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VOICE CONTROLLED PERSONAL ASSISTANT ROBOT FOR SMART APPLIANCES BY USING RASPBERRY-PI

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Abstract

This Paper aims to build up a Personal Assistant by using Raspberry Pi as a processing chip and underlying architecture. It highlights how ambient technologies like robotics and the internet of things (IoT) can replace screen-based interaction by integrating the user interface with the actual device. It is made up of parts like a motor driver, microphone, and infrared sensors. Voice commands are used to control the movements of this voice-activated personal assistant, which can read text from images and then say the necessary words to the user through an integrated speaker. By utilizing their voice as a command, it can assist those who are physically impaired in interacting with the outside world by providing them with access to educational resources such as Wikipedia, calculators, and more. PIBOT describes the implementation of a system that uses the Blynk app and Node MCU to leverage the Internet of Things for controlling home appliances. Through the sensor modules, the various home environment parameters are transmitted as input to the Node MCU. Node MCU processes commands from the user's mobile application to regulate home appliance actuator circuits.

Keywords: Internet of Things, Voice- Controlled Personal Assistant, Home Automation, PIBOT, Raspberry Pi

I. INTRODUCTION

IoT opens the door to more direct integration of the real world into computer-based systems, improving efficiency, accuracy, and financial gain. It does this by enabling things to be detected and controlled remotely across current network infrastructure. Since 4G LTE cellular technology enables for faster IoT-based home automation system advancement, the current generation has had access to high speed internet. IoT technology becomes an example of the broader class of cyber-physical systems when it is enhanced with sensors and actuators. This class includes technologies such as controlling various home appliances, such as lights, fans, water pumps, and many more. A system that links sensor data to the user's everyday activities has been devised. Numerous smart phone-focused remote controller products are currently available. But platform compatibility issues plague current goods constantly, and the graphical user interface (GUI) of these systems is complicated. An method to improve and streamline the controlling and monitoring experience is put forth in this work. Appliances in a home can be remotely controlled by using sensors, provided that the ambient conditions are known from sensor data. A microcontroller processes the sensor data, which are then sent via a WEB server to a mobile application.

The outcomes of testing and deployment have demonstrated that the suggested platform and system can offer more everyday IoT application opportunities. The capacity of mobile phone applications to handle real-world situations with greater dependability has opened the door for the modeling of a system that combines sensors and actuators. Additionally, users can

utilize their mobile application to transmit commands and view data. Thanks to technological advancements, it is now feasible to operate and monitor electronics appliances using an Android application and an internet connection. It allows us to be in complete control of a location even when we are remote from it. IoT lowers human effort and enables us to operate multiple devices at once. This procedure is inexpensive, and it allows for the control of numerous devices in a straightforward circuit.

II. LITERATURE REVIEW

I Hameem Shanavas, et.al [1], have discussed a robot personal assistant that can communicate with users, created with the Raspberry Pi computer platform. With the introduction of family-friendly robots that function as personal assistants at home, technology is developing at an incredibly rapid rate. Humans have already begun use smart phones and computers to communicate. In the near future, these computers and smart phones are expected to be replaced by social robots.

Anurag Mishra, et.al [2], has discussed a voice-activated robot personal assistant. With the aid of personal robotic assistants, humans may perform daily tasks with less manual labor. Using a smart phone, the robotic assistant receives voice commands from a human source remotely. The robot is capable of making various maneuvers, moving objects from one location to another, and initiating and stopping operations.

Narendar Singh, et.al [3], has discussed a virtual assistant with intelligence (IVA). This device takes voice commands from the user and uses a Raspberry Pi. Speak to text by using speech-to-text engines. Data was obtained and queries were processed using this procedure's text. Once the data was acquired, text-to-speech was used to transform it to voice and send it to the user. A surveillance system that matches a visitor's speech to a recorded version could make use of this approach. This paradigm offers an IOT-interactive automated system.

Saad Ahmed Rahat, et.al [4], has discussed a Raspberry Pi-powered interactive speech-recognition robot that can be controlled remotely over the Internet of Things. Anybody may easily operate our speech recognition-based robot automobile with voice commands, and they can even direct the robot to travel a predetermined distance.

III. PROPOSED MODEL

This Paper proposes personal assistant using Raspberry pi. This allows you to connect and control home applications wirelessly, as well as control voice-activated PIBOT, object following with IR sensors, and voice assistant. The following characteristics of this personal assistant are listed below:

VOICE ASSISTANT:

Voice assistant is a computer assistant that listens to specific voice commands and responds with pertinent information or does specific tasks at the user's request using speech recognition, language processing algorithms, and voice synthesis. These days, voice assistants are built into a lot of the gadgets we use on a daily basis, including laptops, smart speakers, and cell phones. This assistant is voice-operated and is managed by a Raspberry Pi together with other audio input and output devices such as a speaker and microphone. Libraries such as the Speech to Text and Voice Recognition Libraries are utilized. The voice assistant's configurable block diagram is displayed in Figure 1. The sound card is connected to the speakers and microphone. This is attached to a Raspberry Pi, which is run on a 5 volt battery.

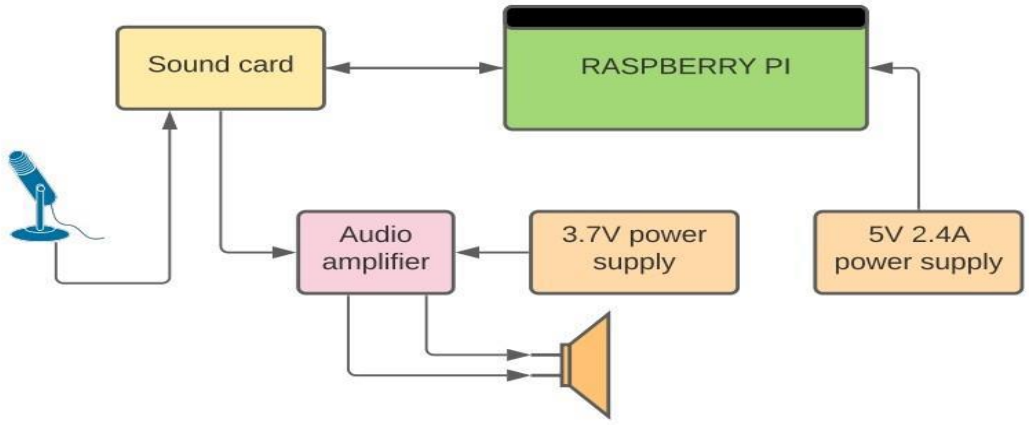

Figure 1: Block Diagram of Voice Assistant

PIBOT MOVEMENT:

PIBOT is a moving robot with two functions. There are two characteristics that define this pibot movement. They are Humans who use Raspberry Pi voice and remote control and infrared sensors. A voice control robot uses voice instructions that are frequently used to control the movements of a basic robot. In this setup, the Raspberry Pi receives human commands using an Android app as a conduit. A 433 MHz module can be interfaced with a controller using the UART protocol. The voice module processes the speech after it is received by the Android app. Text is then created from voice. We're going to proceed and create our very own self-governing robot. Within a 5 to 10 cm range, this robot will follow any thing that comes in front of it. Two infrared proximity sensors will be used, and they will recognize items in front of them and alert the robot when they do. The robot's front will be equipped with two sensors, one on the left and one on the right. The setup block diagram for PIBOT Movement is displayed in Figure 2.

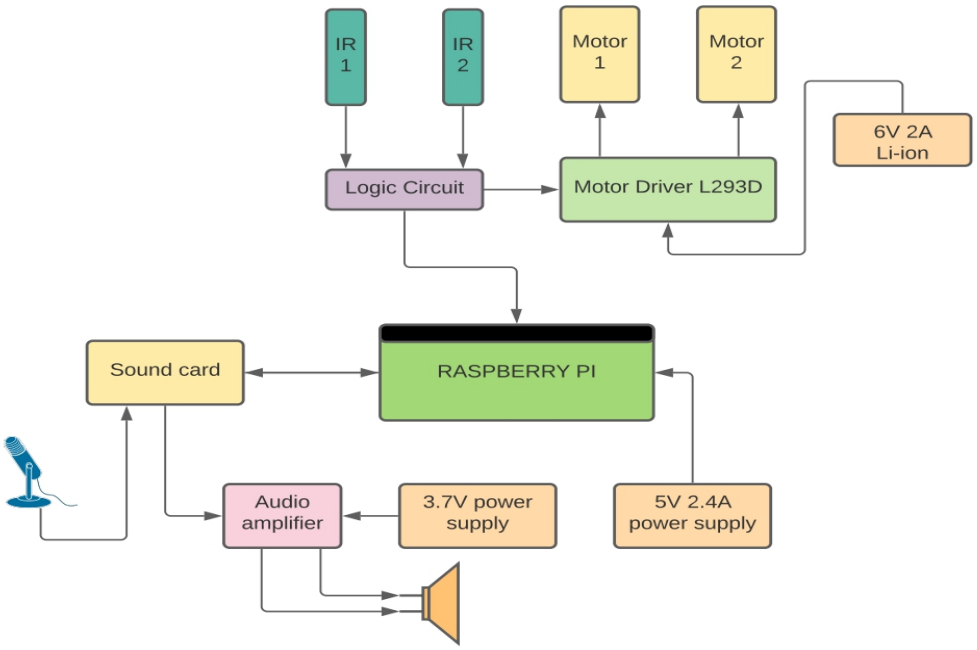

Figure 2: Block Diagram of PIBOT Movement

HOME AUTOMATION

The home automation operates on a 433MHz TX and RX module that is coupled to an HT12D or HT12E, respectively. 100-meter range coverage is required. The AC loads (home appliances) are connected to a 4-channel relay circuit.

IV. HARDWARE DESCRIPTION

Raspberry Pi is a line of tiny single-board computers (SBCs) created by the Raspberry Pi Foundation and Broadcom in the United Kingdom. The original goal of the Raspberry Pi project was to encourage the teaching of computer science fundamentals in classrooms and underdeveloped nations. Unexpectedly, the original model gained popularity and started selling outside of its intended market for robotics-related applications. Its affordability, versatility, and open design make it extensively utilized in a variety of contexts, including meteorological monitoring. Because it accepts HDMI and USB devices, computer enthusiasts and electronics hobbyists are the ones who utilize it most frequently. Following the introduction of the second board type, the Raspberry Pi Foundation established a separate company called Raspberry Pi Trading and appointed Even Upton as CEO, tasked with overseeing technological development. There have been multiple Raspberry Pi generations released. In the proposed system, we use a Raspberry Pi 3 Model A+ Generation.

The primary hardware component of the proposed system is the Raspberry Pi 3 Model A+. The most recent model in the Raspberry Pi 3 lineup is the Raspberry Pi 3 Model A+. It has the same 64-bit quad-core processor (Broadcom BCM2837B0) as the Raspberry Pi 3 Model B+, dual-band 2.4 GHz and 5 GHz wireless LAN, Bluetooth 4.2/BLE, and 512MB of LPDDR2 SDRAM with GPIO pin control. Since the Raspberry Pi serves as the project's brain, other parts including relay circuits,

speakers, microphones, IR sensors, L293D motor drivers, 433MHz transmitter and receiver modules, and other electrical parts are employed in this model. This Raspberry pi is run on a 4000mAh, 5V battery. Additional components such as motor drivers and speaker amplifiers also need an extra battery pack that runs on 5000mah batteries.

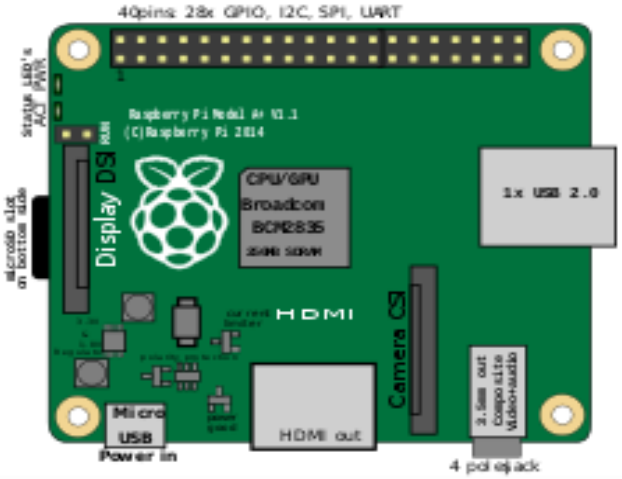

Figure 3: Raspberry Pi 3 Model A+

IR sensor is an electrical gadget that releases light to detect objects in its environment. In addition to detecting motion, an infrared sensor may measure an object's heat. Typically, all items emit some kind of thermal radiation in the infrared range.

Figure 4: IR Sensors

V. RESULTS

Results of the PIBOT which runs successfully are shown in below. It receives user input and executes commands as directed by them. It can also use an infrared sensor to follow a specific item. It senses the object accurately and operates at 80% efficiency.

Robot with Voice Assistant:

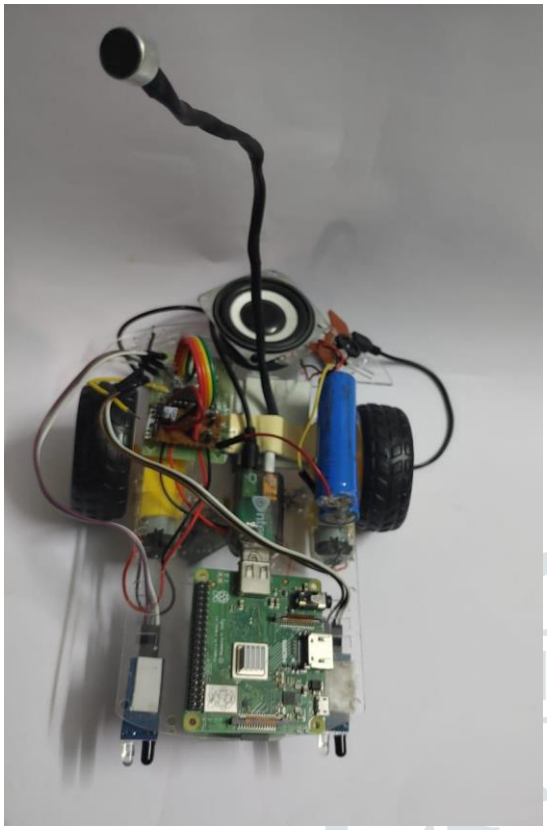

Figure 5: Robot with Voice Assistant

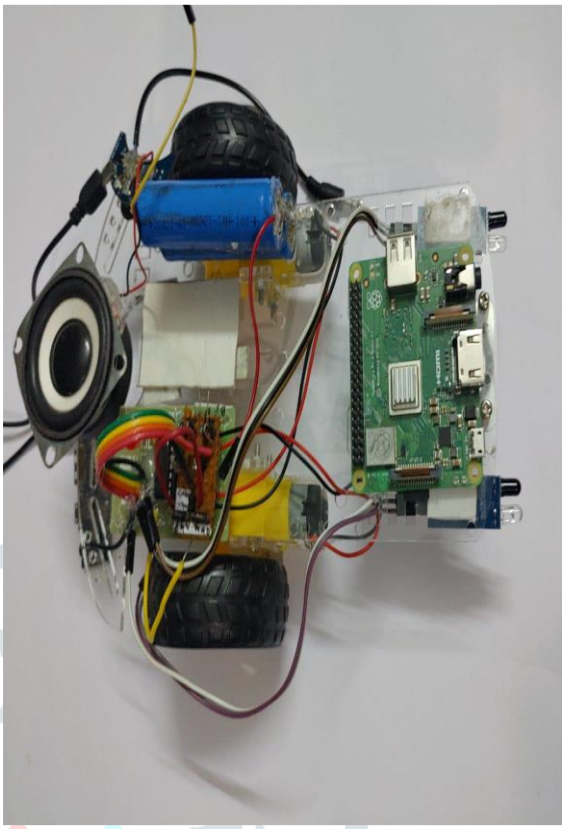

Figure 6: Robot with Voice Assistant-Side view

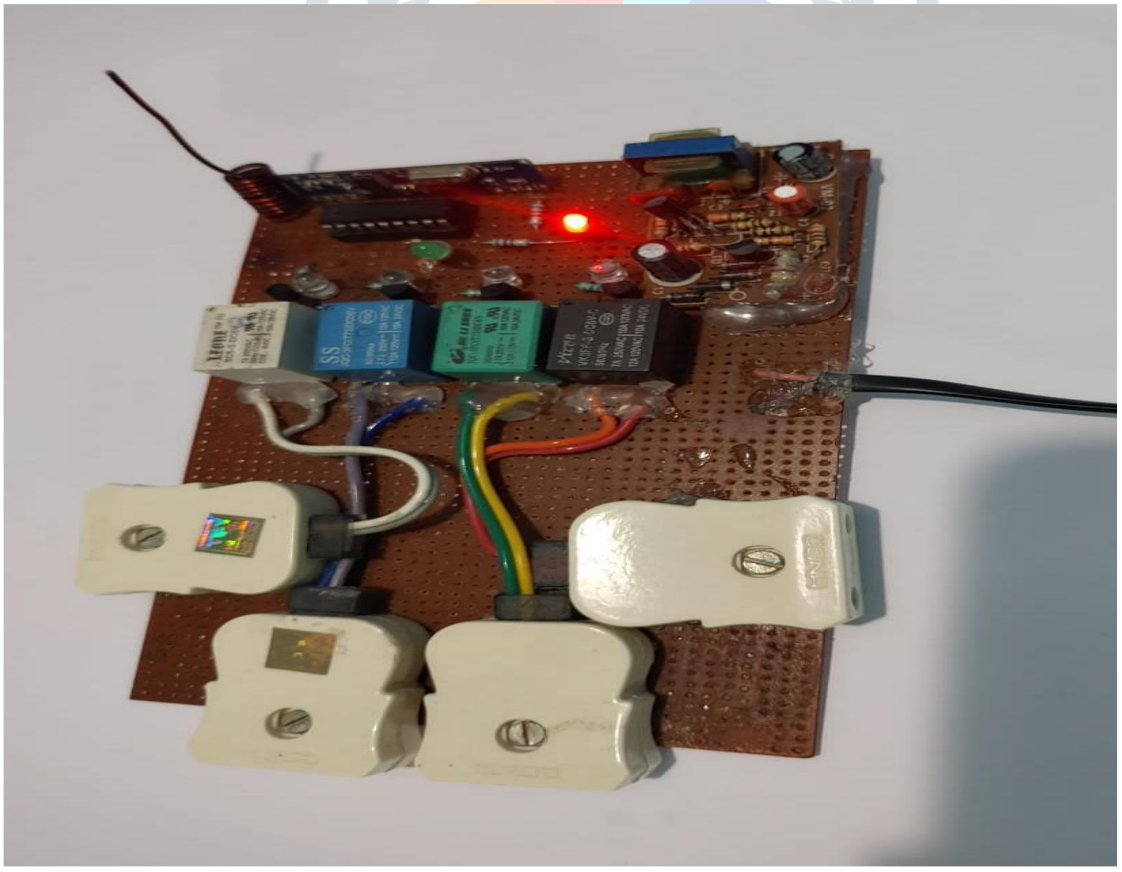

Figure 7: Home Automation

VI. CONCLUSION

Such home automation systems are necessary since people might make mistakes and forget to turn off equipment when not in use. In these situations, they help make efficient use of electricity while maintaining security. The Proposed system gives the owner or controller complete authority over making decisions and managing home appliances with the use of an Android application. It makes one's life comfortable and simultaneously remotely accessible through portable devices like Android phones by offering simple and numerous ways to operate the equipment in the house. In the future, PIBOT will be upgraded with a PI camera to enhance object detection and boost its overall effectiveness. Rather than using IR sensors, a PI camera is employed.

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