GARDUINO- The Garden Arduino

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Abstract

Home automations systems are a requirement of modern day life, because we might not be present at our homes every time. There is requirement of this system not only for people who are too busy but even for those who are physically handicapped. The point we will be discussing in this research paper is which option we shall choose to make a home automation system more interactive and easy to use and with major point being its cost. Though there are systems present in the market but they are not cost effective because they are using more complex mechanism and costly materials. Such a system for garden is known as Garduino-the garden Arduino.

Keywords

WHAS, RPi, Arduino, Wi-Fi Shield

I. Introduction

A system is considered as a home automation system when it is even functional without the presence of owner, a simple term to define such scenarios is a smart house. The system shall have the capabilities of performing basic tasks like from switching off the lights and fans to more complex tasks like watering the plants as soon as the moisture in soil drops.

Making such systems is not a big challenge but making such systems affordable for regular people is a task to accomplish. Traditional home automation systems are not too smart as there is no such connection of system with the internet, thus leaving the system with constraints like involvement of user for some decisions.

To make things more cost effective we will be using Intel's Arduino, and convert the home automation system to a Wireless Home Automation System. A WHAS (wireless home automation system) will be more appropriate as the end user will also be able to handle all the executive decisions without being present at house.

We will be specifically talking about the Arduino board and its constituents because of two major factors: cost effectiveness, easy to build.

II. Literature Review

Home automation systems are a requirement of modern world because of the simple reason that the person or owner of house might not be able to perform all the activities on its own, we all have a busy schedules at work, social life and etc. Thus remaining every time at home to do some basic tasks like opening the valves for storing water, gardening, pre-cooling the bedroom for comfortable sleep cannot be done on regular basis, what we need I such case is a system which is capable for performing all such tasks with a push of a button. A simple home automation system can be explained as a virtual person present in our homes which will notify us after each task is completed or what is the status of task.

The functionality of a simple HAS (home automation system) can be explained using 4 simple steps (1) fetching the data from receptors or sensors (2) reading and analysing the data through the board (3) decision making, whether the end user permission is required (4) executing the solution to the problem

This wirelessly execution of home automation systems still have one issue, which system is better.

The term better does not only reflects working but also cost effectiveness as well as maintenance.

Beside this issue most of the system are capable of functioning in good manner and there are large number of companies which help the user have a dream home with all the installed features.

III. Proposed Solution

The ultimate objective of this research is to find a better alternative for developing a better wireless home automation system. For such system we will be discussing about Intel's Arduino and its features which support the cause of using it.

The Arduino board from Intel is a microcontroller which acts just like a big switch which understands the data in complex forms and analyses them to give the desired out puts as 0 and 1 or as on or off. Arduino itself has its own IDE which makes coding part quite easy. And for uploading the code on the board we are also given with a USB port. Arduino is an open source on basic levels because for considering something to be complete open source it would include an open core but there are some hardware which claim to be open source but do not include the total control of the processor. Arduino has allowed users to create whatever they want with the hardware available in board. Going on to cost effectiveness of Arduino, a general Arduino board hardly costs up to INR 500 with all its basic functionality. Whereas other boardslike RPi are approx. 3-4 times the cost of Arduino with all the requirements to make a project out of it as there are some hidden costs associated with the RPi.

IV. Implementation in Arduino

A simple Garduino consists of main component the Arduino, some sensors (for moisture, humidity, temperature), the most important part is the designing algorithms for its efficient working other than this some hardware like a relay, motor for pumping water, jumper cables.

The basic schematics for connection of all the components are simple all the sensors should be connected to Arduino's digital pins for calculation of heat and moisture. A relay to regulate and control the pump because the pump requires 12V for working and Arduino will fry at such high voltage as it works in 5V.

This is the setup for Arduino connected to pc for uploading of code.

Fig. 1: Setup for Arduino connected to pc for uploading of code

This is the image of soil moisture sensor and relay connected to Arduino.

Fig. 2: Soil Moisture Sensor and Relay Connected to Arduino

The algorithm we used for this project was quite simple. We only created a routine execution of simple steps like running a statement for fetching the data from the sensors and calculating average for moisture sensors. And feeding the data to Arduino for deciding whether it should water the plants or not. The twist here was to see whether if it rains tomorrow or not. To check the weather there were many sources present we opted for yahoo weather forecast, in case it rains tomorrow the water will not be supplied to soil all such basic decision making is carried out in the Arduino, but the computer is supposed to stay connected to the Arduino for all such decision and fetching the data from yahoo weather forecast. The solution to such issue is using a Wi-Fi shield like ESP8266-01 which costs hardly INR.300, and configuring it is also easy and can be used independently with the setup or using an UART connection for USB to serial connector. This Wi-Fi shield fetches the data from yahoo weather forecast.
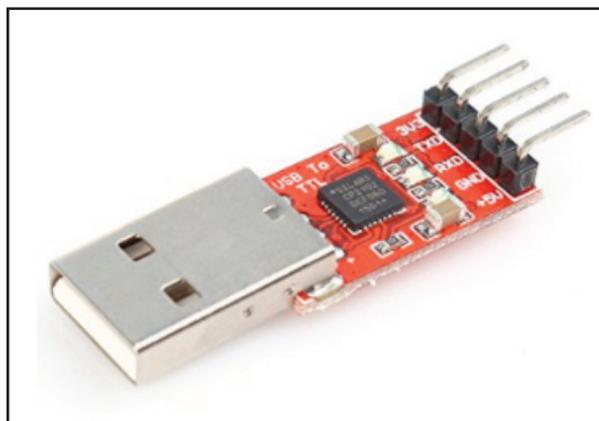

Fig. 3: Image of UART Serial to USB Connector

Fig. 4: Image of ESP8266 -01

V. Connection Details

Pins are initialised as per requirements mostly digital pins are used. Pin number 0 to13 are used for making digital connections. In our design we allocated these pins for sensors like moisture and temperature. For connection of ESP8266 and UART, we followed this schematics:

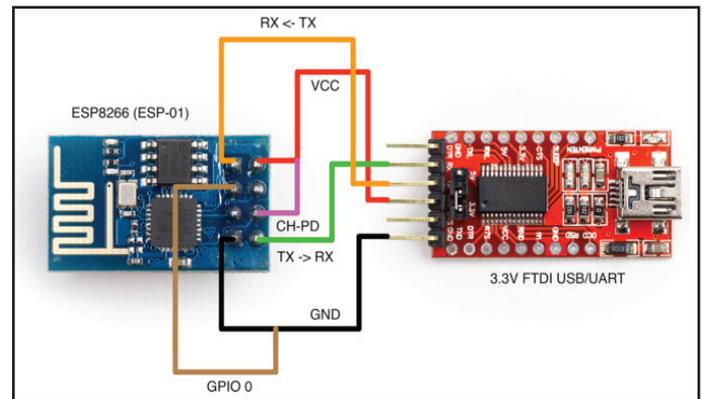| UART	→	ESP8266
Rx	→	Tx
Tx	→	Rx
GND	→	GND
5V	→	VCC

Fig. 5:

VI. Performance

Arguably, "performance" is subjective, and depends on what you want to do with the board. Yet a normal Arduino has these basic stats a running speed of 400 MHz, 512 KB of on-die embedded SRAM, simple to program: Single thread, single core, constant speed and works under 5V. Wi-Fi shield also works in 5V.

A. Resources Needed

You can simply order the Arduino online from various websites, and you will only need some basic idea about the coding language and it is very user friendly in nature that even an amateur coder can make simple stuff done.

B. Cost

It is quite cheap as compared to other boards present in the market, the board would cost up to Rs 500 or so.

C. Portability

The board itself is very small in size and is sold alone in the box thus making it very much portable and handy, the coding part of the Arduino is done using Arduino IDE with help of a computer and a USB post present on the board. Using ESP8266 Wi-Fi shield makes its range larger than before.

VII. Conclusion

In this research we studied about the home automation systems and Intel's Arduino board and its comparison to basic boards present in the market and why is it a good option to choose for general projects of home automation. In this research, emphasis has been made on Intel's Arduino board specifically as it is a genuine board developed by Intel and open source in nature. It is also quite easily accessible to all the developers and creators who are interested in making new systems which are capable of doing a lot of new tasks on their own.

Home Automation System is a field where all new algorithms are developed by the developers to make the system more independent

but hardware puts the constraints most of the time. A wireless home automation system is really a good option for people who are too busy in work, or are physically challenged, this system will help and serve all the requirements of people present in this world.

VIII. Future Scope

A very good future scope of this technology can be a home which has its own brain and runs of the renewable resources of energy, a house which runs on its own, uses solar panels, wind turbines and several other such resources. A live beacon of a smart house.

This research will be helpful for ensuring the development of such systems on low prices and making it affordable for everyone, there is only a slight requirements of hardware like wifi shield and simple sensors to make a fair system.

Overall WHAS is a filed which will grow and improve itself by time and new breakthrough in technology and thus companies should invest in developing such systems.

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