Voice Based Hot and Cold Water Dispenser

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Abstract – The purpose of research paper is to illustrate the implementation of automatic water dispenser system. The voice based water dispenser is the idea which will be helpful for old age home, hospitals, canteens and offices. The main aim of project is not only to make water hot and cold but also it work on voice command. This system works on the primary input of user's voice. Additionally this system includes temperature sensor which displays temperature and also control temperature. This paper presents the design and implementation of a low cost but yet flexible and secure voice based hot and cold water dispenser system. The communication between the cellphone and the controller board is wireless. Voice command sends from mobile to the microcontroller, to understand whether the water required by the person should be hot or cold. The microcontroller processes the information to the IR sensor to determine where the glass is placed below the pipe or not.

Key Words: Bluetooth Module HC05, DS18B20 TEMP Sensor, Water Level Sensor, ARM7 LPC2148, Solenoid Valve.

1. INTRODUCTION

Nowadays, we have remote controls for our television sets and other electronic systems, which have made our lives real easy. Have you ever wondered about home automation which would give the facility of controlling tube lights, fans and other electrical appliances at home using a remote control? Off-course, Yes! But, are the available options cost-effective? If the answer is No, we have found a solution to it. We have come up with a new system called voice based automation using Bluetooth. This system is super-cost effective and can give the user, the ability to control any electronic device without even spending for a remote control. This project helps the user to control hot cold water dispenser using his/her voice command to smartphone. Time is a very valuable thing. Everybody wants to save time as much as they can. New technologies are being introduced to save our time. To save people's time we are introducing hot cold water dispenser system using Bluetooth.

Till now voice based water dispenser system did not exist. This system include series of many function like cooling and heating process, voice based controlling, maintaining temperature and controlling flow of water and also displaying temperature. Voice is integral part of the system. Since, it is faster to process rather than to process written text.

This system is fully based on voice commands sends from mobile Bluetooth to controller. This water dispenser system also uses IR sensor, solenoid valve, jars for storing water, pipes and water heater. In this project the voice is detected by the smartphone, and then the smartphone sends the respective information to the microcontroller via Bluetooth, to understand whether the water required by the person should be hot or cold. The microcontroller processes the information to the IR sensor to determine where the glass is placed below the pipe or not. The system uses IR sensors to detect the presence of water glass and then the IR sensor sends the signal to the microcontroller about the presence of the glass, accordingly the motor starts and the water flows though the pipes from the particular jar (hot/cold). If the glass is not placed, the sensor sends respective signal to the motor, which does not because the water to flow through the pipe until the glass is placed. This system can be used at home, offices etc. to get hot or cold water by just giving voice command.

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1.2. LITERATURE REVIEW

This literature review explains about relevant past research and project development which is used the almost similar system for this project.

Water dispenser consisting of compressor, ARM processor, and evaporator were designed. It provides good result but heat pumps were added because of which temperature increases during winter season, thereby decline its effectiveness [3].
Hot cold water dispenser with inbuilt inverter, consist of Peltier module, hot cold chamber, inbuilt inverter. This device work without compressor, condenser or evaporator but was not automated or based on voice command [4].
Water dispenser system using coin consisting of components like IR sensor, microcontroller and water pumps. Automatic heating and cooling of water were absent [1].
Voice command using raspberry pi which help to get best performance from system terms of space, time and complexity. This also provides way of using IOT [2].

5]The idea of automation can be dated back to 1800s, when Nikola Tesla developed the idea of having a remote control for vessels and vehicles in 1898. Later with the advent of electrical appliances, the idea of home automation became more important. A.R.Al-Ali and M.Al-Rousan developed a Java based Home Automation System.

[6] It used Wi-Fi as a medium for communication between the hardware and software component. Its main disadvantage was that Wi-Fi range is limited and hence the user has to be in a certain range for operating the system. An android based HAS was developed.

[7] It would use internet as a medium for connectivity. Its disadvantage was that the unavailability of internet would fail the entire system. Embedded smart home management scheme was presented.

[8] It was based on use of Ethernet network. The system also had GSM support for the issue of unavailability of network. It was thus costly and hence was the only disadvantage. D.Naresh, B.Chakradhar & S.Krishnaveni presented the idea of Bluetooth based HAS in.

[9]It used arm processor (ARM9 and ARM7), and so the system has a complex architecture.

2. PROPOSED SYSTEM

In this, we present the theory on voice based hot and cold water dispenser system. The overall block diagram of the proposed method is explained. Each and every block of the system is explained in detail. In this proposed block diagram consist of several sensors (water level, IR sensor, DS18B20 temp sensor, HC05 temp sensor) is connected to ARM7 controller. The controller are accessing the sensor values as well as get command from Bluetooth module and processing them to dispense hot or cold water. All parameters are also shown on LCD display. A solenoid valve will be used to control the flow of water, which is when energized the water will flow out and when de-energized the water will be stopped. So we will write an controller program which always checks if any object is placed near the tap, if yes then the solenoid will be turned on and wait till the object is removed, once the object is removed the solenoid will turn off automatically thus closing the supply of water. The microcontroller processes the information to the IR sensor to determine where the glass is placed below the pipe or not. The system uses IR sensors to detect the presence of water glass, accordingly the motor starts and the water flows through the pipes from the particular jar (hot/cold).If the glass is not placed, the sensor sends respective signal to the motor, which does not cause the water to flow through the pipe until the glass is placed. This system can be used at home, offices etc.to get hot or cold water by just giving voice command.
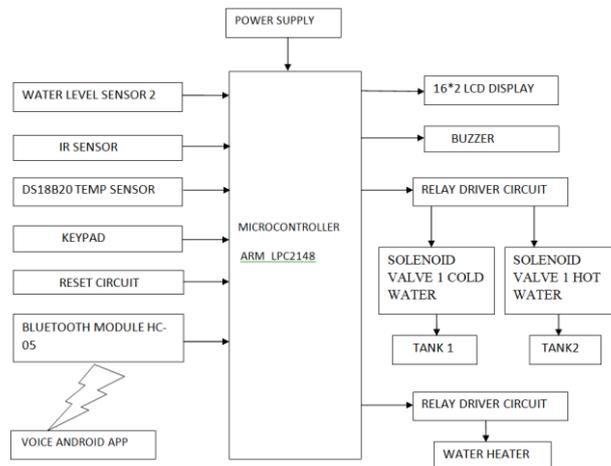

Fig -1: Block Diagram
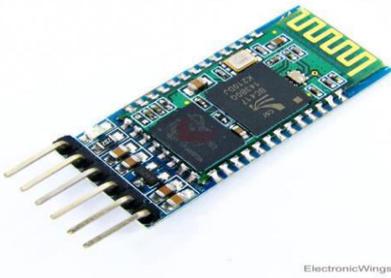
2.1 ARM7 LPC2148 Microcontroller:

The LPC2148 ARM Header Board is a Low Cost Board that can be used to quickly evaluate and demonstrate the capabilities of NXP LPC2148 (ARM7TDMI) microcontroller. The Header board is designed as DIP package with access to all Port pins for external connection. The LPC2148 ARM Header Board consists of all basic components required to function the microcontroller. The board is populated with voltage regulators, RTC crystal, Main Crystal and necessary de-coupling capacitors.

Fig -2: **ARM7 LPC2148 Microcontroller**

2.2 Bluetooth module (HC-05):

Bluetooth wireless technology is becoming a popular standard in the communication. it is one of the fastest growing fields in the wireless technologies. It is convenient, easy to use and has the bandwidth to meet most of today's demands for mobile and personal communications. Bluetooth technology handles the wireless part of the communication channel; it transmits and receives data wirelessly between these devices. It delivers the received data and receives the data to be transmitted to and from a host system through a host controller interface (HCI). The most popular host controller interface today is either a UART or a USB .Here, I will only focus on the UART interface, it can be easily show how a Bluetooth module can be integrated on to a host system through a UART connection and provide the designer an optimal solution for Bluetooth enabled systems.

Fig -3: Bluetooth Module HC05

2.3 Water Level Sensor:

Level sensors are used to detect the level of substances that can flow. Such substances include liquids, slurries, granular material and powders. Level measurements can be done inside containers or it can be the level of a river or lake.

Fig -4: **Water Level Sensor**

2.4. DS18B20 Temperature Sensor:

This is a 1 Meter Long Waterproof, sealed and pre-wired digital temperature sensor probe based on DS18B20 sensor. It is very handy for when you need to measure something far away, or in wet conditions. Because they are digital, you don't get any signal degradation even over long distance. These 1-wire digital temperature sensors are fairly precise (±0.5°C over much of the range) and can give up to 12 bits of precision from the onboard digital-to-analog converter.
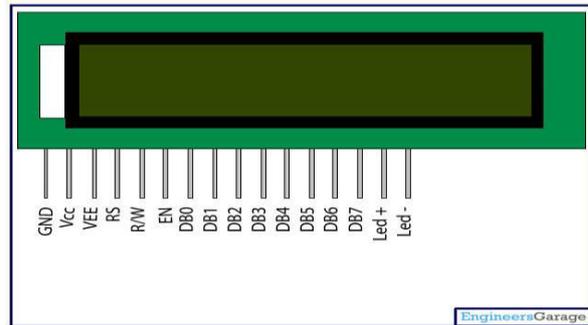

Fig -5: **DS18B20 TEMP Sensor**

2.5. **LCD display**:

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD.
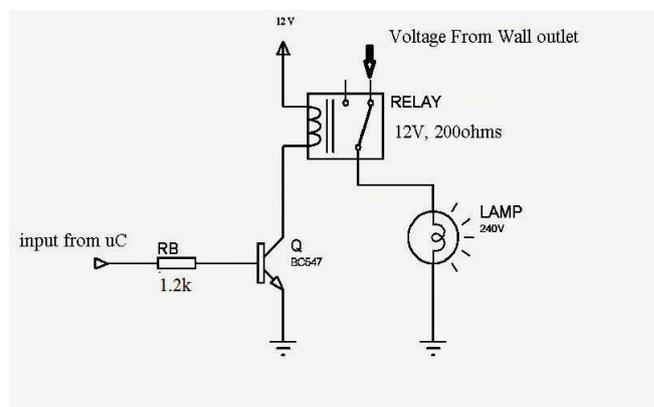

Fig -6: LCD Display

2.6. **Relay Driver Circuit**:

A relay driver circuit is a circuit which can drive, or operate, a relay so that it can function appropriately in a circuit. The driven relay can then operate as a switch in the circuit which can open or close, according to the needs of the circuit and its operation. Now that we're using a transistor to drive the relay, we can use considerably less power to get the relay driven. Because a transistor is an amplifier, we just have to make sure that the base lead gets enough current to cause a larger current to flow from the emitter of the transistor to the collector. Once the base receives sufficient power, the transistor will conduct from emitter to collector and power the relay.

With no voltage or input current applied to the transistor's base lead, the transistor's emitter-to-collector channel is open, hence blocking current flow through the relay's coil. However, if sufficient voltage and input current are applied to the base lead, the transistor's emitter-to-collector channel will close, allowing current to flow through the relay's coil.

Fig -7: Relay Driver Circuit

2.7 Solenoid valve:

A solenoid valve is used as a water controlling valve; it is a simple electromagnetic device that converts electrical energy directly into linear mechanical motion. A solenoid valve is the combination of a mechanical valve and basic solenoid. So a solenoid valve has two parts namely electrical solenoid and a mechanical valve. A solenoid valve is an electromechanically operated valve.
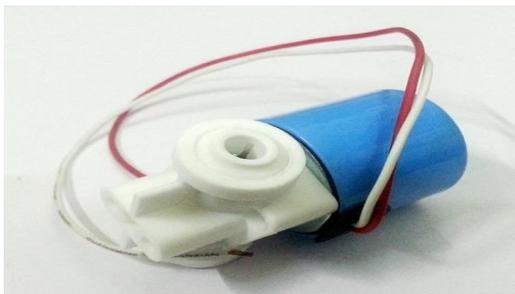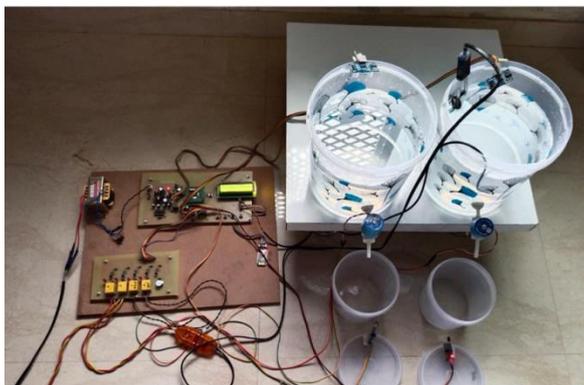

Fig -8: **Solenoid valve**

3. RESULT

Fig-5: Hardware implementation with ARM LPC2148

The system uses IR sensors to detect the presence of **water** tank and then the IR sensor sends the signal to the microcontroller (LPC2148) about the presence of the tank, accordingly the solenoid valve starts and the **water** flows though the pipes from the particular jar/glass (hot/cold).

4. CONCLUSIONS

The implementation of this project overall is successful. The motive of making the project cost efficient and user friendly is taken into account and achieved. The proposed system is created with the use of different sensors, ARM7 as controller and Bluetooth module to get command from user smartphone. The system implementation is based on the ARM7 microcontroller, which has been programmed to control a hot and cold water dispenser valve based on sensor signals and on direct commands by the user. The system has been programmed to have Bluetooth communication capability.

Taking into consideration the target audience of elderly and handicapped people, the project developed is user friendly.

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