Design and implementation smart multi language sound guide using raspberry pi and RFID system

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Abstract
A conventional phonetic expression into the museums, exhibits, and spectacular places, is hard to ensure the quality demands of the visitors, on account of the languages difference and the large numbers of visitors. Hence, it is essential to develop a Multilanguage sound system, which can answer the different demands of various language users for the same exhibition. The system included RFID technology and a raspberry pi device. The system can define the language of the expression according to the demands of visitors, and then it could provide visitors extensive information about the exhibition in a clear, noise-free sound, as Clear and understandable. This will reduce the workforce and increases performance, but it also can completely ensure the quality of the expression.

Keywords — Raspberry pi ; RFID.

INTRODUCTION
Conventional phonetic expression works of the museums, exhibits, and spectacular places are presented via guides. Some content of remarks is spoken frequently via guides, and the majority can only speak into a particular language. It’s a tiresome and poor quality job. Hence, it is important to design a multi-language system for museums, exhibits, and spectacular places. The system provides the information need around the exhibitions in different languages of the visitors whose comes from every aloft the world, moreover, it could decrease the workforce and increases performance in the condition of the expressions quality been completely warranted. That’s an incorporated technology of RFID (radio frequency identification) and raspberry pi device, which consolidated with the characteristic of intellectualization, multi-language, excellent sound quality, and Practical application. Despite the time sequence that the visitors reached and the specific language they required, users could identify a certain sort of expression language through the keypad and provides complete notice for each particular item. It also provides a clear, noise-free sound.
LITERATURE SURVEY

A RFID & Handheld Device-Based Museum Guide System (2)

Yafang Wang and Chenglei Yang et al introduced an audiovisual system identical to multimedia applications, as this system uses motion RFID technology to identify the unique number of exhibits and depends on how portable devices work. So that it is easy for visitors to either roam according to their desire and know the information to be reached or stand in a comfortable place and search for what you want to know. Despite all the functions performed by this system, it suffers from some restrictions and has not been resolved, for example, a long period for response and inefficiency in dealing with the system.

SoundSpot: A Next-generation Audio-guide System for museums (3)

Fusako Kusunoki and Ichiro Satoh et al designed a system that depends on the mechanism of its work on two basic concepts, namely a matrix of loudspeakers and RFID technology for locating, connected to the internet and this system is called soundspot, and it is considered an audio guide used by museums. Although the aim to create this system is to produce satisfactory comments and more clearly, it is It can be considered an entertainment system. This system gives every visitor to the museum to know its contents in a smooth and simple way.

Sensing and Classifying Indoor Environments: An IoT Based Portable Tour Guide System (4)

Md Sayedul Aman and Cuyler D. Quint et al designing a Portable tour-guide system and present dedicated audiovisual details According to the place of the Tourist, making the tourists autonomous of following any a guide. The heart of the module is an RPI 3 with Bluetooth also Wi-Fi. Locating is achieved using IBeacons, and Radio Frequency Identification technology is used to recognize certain things. The Thingworx program has been utilized for applying cloud servers while YouTube has been utilized to offer a visible response to the user.

Audio guidance system for blind (5)

Madhura Gharat and Rizwan Patanwala et al propose an RFID based system for autonomous Mobility in a building for partially sighted or blind persons. The transformation of speaking to text is executed to utilize speaking recognition software
units. This system is initiated by creating a sound command and identifies the place to become by the blind individual. This system will instruct the blind individual over the trail by providing audio Mobility help to reach the desired place. Blind individuals can Mobility autonomously and they can obtain information on the current place.

3. Problem identification

From the survey, we have examined that there are specific restrictions to the present technologies in Sound guides systems. Many difficulties are known in the above part. For example, one system requirements are the PDA that communicates with the evidence server via IEEE 802.11(also called by the trademark Wi-Fi). However, RFID technology was used to determine the location, The process of communication between these components requires an actual time, which causes a delay in the response time to the visitor's request, and thus the inefficiency in dealing with these systems. The use of four linear matrices of speakers and each matrix consisting of 256 speakers for the PC is outfitted including a 128-channel PCI that transforms from digital to analog, is costly and inefficient and most use it for children for educational issues.

Using YouTube and the Thingworx principles as a cloud server for the system, BlueTooth, Wi-Fi, and iBeacons for interpretation makes the system more complicated in terms of maintenance and information being displayed for theft or vandalism by unauthorized persons. Likewise, some systems use only one language and this causes a problem if the user speaks another language.

PROPOSED SYSTEM

The work flow chart of the proposed system is explained in figure(1). In our literature survey and looking at the flaws of sound guides, we suggested a multi-language sound system for tourists that are more reliable and effective in the roaming process. The audio system is implemented using RFID technology, so with this technology a Raspberry Pi device is used which is a small computer; the language required by the tourist is defined by the keyboard connected to Raspberry Pi Through a wired connection. This tag attached to objects must be within the range of the reader and each tag has its unique number. After nearing the reader, this tag will activate and send a unique number to the reader and then to the raspberry. Raspberry pi will process the received data, and then play the object's sound file via headphones. By working on our project, we aim to make the tourist walk around freely without the need for any tourist guide and listen to the information you want to know clearly and more thoroughly.
This proposed system is divided into two parts:

(A) RFID tags and reader module:

The proposed system depends on two main parts: - The reader who is active and tags of the passive high-frequency type, which means that these tags do not have internal energy to activate them, but are active when they are within the range of the reader. The range of these tags ranges from 10 cm to 1 m and their frequency is 13.56MHz. The tags will be placed on the objects to be recognized and the reader will be connected to a wired connection to the Raspberry Pi. Once the language is identified through the keypad, at the same time the tag should be near the reader in this state users to the system will hear sound through the headphone about the object to be known.

(B) Determine the required language and sound output

Determining a language plays a main role here. Pressing any button on the keypad is considered a required interface for system inputs. The keypad communicates with the raspberry Wired through a cable jumper. After this stage, we must connect the keypad with the raspberry programmatically by writing a program code (sudo pip3 install pad4pi) in the terminal installed in the Raspberry Pi. Because the keypad is used provided that there is a read operation of the tag by the reader. The keypad consists of
an array of numbers starting from the number (0) and ending with the number (9) and each number represents a specific language and any one of them is chosen according to the user’s desire, for example, the button that holds number (1) was chosen in this case after the tag scanning process, a voice will be generated through the speaker and it will be very clear, and Sound settings must also be made by using the terminal for the sound to be on 3.5mm jack and during this process, data processing is taking place, that the tag’s ID must match the audio programmed for it previously in the database. When the scanning process is for more than one TAG, it will read the one closest and put the second TAG in hibernation for a period that must be specified so that it is in the same period as the previous TAG.

**BLOCK DIAGRAM**

Figure 2 shows the general scheme of the multilingual sound guide system. The scheme consists of the following main parts: The first part is raspberry pi3 model B+ and it is considered the main control board used for this project and all other components related to it. The RFID reader and keypad are connected to the raspberry device via GPIO pins. The part is the RFID system, which consists of two main parts: a passive tag with a high frequency (HF) and a reader, that is used to read the ID of the object to be known and sends a signal to the Raspberry Pi, which connects to the headphones to output the sound via USB. The operating system in Raspberry pi is Raspbian lite OS. The programming language used to program the system is Python IDLE. It will run at energy of 10,000 milliamp-hours and it will work well. It may be up to eight hours if it is fully charged.

![Fig2. Block diagram of proposed system](image-url)
5- Proposed system components

Raspberry pi 3 model B +:
A small computer (similar to a credit card) that has full features and works with the
approved operating system Linux. It contains ports that are necessary to connect to the
peripheral devices. The audio jack is provided by the Raspberry Pi and there is also an
Ethernet jack used for Internet connection. (6)

Specifications:
• Processor: BCM2835 ARMv6
• CPU frequency= 700 MHz
• RAM= 512 MB SDRAM
• Storage= MicroSD
• GPIO= 40 pin
• USB 2.0=4

Keypad:
It is of type 4 x 3, in this case the number of buttons is 12. (7)

Speaker:
It works to output sound in the form of sound waves. (8)

RFID Reader:
The principal goal of an RFID reader is to send and accept signals, transforming the
wireless waves of the tags in a readable form for computers. The RFID-RC522 has been
used in our project and has certain characteristics: (9)

• Frequency ( 13.56MHz)
• Distance( ≥50mm/1.95)
• Size(40mm×60mm/1.57*2.34)
• Data transfer rate( maximum 10Mbit/s)

Python 3:  Programming language utilized in the proposed system.

Raspbian lite:  This is the operating system utilized in this proposed system
for Raspberry Pi.

EXPERIMENT AND RESULT

According to the general structure of the designed system in figure 3, it contains RFID and Raspberry Pi. An experimental model for the multilingual audio guide system was built as shown in Figure ( ). Before starting the experiment, we linked the system components in the raspberry device and then installed two languages in the system Language English and Arabic. Experience has proven that the reader can read tags when it is within its range. Then the reader sends the ID to Raspberry Pi through the SPI interface for data processing. After that, a issued audio through the headphones and in the required language, in which case the goal for which the system was designed is achieved.

Conclusion

According to the results about the replicated tests executed on the designed method, the method could perform language choice According to the visitor's demand and voice working function well and performs group the intended functions. The Multilanguage sound system could reduce the workforce, improve performance, and ensure the quality of the description. Hence, the applying view of the Multilanguage sound system would be very broad.
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