Design and Implementation of Smart Irrigation System using Raspberry Pi

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Abstract:
In India most of the people are doing work related agriculture directly or indirectly. An economy of India is mostly affected by agriculture related activities. To check water level of well, farmer has to go to farm and start water pump. Sometimes he has to go in night to switch on the motor pump. The main aim of this project is to develop a smart irrigation system using raspberry pi. Focus area will be parameters such as water pumping, switch on lights and know weather conditions. This system will be a replacement to traditional farming method. We will develop such a system that will help a farmer to know his field status in his home or he may be residing in any part of the world. It proposes an automatic irrigation system for the agricultural lands.

Key Words: Raspberry Pi, Automated Irrigation System, Voice, Linux.

1. INTRODUCTION

In today’s life automation can play a major role. Automation makes thing simple and easy. The advantages of any smart irrigation system is reducing or decreasing the human labor, efforts, time and errors due to human negligence. So, what we do is bring automation in farming where farmers can be benefited. A Raspberry Pi is a credit card-sized computer which is usually used for developing various applications. This project is based on Internet of Things (IoT). Internet of Things is a network in which physical objects can exchange data internally or with other connected machines. It is embedded with sensors, software and electronics. This project enables easy way to control the devices in farming.

2. PROPOSED SYSTEM

The proposed system includes a voice recognition system that would enable farmers to control basic level automation and get assistance. So this system basically consists of a Raspberry pi whose GPIO pins will be used for sending of the signals to a controller based on voice commands which were filtered by the Raspberry pi’s part. A suitable interface is built which will allow the user to interconnect with raspberry Pi. The overall design of this smart irrigation system which implement wireless communication between Raspberry Pi module and user input. The main operating system use Wi-Fi to provide remote access from raspberry pi. The processor that is being used in this project is Raspberry Pi 3 B+ processor. The Voice inputs controls the Raspberry Pi wirelessly to perform the necessary function. The connection between the Raspberry Pi and the controller is established via internet connection. The simplification of these services would involve adopting a wide range of existing technology and would help people with varied disabilities access the same technology. Voice controlled Assistant & Automation System makes use of the power of Raspberry Pi to provide a holistic voice-controlled assistance and automation system.

Figure 1.1. functioning of the system

The instructions from the user will be transmitted through the Wi-Fi network. The raspberry pi board is configured according to the home system and it enables the relay circuit as per user request. The relay circuit is used to control the Electronic devices. The main motive of this proposed system is to design and to implement a cheap and open source home automation system that is capable of controlling and automating most of the house appliances.

Proposed System Work Flow
In proposed flowchart of voice-based assistant and automation using the technology of the Raspberry Pi. The system flow starts from the user voice command. Once voice command is provided to the Raspberry Pi. The voice command is recognized by the Google speech recognition and the command will be mapped with database to perform the action given by user command. The voice command is mapped with the database and either gives assistance to the user on the basis of the command or performs automation for desired appliance on/off or Like device name on/off. Voice is converted to text in this process by Google speech recognition and python library pyttsx3 during the system process. Then the Text is transmitted to raspberry pi for processing. After this text matching is done on successful text matching that appliance is switched on/off or audio output is given to user with interacting to the input. This is the flow of proposed system that is smart irrigation system using Raspberry Pi technology.
System Architecture:
The system architecture gives overall view of the project and how the system components are connected to each other and perform their role of work in this project which are assigned to them. Raspberry pi and artificial technology are the main technologies that are used in this project. A 5v power supply is provided and passed through regulator so that it can be converted to 3.3v and then it is provided to raspberry pi. The voice command is given as input to raspberry pi and the output from raspberry pi is given to relay switch. Relay switch is connected to electronic device which does the main function of switching on/off.

3. ANALYSIS

3.1 Software Requirements
1. Operating system: Raspbian, windows
2. Linux
3. Python Programming

Raspbian
Raspbian is the operating system of Raspberry Pi. Raspbian is an open source operating system based on Debian optimized for the Raspberry Pi hardware. An operating system is the collection of basic programs and utilities that make your Raspberry Pi run. However, Raspbian provides more than a pure OS

Python
Python is a high level programming language which is used by Raspberry including execution of GPIO command as this language is very powerful and easy to code. Python was created by Guido van Rossum and was first released in 1991. Its language constructs and object-oriented approach helps the programmers write clear, logical code for small and large-scale projects

3.2 Hardware Requirements
1. System: Raspberry Pi 3 model B plus
2. Relay Module
3. Servo Motor
4. 3dusb sound card
5. sd card
6. Ram: 1 GB.

Raspberry pi
Raspberry pi 3 is the development to the upcoming technology with which enhances connectivity with Bluetooth and Wi-Fi on raspberry pi board. The raspberry pi 3 has enhanced power management, up to 2.5 Amperes, to help more powerful external USB devices. The Raspberry Pi 3 has four in-built USB ports helps to provide interconnection for every ushubb. We can power the Raspberry Pi 3 by just inserting any USB power supply into the micro-USB port. The four in-built USB ports can give output up to 1.2A which enables to connect more USB devices that requires more power. This does require a 2Amperes micro USB Power Supply, concerning all of them, the under-level peripherals on the raspberry Pi 3 make it great for hardware hacking. The 40-pin GPIO header on the Pi gives access for 27 GPIO as well as 3.3 and 5 voltage sources. Raspberry Pi use python programming in this enhancement. The raspberry Pi is similar to motherboard, with mounted chips and ports exposed.

Relay and relay driver:
An electromagnetic switch which is said to be relay. It allows one circuit to switch between another circuit while they are distanced among them. The Relay is used when we allow using one low voltage circuit for turning on and off the device for which used for high voltage for the operation. It is further classified into 2 parts, other one is input and other one is output.
4. IMPLEMENTATION

In this project, we developed a “Smart Irrigation System” in which user can give Voice/text Commands for operation (ON/OFF) on specified Electronic appliance or interact with the system with voice commands. A Voice to Text conversion library is used named “Pyttsx3” is a library from python community and “Google speech Recognition” API provided by Google is used to recognize the speech of the user. The voice command is converted to the text. Whichever command is given is converted to text is then starts to map with the commands in the database. If the command is mapped with the words present in the database then the output is processed in Raspberry Pi gives a high signal to the relay driver and the relay driver is closed and generates the power on Electronic Devices or gives speech output where user command “Light On” is given and Raspberry Pi has received the input. It performed the task and acknowledgement is given back and displayed in the interface task performed.

5. RESULT

It can interact with user’s commands and also play music, google and Wikipedia searches, plays YouTube videos. It is used to control the electronic appliances using voice commands.

6. CONCLUSION

The Main Objective of the project is to work for uneducated farmers who cannot use these products this project will be a substitution for those products and does not have any complexity to use. Moreover, this architecture is using Raspberry pi which promises many features for growing plants perfectly. Overall, this provides a novel approach to save a water usage and make irrigation system better. Raspberry pi is an important part of system which is handle the processing and working. From this project it can be concluded that there can be considerable development in irrigation with those of IOT and automation. Hence, this system is a solution to the problems faced in the existing process of irrigation.

7. FUTURE SCOPE

This system is provides very huge future scope. It can comprehend in many ways. One way is to add camera module to it. When flame sensor detect fire, camera module click picture and put it in website or send it in mail. And take input from user that there is fire or not if it is there send message to fire bridge. Another way is attach different type of sensor like humidity sensor, measuring fertilizer and also attach temperature sensor to generate more data about soil. Another way is to join water pump to the system and when moisture goes down system will atomically start the motor. This type of agriculture application of Internet of things in the real world environment is necessary to know the effect of the environment on such system. So is always better to know the risks beforehand.

8. REFERENCES


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