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SMART WARE HOUSE MONITORING AND CONTROLLING USING SENSORS

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Abstract: Monitoring and control of greenhouse environment play an important role in greenhouse production and management. To monitor the greenhouse environment parameters effectively, it is necessary to design a measurement and control system. The objective of this project is to design a simple, easy to install, microcontroller-based circuit to monitor and record the values of temperature, humidity, soil moisture and sunlight of the natural environment that are continuously modified and controlled in order optimize them to achieve maximum plant growth and yield. The controller communicates with the various sensor modules in real-time in order to control the light, aeration and drainage process efficiently inside a greenhouse by actuating a cooler, fogger, dripper and lights respectively according to the necessary condition of the crops. An integrated Liquid crystal display (LCD) is also used for real time display of data acquired from the various sensors and the status of the various devices. Also, the use of easily available components reduces the manufacturing and maintenance costs. The design is quite flexible as the software can be changed any time. It can thus be tailor-made to the specific requirements of the user. This makes the proposed system to be an economical, portable and a low maintenance solution for greenhouse applications, especially in rural areas and for small scale agriculturists. The result shows that the condition specified in sensor's datasheet and system in reality is appropriate. The achieved test result concludes that the system is working properly.

Keywords— ESP8266, economic, portable, natural environment.

I. INTRODUCTION

Green house farmers cannot precisely detect level of level of humidity inside the green house. They only know the condition inside the green house manually and by feel it by themselves. Ultimately, experiences play a bigger part on their daily operations. If the condition is too dry, they will give water to the plants or soil, but if it is too humid, they will open the rooftop of the green house, especially in the daylight. In designing this device, there is limitation to problems, to see how far this system can do its tasks. This limitation according to the situation where this system will be used later. There are 3 kinds of activity that are designed in the system. First, monitor the humidity level in the green house. Secondly, if the green house is too dry, the water sprayer can be activated, to increase the humidity level.

It also can deactivate water sprayer. Third, if the green house is too humid, the rooftop can be opened to lower the humidity level. The third function can be use to open or close the rooftop based on the needs. This embedded system for monitoring and controlling the green house is based on measuring the humidity and temperature by sensor that located at different places. The monitoring and controlling is conducted through Android Smartphone. The proposed system is an embedded system which will closely monitor and control the microclimatic parameters of a greenhouse on a regular basis round the clock for cultivation of crops or specific plant species which could maximize their production over the whole crop growth season and to eliminate the difficulties involved in the system by reducing human intervention to the best possible extent. , The sensors sense the change and the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC . The microcontroller then performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. Since a microcontroller is used as the heart of the system, it makes the set-up low- cost and effective nevertheless. As the system also employs an LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user friendly. Thus, this system eliminates the drawbacks of the existing set-ups and is designed as an easy to maintain, flexible and low cost solution.

Fig 1. House sensor system

II. LITERATURE SURVEY

In the existing system of agriculture the crops are being monitored with the help of Arduino boards and GSM technology where in Arduino boards acts as a microcontroller but not as a server. Here the set up cost is bit high which may pose problems for the installation. Hence in order to overcome all these features Arduino boards or renes as microcontrollers are being replaced with the Raspberry Pi 3 which is a latest version and also which acts both as a microcontroller as well as server. Main feature of this methodology is its cheap cost for installation and multiple advantages. Here one can access as well as control the agriculture system in laptop, cell phone or a computer.

III. RELATED WORK

In this paper, we implemented smart agriculture management system using water level sensors soil sensor interfaced to microcontroller. Whenever the water level is less, immediately motor will on and sends alert message to owner, the same procedure repeats for pesticides and so on.

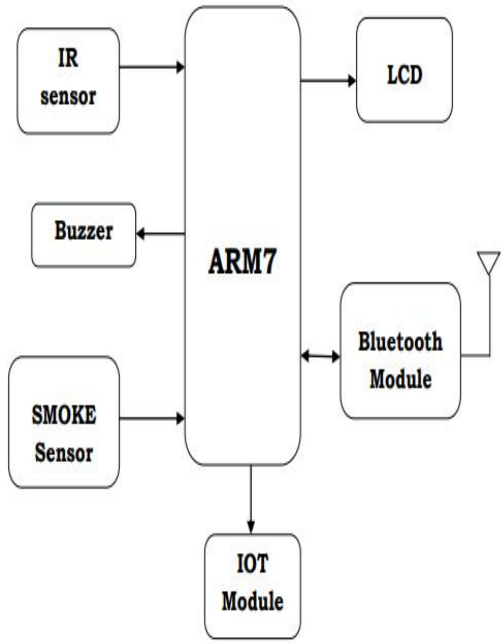

Fig 2. Proposed Block Diagram

A. CORTEX M3

The Cortex-M3 processor is specifically developed to enable partners to develop high performance low-cost platforms for a broad range of devices including microcontrollers, automotive body systems, industrial control systems and wireless networking and sensors. Arm Design Start provides the fastest, simplest, no-risk route to custom silicon success.

- ✓ Design the most optimal System-On-Chip with a processor that has the perfect balance between area, performance and power with comprehensive system interfaces and integrated debug and trace components.
- ✓ Develop solutions for a large variety of markets with a full-featured Armv7-M instruction set that
  has been proven across a broad set of embedded applications.
- ✓ Capture a worldwide experienced developer base to accelerate adoption of new Cortex-M3 powered products and leverage the available extensive knowledge base to reduce support costs.
- ✓ Achieve exceptional 32-bit performance with low dynamic power, delivering leading system energy efficiency due to integrated software controlled sleep modes, extensive clock gating and optional state retention.

Powerful debug and non-intrusive real-time trace

Comprehensive debug and trace features dramatically improve developer productivity. It is extremely efficient to develop embedded software with proper debug.

Memory Protection Unit (MPU)

Software reliability improves when each module is allowed access only to specific areas of
Memory required for it to operate. This protection prevents unexpected access that may overwrite critical data.

Integrated nested vectored interrupt controller (NVIC)

There is no need for a standalone external interrupt controller. Interrupt handling is taken care of by the NVIC removing the complexity of managing interrupts manually via the processor.

Thumb-2 code density

On average, the mix between 16bit and 32bit instructions yields a better code density when compared to 8bit and 16bit architectures. This has significant advantages in terms of reduced memory requirements and maximizing the usage of precious on-chip Flash memory.

SPDT

A relay is an electrically operated switch used to isolate one electrical circuit from another. In its simplest form, a relay consists of a coil used as an electromagnet to open and close switches contacts. Since the two circuits are isolated from one another, a lower voltage circuit can be used to trip a relay, which will control a separate circuit that requires a higher voltage or amperage. Relays can be found in early telephone exchange equipment, in industrial control circuits, in car audio systems, in automobiles, on water pumps, in high-power audio amplifiers and as protection devices.

The switch contacts on a relay can be "normally open" (NO) or "normally closed" (NC)--that is, when the coil is at rest and not energized (no current flowing through it), the switch contacts are given the designation of being NO or NC. In an open circuit, no current flows, such as a wall light switch in your home in a position that the light is off. In a closed circuit, metal switch contacts touch each other to complete a circuit, and current flows, similar to turning a light switch to the "on" position. In the accompanying schematic diagram, points A and B connect to the coil. Points C and D connect to the switch.

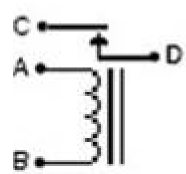

Fig 3. Relay connection

IV. INTERNET OF THINGS

The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

Fig 4. Internet of things interfacing

This module has a powerful enough on-board processing and storage capability that allows it to be integrated with the sensors and other application specific devices through its GPIOs with minimal development up-front and minimal loading during runtime. Its high degree of on-chip integration allows for minimal external circuitry, including the front-end module, is designed to occupy minimal PCB area. The ESP8266 supports APSD for VoIP applications and Bluetooth co-existence interfaces; it contains a self-calibrated RF allowing it to work under all operating conditions, and requires no external RF parts.

There is an almost limitless fountain of information available for the ESP8266, all of which has been provided by amazing community support. In the *Documents* section below you will find many resources to aid you in using the ESP8266, even instructions on how to transforming this module into an IoT (Internet of Things) solution.

Fig5. ESP8266 IOT module

There seems to be three ways of using this module, in order of increasing complexity:

1. Sending it AT commands from a computer via an USB to serial adapter. This is mostly useful for testing and setup.
2. Interfacing with cortex M3 or any other micro controller and using this board as a peripheral.
3. Programming the module directly and use its GPIO pins to talk to your sensors, eliminating the need for a second controller.

IV. RESULT ANALYSIS

The Internet of Things provides access to a broad range of embedded devices and web services. Thing Speak is an open data platform and API for the internet of Things that enables you to collect, store, analyze, visualize, and act on data from sensors or actuators, such as Cortex M3, Beagle Bone Black, and other hardware. For example, with Thing Speak you can create sensor-logging applications, location tracking applications, and a social network of things with status updates, so that you could have your home thermostat control itself based on your current

location. The primary element of Thing Speak activity is the channel, which contains data fields, location fields, and a status field. After you create a
Thing Speak channel, you can write data to the channel, process and view the data with MATLAB® code, and react to the data with tweets and other alerts. The typical Thing Speak workflow lets you:

1. Create a Channel and collect data
2. Analyze and visualize the data
3. Act on the data using any of several Apps.

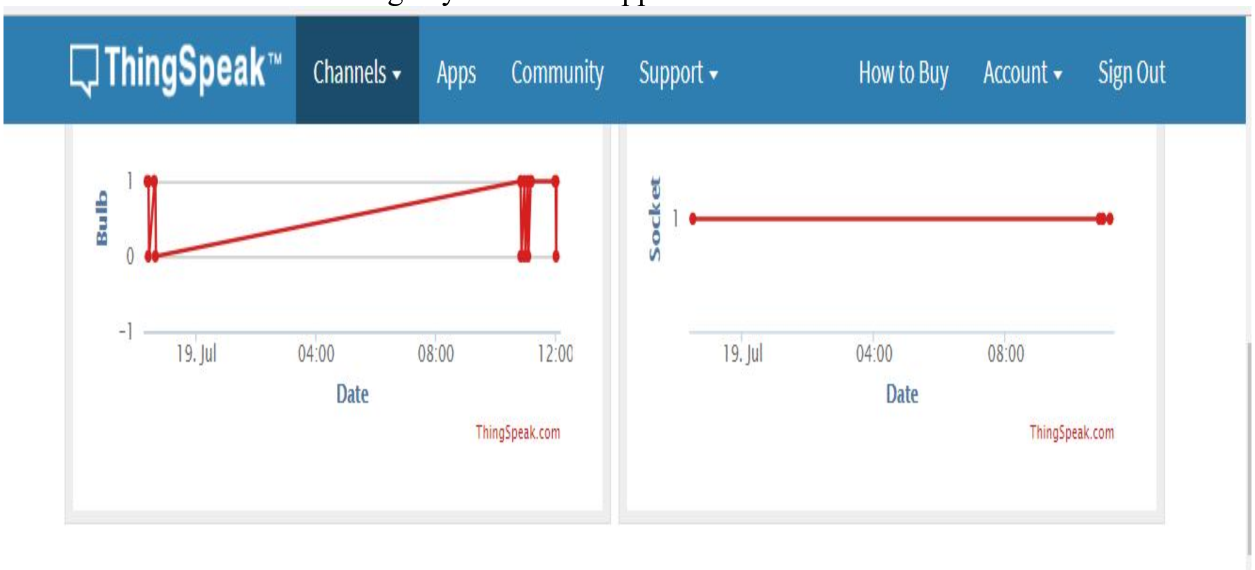

Fig 6. Graphical representation of output

VI. CONCLUSION

The system is successfully built and run in reality based on Technology Acceptance Modeling. The output for the given analog input values are visualized in android application system. The analog value given by the sensor changes it into a digital value. The android software is already working properly and appropriate with the purpose in the beginning, that is to get humidity value from green house and give input to control components in green house. After development is finished, test for sensor's work is done and device is working properly. The testing that has done shows that condition in datasheet of sensor and in system is appropriate. The test result shows in temperature 30°C to 70°C, humidity is still in normal range area. If temperature gets higher and more, relative humidity will be decrease and goes near to zero. The system has successfully overcome quite a few shortcomings of the existing systems by reducing the power consumption, maintenance and complexity, at the same time providing a flexible and precise form of maintaining the environment.

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