IOT Based Automated Irrigation System Using a Wireless Sensor Network and GPS Module

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Abstract:

Agriculture continues to play a major role in Indian Economy. Agriculture Sector is changing the socio-economic environments of the population due to liberalization and globalization. Irrigation system in India has given a high priority in economic development. Many new concepts are being developed to allow agricultural automation to flourish and deliver its full potential This project implements atomization of agricultural environment for social modernization of Indian agricultural system using ARM7 is focused on atomizing the irrigation system for social welfare of Indian agricultural system. The project is implemented by using advanced processor ARM7TDMI which is a 32 bit microprocessor, IoT serves as an important part as it gets all the information about the farm. IoT module is connected to make the information available in web.

In this project we are using LPC2148, humidity sensor, traic boards in combination with MOC 3021 based opto coupler which acts as a driver, Temperature sensor, LDR. The status can be displayed on 16X2 LCD. To check the status of day and night mode we are using LDR sensor. The status of LDR can be displayed on LCD. This project uses regulated 3.3V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

I. Introduction:

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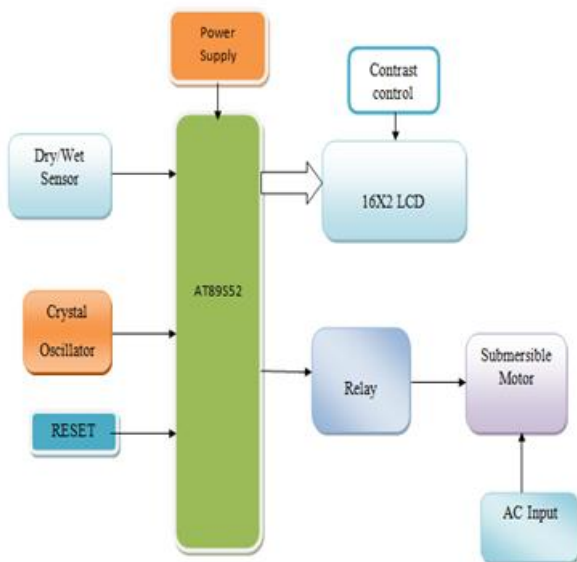
BLOCK DIAGRAM
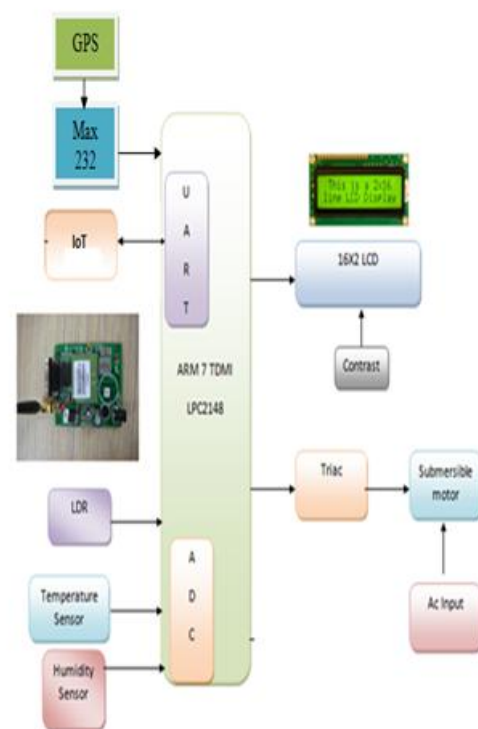
II. Literature survey:
Existing method:

The project irrigation control using AT89S52 is designed to tackle the problems of agricultural sector regarding irrigation system with available water resources.

Prolonged periods of dry climatic conditions due to fluctuation in annual precipitation, may appreciably reduce the yield of the cultivation. The expenses in establishing many of these crops and their relative intolerance to drought make an effective irrigation system a necessity for profitable enterprises. In this project we are using AT89S52, Moisture sensors, AC submersible pump, relay driver. A submersible motor will get switched ON /OFF depending on the soil moisture condition and status of motor can be displayed on 16X2 LCD.

With their compact 64 pin package, low power consumption, various 32-bit timers, 4- channel 10-bit ADC, USB PORT,PWM channels and 46 GPIO lines with up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale. With a wide range of serial communications interfaces, they are also very well suited for communication gateways, protocol converters and embedded soft modems as well as many other general-purpose applications.

Figure4: Architecture

ARM PROCESSOR:
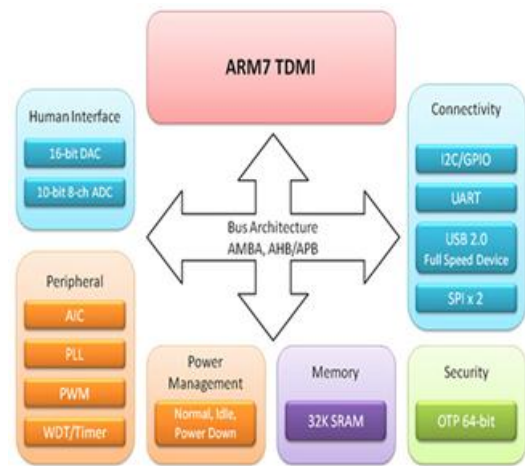

Figure5: ARM7 board

Drawback:

Only one sensor is used and there is no remote monitoring.

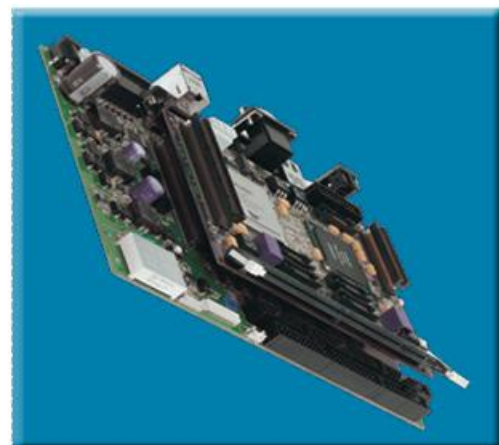**III.   Hardware modules**

1.   LPC2148 controller:

The **LPC2148** are based on a 16/32 bit ARM7TDMI-S™ CPU with real-time emulation and embedded trace support, together with 128/512 kilobytes of embedded high speed flash memory. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at maximum clock rate. For critical code size applications, the alternative 16-bit Thumb Mode reduces code by more than 30% with minimal performance penalty.

2.LM35
FEATURES DESCRIPTION

• Calibrated Directly in ° Celsius (Centigrade)

• Linear + 10 mV/°C Scale Factor • 0.5°C Ensured Accuracy (at +25°C) • Rated for Full −55°C to +150°C Range

• Suitable for Remote Applications

• Low Cost Due to Wafer-Level Trimming

• Operates from 4 to 30 V

• Less than 60-μA Current Drain

• Low Self-Heating, 0.08°C in Still Air

• Nonlinearity Only ±¼°C Typical

• Low Impedance Output, 0.1 Ω for 1 mA Load

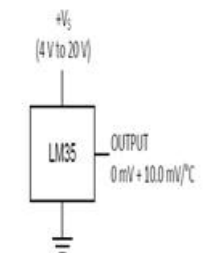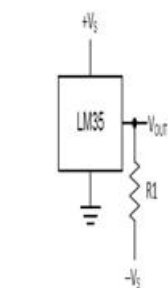Figure 1. Basic Centigrade Temperature Sensor (+2°C to +150°C)

Figure 2. Full-Range Centigrade Temperature Sensor

3. Humidity(Dry and Wet) sensor

Soil moisture sensors measure the water content in soil. A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use is a Frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilize the moderator properties of water for neutrons. Cheaper sensors - often for home use- are based on two electrodes measuring the resistance of the soil. Sometimes this simply consists of two bare (galvanized) wires, but there are also probes with wires embedded in gypsum. **Internet of things** helps the things to communicate each other using IoT module

ESP8266EX

➤ The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data.
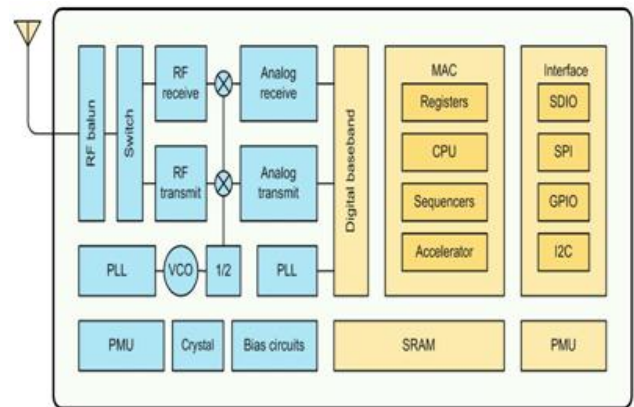

Different Modules

➤ ESP8266(ESPRESSIF)

➤ ESP8089

➤ ESP6203

Wi-Fi module:

ESP8266EX offers a complete and self-contained WiFi networking solution; it can be used to host the application or to offload WiFi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications. Alternately, serving as a WiFi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated WiFi chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the WiFi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs; sample codes for such applications are provided in the software development kit (SDK).
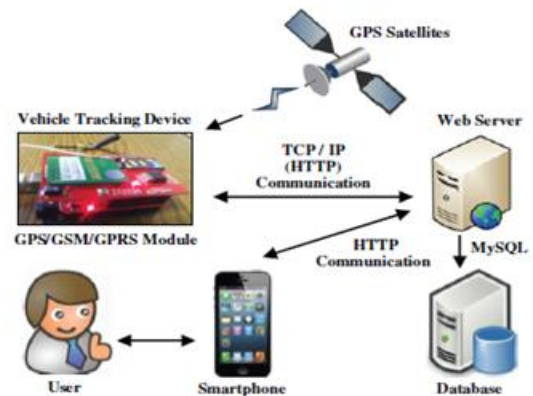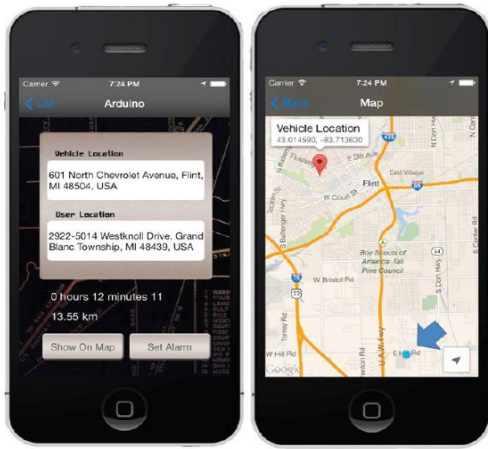

Basic concept of GPS

A GPS receiver calculates its position by precisely timing the signals sent by the GPS satellites high above the Earth. Each satellite continually transmits messages which include

- the time the message was transmitted
- precise orbital information (the ephemeris)
- The general system health and rough orbits of all GPS satellites (the almanac).

IV. SOFTWARE DETAILS
A. Keil compiler

Keil compiler is a software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. Keil compiler also supports C language code.

V. ADVANTAGES:

Device can be implemented with low cost, easy maintenance and human effort is reduced.

VI. CONCLUSION:

This project is implemented by using advanced processor ARM7TDMI which is a 32 bit microprocessor, IoT has important part as it is responsible for updating all the information.

References

a. W.A. Jury and H. J. Vaux , "The emerging global water crisis: Managing scarcity and conflict betweenwater users" , Adv. Agronomy , vol. 95 , pp.1 -76 , 2007

b. X. Wang , W. Yang , A. Wheaton , N. Cooley and B. Moran , "Efficient registration of optical and IR images for automatic plant water stressassessment" , Comput. Electron. Agricult. , vol. 74 , no. 2 , pp.230 -237 , 2010

c. G. Yuan , Y. Luo , X. Sun and D. Tang , "Evaluation of acrop water stress index for detecting water stress in winter wheat in the North China Plain" , Agricult. Water Manag. , vol. 64 , no. 1 , pp.29 -40 , 2004

d. S. B. Idso , R. D. Jackson , P. J. PinterJr. , R. J. Reginato and J. L. Hatfield , "Normalizing the stress-degree-day parameter for environmental variability" , Agricult. Meteorol. , vol. 24 , pp.45 - 55 , 1981

e. Y. Erdem , L. Arin , T. Erdem , S. Polat , M. Deveci , H. Okursoy and H. T. G¿¿ltas , "Crop water stress index for assessing irrigation scheduling of dripirrigated broccoli (Brassica oleracea L. var. italica)" , Agricult. WaterManag. , vol. 98 , no. 1 , pp.148 -156 , 2010

f. K. S. Nemali and M. W. Van Iersel , "An automated system for controlling drought stress and irrigation in potted plants" , Sci. Horticult. , vol. 110 , no. 3 , pp.292 -297 , 2006

g. S. A. O'Shaughnessy and S. R. Evett , "Canopy temperature based system effectively schedules and controls centerpivot irrigation of cotton" , Agricult. Water Manag. , vol. 97 , no. 9 , pp.1310 -1316 , 2010

h. R. G. Allen , L. S. Pereira , D. Raes and M. Smith , Crop Evapotranspiration-Guidelines for Computing Crop Water Requirements¿¿¿FAO Irrigation and Drainage Paper56 , 1998 :FAO

i. S. L. Davis and M. D. Dukes , "Irrigation scheduling performance byevapotranspiration-based controllers" , Agricult. Water Manag. , vol. 98 , no. 1 , pp.19 -28 , 2010

j. K. W. Migliaccio , B. Schaffer , J. H. Crane and F. S. Davies , "Plant response to evapotranspiration and soil water sensor irrigationscheduling methods for papaya production in south Florida" .
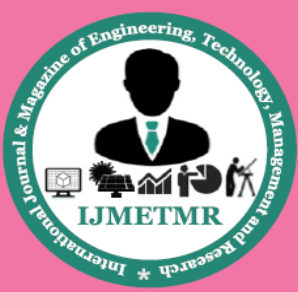
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