



IOT BASED DATA RETRIEVAL FOR VISUALLY IMPAIRED USING RASPBERRY

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ABSTRACT

In today's society we obtain a great deal of information and entertainment using computers and internet. But visually impaired people struggle much more to access comparable information in their day to day life. In the Early days NGO's provided Braille books and audio books for their educational. The audio book converts the text in to audio form which was helpful for blind people. But visually impaired people faced a problem for getting a book which they want. In this paper Raspberry pi is proposed to retrieve the information. The server contains all the information in the database and through pub nub the data will be transmitted from the server. Then the information will be stored in the SD card of the raspberry pi. Through microphone visually impaired people send the query as a voice. Using voice recognizers the voice will be recognize and a search for the relevant information will be done to retrieve the data. The retrieved data will send to the blind person as audio form through speaker. Through this process the visually impaired people can study the subjects and enjoy music, drama etc.

Keyword: raspberry, server, client, voice recognition.

1. INTRODUCTION

The IOT (Internet of Things) is considering as third wave information technology later than mobile communication and Internet. IOT is characterized by measure, through sense, intelligence and comprehensive interoperability. The IOT can effectively assist the service management, production materials and integration of digital and physical world [4]. In IOT technologies develop the most important application of IOT which covers public security, infrastructure construction, modern agriculture, intelligent industry, business service, environment protection and further fields [1]. Maintenance of Talking Book and Braille Library is the major service. Through two different sectors the service of Braille Library and Talking Book is composed. First the book transcribed in Braille, second the book transcribed in an audio cassettes as talking books. In analog world, information technologies and internet emergence are tangible. In digital world, audio cassettes and Braille books are intangible in Internet distribution. Geneva University established the objectives with Object Systems and vision to achieve electronic books. First analog and printed audio book was transferred to digital. In second, the system distribution implementation through internet requires the author rights and copyright protection for book. There are many advantages in transfer of audio books and Braille library to digital format. They allow simple way to provide books in Braille or audio format for visually impaired person through internet, reducing degradation and simplifying administration of books. Enhancement of library protection is the second advantage. Finally telecoms convergence and development access technology will able to improve audio books access with their usability. (i.e. retrieval systems, navigation among parts etc). At present in same location all books are placed in case of hazard library will destruct. Transferred digital media backup copies are stored in different location. For visually impaired persons (ex DAISY) [2]

the book are transferred to digital format and the library is ready to give electronics audio books conformance with rising international standards. The large numbers of Braille books are already transferred in electronic format were the first phase was installation of digitalization for transfer of tapes and audio cassettes to digital formats with creation of WWW site [3]. A second phase system implementation provides basic electronic service and also permits distribution of digital books via Internet. Third phase is digital record studio implementation and DAISY books production. In this paper Voice recognition equipment is proposed to understand, identify and converting the voice into commands or text [5].

2. EXISTING METHODOLOGY

For blind people Sylvain Cardin presented a system of obstacle detection. While traveling user alert closed obstacles in their environments [6]. We propose stereoscopic sonar to detect nearest obstacle and sends vibro-tactile response to inform about user localization. Przemyslaw Baranski [7] explained a concept and remote guidance systems information for blind people. The system consists of two parts mobile terminal and remote operator terminal. Digital camera, headset and GPS receiver are the small electronic devices which come under mobile terminals. Two terminals are connected wirelessly via internet and GSM. The video is transmitted by link from GPS data, blind traveler and gives duplex audio between terminals. Koren Ward and Simon Meers [8] presented novel based human computer interfaces that permit computer display without any help of eyes. Our system track head position of user and orientation. Through haptic feedback it indicate the object gaze location to user by fingers and Braille text or synthetic speech.



3. OVERALL ARCHITECTURE

In our proposed methodology all the information is stored in the server database. Through pub nub the data explicitly is delivered to the client. Pub nub act as both receiver and transmitter. After data transmission the client send an acknowledgment to the server. After receiving the data from the server it will store in the memory card of the raspberry pi. A USB Microphone is connected to the raspberry pi which would help the visually impaired people to give voice command. The voice command will be processed in the voice reorganization. Then the voice command is converted in the form of text and searches related content in the raspberry pi. The related data is retrieved in the form of text and then the retrieved data is send to the client in the form of audio through speaker.

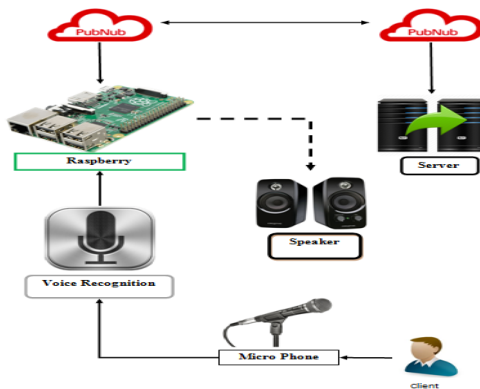


Figure-1. Audio based data retrieval Raspberry system overview.

4. PROPOSED TECHNIQUES

4.1 Server

The server is used to share the resources to one or more client. In server side all the data is stored in the database. To transfer data the server must have internet connection to the system. Pub nub plays a vital role in client - server communication. After information retrieval the client sent the acknowledgment to the server.

4.2 Client

In client side, the visually impaired people send queries as a voice to search. If the voice doesn't recognize properly then client send requirement message to server to send again. Then the voice is processed and retrieves information to client. After retrieving the information from server the client sends acknowledge to server.

4.3 Pub Nub

Pub Nub is a protected DSN (Data Stream Network) and it uses API easily that enables customers to scale, control real time functionality and build for application and IOT devices. Pub nub has a unique infrastructure and it easily operate the IOT device and real time application. Pub nub is more efficient in data transmission.

4.4 Voice recognition

Voice recognition is considered as alternative keyboard. The visually impaired people give the query as a voice to a device to search. Then the voice will be processed in the voice recognition. It is more useful for the people who have physical disabilities and feeling difficult to type. Voice-recognition helps in spelling difficulties and dyslexia people.

4.5 Voice processing

Using microphone the client call the particular variable which He / She want to hear. The client searches the variable in the form of voice. That voice input is processed in the voice recognizer. Then the voice is converted in to text and searches the content in the raspberry pi. Then it retrieves the content in the form of text. Then the text message executes as to the client as an audio through speaker.

4.6 Raspberrypi speech synthesizer

Raspberry pi contain the SD card to store the information. The information is stored in the raspberry pi from the server. Distance measurement unit generates a text which is stored in the folder. Speech maker spell a text from that folder and produce output as a voice signal. Through speaker the blind people can hear the output. Raspberry pi can implement the both hardware and software. Based on humans clarity voice the speech synthesizer works efficiently with quality. Install text to speech festival software in raspberry pi so that visual impaired people and those who have reading and writing disability can hear the voice with the help of raspberry pi. Festival software synthesis multilingual speech on the multiple-platforms offering text to speech with different APIs environment for research and development.



Figure-2. Raspberry PI.

4.7 Working operation

The server contains all the information in the server database. Through pub nub the data is delivered to the client from the server. The collected information is store in the raspberry pi. The client gives the voice command using microphone. If the voice command can't get properly the client need to give voice command again. That voice command will be processed in the voice reorganization. The voice command is converted in the form of text and then searches the related content in the raspberry pi and retrieves the information in the form of



text. The text content is delivered to the client in the form of audio.

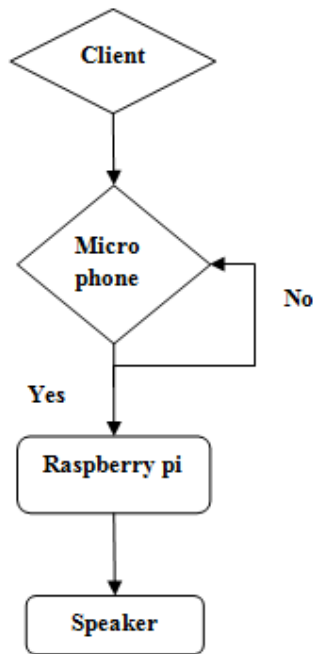


Figure-3.

5. HARDWARE COMPONENTS DESCRIPTION

5.1 Raspberry PI board

Raspberry Pi is a single board with credit card size developed by raspberry Foundation in UK. Raspberry Pi constructed with Broadcom BCM2835, 700MHz of ARM11 process which include 250 MHz clock frequency. 512 MB Memory B-model divided in to graphics card.

5.2 BCM2835

BCM2835 is cost optimized, multimedia processor for embedded applications and mobile, full HD. It requires highest multimedia performance, optimized power efficiency. It uses Core IV Broadcom's Video to facilitate application in imaging, streaming media, media playback, graphics, camcorder and 3D gaming.



Figure-4. BCM2835.

5.3 ARM1176 JZF-S 700 MHZ Processor

ARM11 is ARM architecture family and it has 32-bit microprocessor RISC cores. ARM 11 include SD card.

5.4 USB Microphone

A microphone is an electric sensor or transducer that converts voice signal to electric signal. The Electromagnetic transducers convert acoustic signals to electrical signal.

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5.5 SD Card

SD (Secure Digital) card is portable device and it has non volatile memory format. The initial SD card family use 3.3 volt of electrical interface.

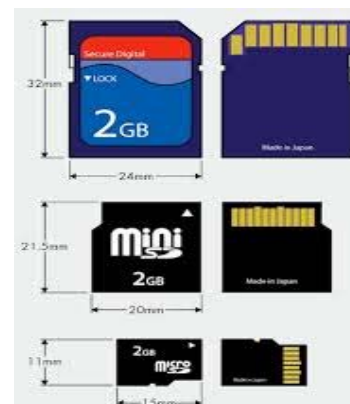


Figure-5. SD Card.



6. RESULTS AND DISCUSSIONS

Our proposed Approach is experimented in this paper by configuring the following requirements like Linux Operating System. ARM1176 Raspberry Pi Board,

BCM2835, USB Microphone, SD Card are required to implement this paper.

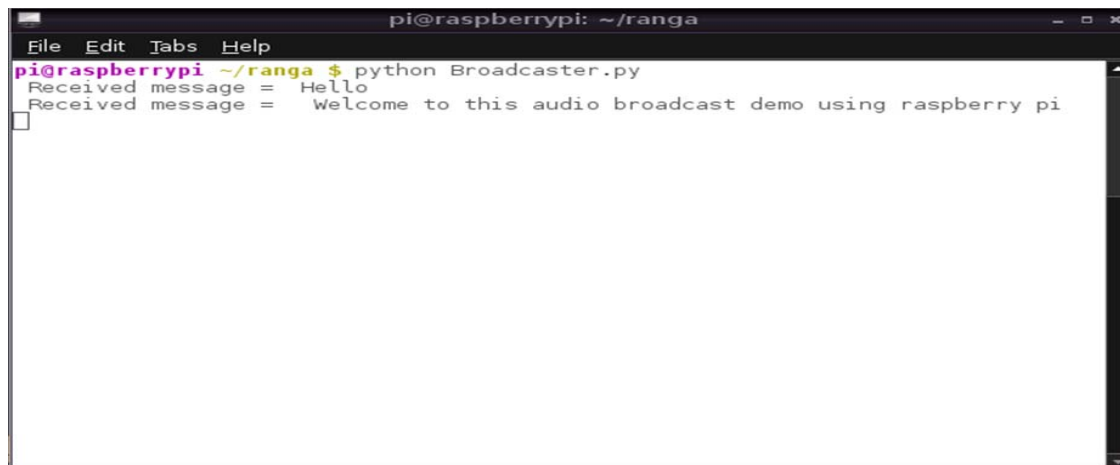
6.1 Server side connections



```
Terminal
ranga@Ranga-Lenovo-G50-30 ~/audio $ sudo python Requester.py
sending message: Hello
sending message: Welcome to this audio broadcast demo using raspberry pi
sending message: This is a message broadcasted using raspberry pi in realtime
```

Figure-6. Presents server side connections. The server connecting to a client in order to transfers data to client.

6.2 Client side connections



```
pi@raspberrypi: ~/ranga
File Edit Tabs Help
pi@raspberrypi ~/ranga $ python Broadcaster.py
Received message = Hello
Received message = Welcome to this audio broadcast demo using raspberry pi
```

Figure-7. Presents the client side connections. The client receives the server connection in order to receive a message.



6.3 Data transfer in server side

```

Terminal
ranga@Ranga-Lenovo-G50-30 ~ $ cd audio/
ranga@Ranga-Lenovo-G50-30 ~/audio $ sudo python Requester.py
[sudo] password for ranga:
sending message: Hello
sending message: Welcome to this audio broadcast demo using raspberry pi
sending message: This is a message broadcasted using raspberry pi in realtime
sending message: This message is being transmitted as text via PubNub
sending message: And raspberry pi is receiving and converting it to speech
sending message: Thanks for paying attention
sending message: Goodbye and have a good day

```

Figure-8. The data transfer in server side. The server send message to client and that message will reach to client in the audio form.

6.4 Data transfer in client side

```

pi@raspberrypi: ~/ranga
File Edit Tabs Help
pi@raspberrypi ~/ranga $ python Broadcaster.py
Received message = Hello
Received message = Welcome to this audio broadcast demo using raspberry pi
Received message = This is a message broadcasted using raspberry pi in realtime
Received message = This message is being transmitted as text via PubNub
Received message = And raspberry pi is receiving and converting it to speech
Received message = Thanks for paying attention
Received message = Goodbye and have a good day

```

Figure-9. Data transmission in client side. The client receives a message from the server.

6.5 Voice recognition

6.5.1 Voice recognition information

```

pi@raspberrypi: ~
File Edit Tabs Help
hones
INFO: dict2pid.c(131): Allocated 30200 bytes (29 KiB) for word-final triphones
INFO: dict2pid.c(195): Allocated 30200 bytes (29 KiB) for single-phone word trip
hones
INFO: ngram_model_arpa.c(477): ngrams 1=5, 2=6, 3=3
INFO: ngram_model_arpa.c(135): Reading unigrams
INFO: ngram_model_arpa.c(516): 5 = #unigrams created
INFO: ngram_model_arpa.c(195): Reading bigrams
INFO: ngram_model_arpa.c(533): 6 = #bigrams created
INFO: ngram_model_arpa.c(534): 3 = #prob2 entries
INFO: ngram_model_arpa.c(542): 3 = #bo_wt2 entries
INFO: ngram_model_arpa.c(292): Reading trigrams
INFO: ngram_model_arpa.c(555): 3 = #trigrams created
INFO: ngram_model_arpa.c(556): 2 = #prob3 entries
INFO: ngram_search_fwdtree.c(99): 4 unique initial diphones
INFO: ngram_search_fwdtree.c(147): 0 root, 0 non-root channels, 12 single-phone
words
INFO: ngram_search_fwdtree.c(186): Creating search tree
INFO: ngram_search_fwdtree.c(191): before: 0 root, 0 non-root channels, 12 singl
e-phone words
INFO: ngram_search_fwdtree.c(326): after: max nonroot chan increased to 132
INFO: ngram_search_fwdtree.c(338): after: 4 root, 4 non-root channels, 11 single
-phone words

```

Figure-10. Shows voice recognition information while the user giving variable to search.



6.5.2 Data storage

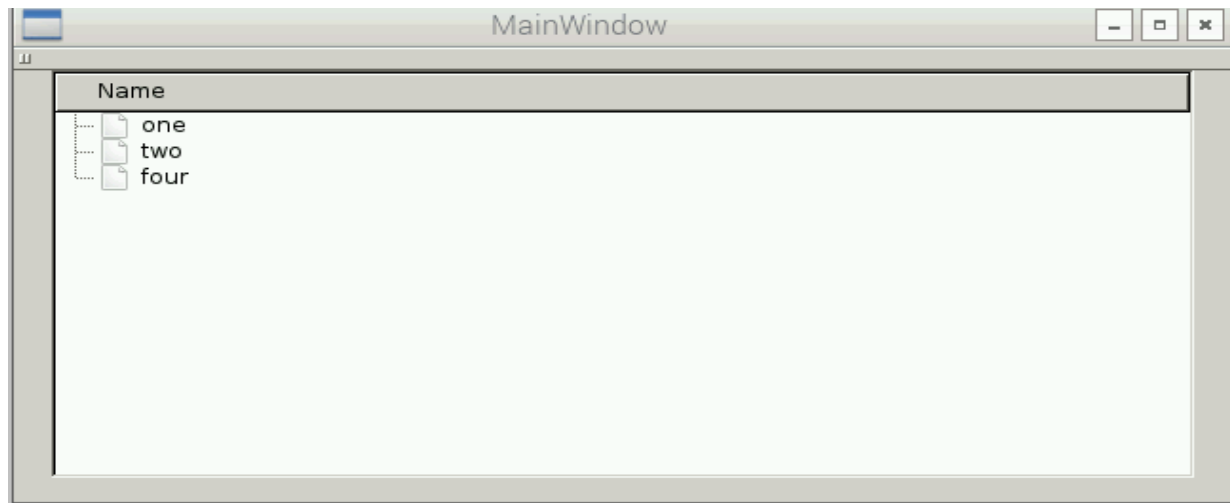


Figure-11. Data storage. The data are stored in the server. The client can access data through audio based data retrieval raspberry system.

6.5.3 Data access

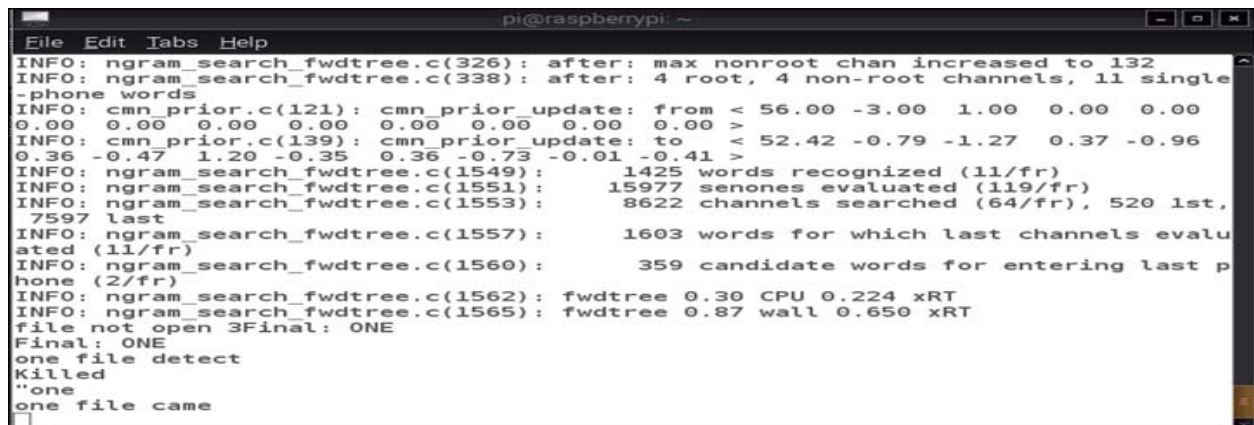


Figure-12. Shows access. Client gives the variable through voice recognizer. Through raspberry system the data will retrieve.

7. CONCLUSIONS

This paper proposed data retrieval using raspberry pi system for visually impaired people. Using microphone the blind person give the voice command that will be processed in the voice recognition. After recognition of voice it searches the relevant content in the raspberry pi. In raspberry pi all the information are stored from the server. After data retrieval the information send to the blind person in the form of audio. The future enhancement of this paper is visually impaired people can access the online pages. Using Embedded Linux the future enhancement can be done.

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