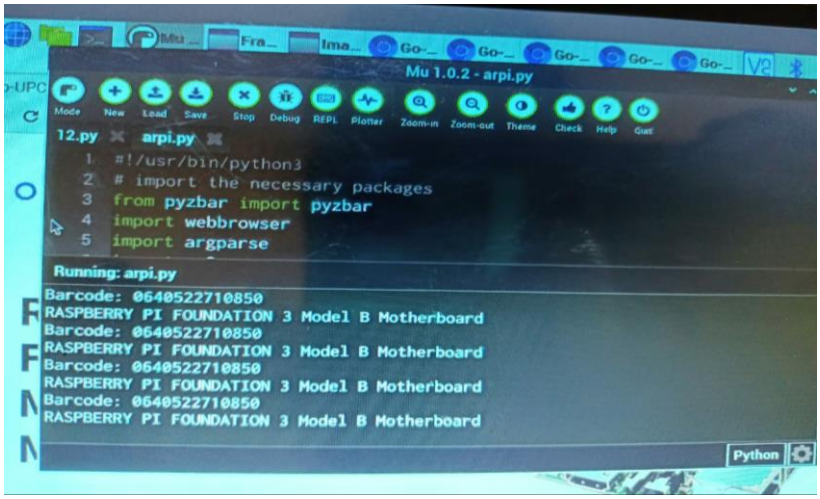

Fig V. Output shown in the terminal

Fig V. shows the ID and product name that is fetched through web scrapping

VII. CONCLUSION

The work provides product detection system that help the blind people to recognize the product in retail shops. It also expresses product recognition by scanning the barcode with the help of Raspberry Pi camera module and gets the information of the product. Using the text to speech conversion method the blind will get to know about the product details. The system is fast, efficient, and inexpensive way of scanning large numbers of barcodes and reading out the information of corresponding products.

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