International Journal of Research In Science & Engineering e-ISSN: 2394-8299
Volume: 2 Issue: 3 March-April 2017 p-ISSN: 2394-8280

SMART IRRIGATION SYSTEM IN RURAL AREAS USING ATMEGA328 MICROCONTROLLER:(DESIGN)

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Abstract—With the increased in technology threat to personal data and national security had also increased. There was a need to introduced a technology that secures our data more efficiently the smart irrigation is the technology which we can use in fields. Our present work is to develop Smart irrigation in rural areas using Atmega328 microcontroller. Monitoring of environmental factors has increased in importance of water level management to increase the underwater level. In agricultural environment we have to consider various factors such as temperature, moisture content available in the soil depends on that the water flow will be allowed and the amount of water flow range and amount of pressure to be retrieved, attendance, and security.

Keywords: Agriculture, Microcontroller, monitoring system, wireless sensors.

I. INTRODUCTION

The Internet of things (stylised Internet of Things or IoT) is the internetworking of physical devices, vehicles (also referred to as connected devices and smart devices), buildings, and other itemsembedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.In 2013 the Global Standards Initiative on Internet of Things (IoT-GSI) defined the IoT as the infrastructure of the information society.The IoT allows objects to be sensed and/or controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit in addition to reduced human intervention.When IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyberphysical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020. SMAC (social, mobile, analytics and cloud) is the concept that four technologies are currently driving business innovation. SMAC creates an ecosystem that allows a business to improve its operations and get closer to the customer with minimal overhead and maximum reach. The proliferation of structured and unstruc-tured data that is being created by mobile devices, sensors, social media, loyalty card programs and website browsing is creating new business models built upon customer-generated data. None of the four technologies can be an afterthought because its the synergy created by social, mobile, analytics and cloud working together that creates a competitive advantage. Today, new, inventive, better integrated ways of doing business are being conceived, designed and delivered at lightning speed. Examples include intelligent supply-chain logistics, the smart phones disruption of the GPS market, and integrated, intelli-gent cities. Companies are taking advantage of the massive im-pact of I-

SMAC our acronym for the synthesis and integration of the Internet of Things, Social Media, Mobility,Analytics and the Cloud.

Fig. 1. I-SMAC

II. DESIGN

In the proposed system, there is ATMEGA328 Microcon-troller, GSM/GPRS module sim800. Proposed system consist of various sensors- .LM35 temperature sensor .PIR motion sensor .DHT11 humidity sensor .Water level sensor .SEN-13322 soil moisture and humidity sensor

A. ATMEGA328 Microcontroller

The Atmel picoPower ATmega328/P is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC ar-chitecture. By executing powerful instructions in a single clock cycle, the ATmega328/P achieves throughputs close to 1MIPSper MHz. This empowers system designer to op-timize the device for power consumption versus processing speed. Features High Performance, Low Power Atmel AVR 8-Bit Microcontroller Family Advanced RISC Architecture 131 Powerful Instructions Most Single Clock Cycle Exe-cution 32 x 8 General Purpose Working Registers Fully Static Operation Up to 20 MIPS Throughput at 20MHz On-chip 2-cycle Multiplier High Endurance Non-volatile Memory Segments 32KBytes of In-System Self-Programmable Flash program Memory 1KBytes EEPROM 2KBytes Internal SRAM Write/Erase Cycles: 10,000 Flash/100,000 EEPROM Data Retention: 20 years at 85C/100 years at 25C(1) Optional Boot Code Section with Independent Lock Bits In-System Programming by On-chip Boot Program True Read-While-Write Operation Programming Lock for Software Security Atmel QTouch Library Support Capacitive Touch Buttons, Sliders and Wheels QTouch and QMatrix Acquisition Up to 64 sense channels. Peripheral Features Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode Real Time Counter with Separate Oscillator Six PWM Channels 8-channel 10-bit ADC in TQFP and QFN/MLF package Temperature Measurement 6-channel 10-bit ADC in PDIP Package Temperature Measurement Two Master/Slave SPI Serial Interface One Programmable Serial USART One Byte-oriented 2-wire Serial Interface (Philips I2C compatible) Programmable Watchdog Timer with Separate On-chip Oscillator One On-chip Analog Comparator Interrupt and Wake-up on Pin Change Special Microcontroller Fea-tures Power-on Reset and Programmable Brownout Detection Internal Calibrated Oscillator External and Internal Interrupt Sources Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby, and Extended Standby I/O and Packages 23 Programmable I/O Lines28-pin PDIP, 32-lead TQFP, 28-pad QFN/MLF and 32-pad QFN/MLF Operating Voltage: 1.8 - 5.5V Temperature Range: -40C to 105C Speed Grade: 0 - 4MHz @ 1.8 - 5.5V 0 - 10MHz @ 2.7 - 5.5V 0 - 20MHz @ 4.5 - 5.5V Power Consumption

at 1MHz, 1.8V, 25C Active Mode: 0.2mA Power-down Mode: 0.1A Power-save Mode: 0.75A (Including 32kHz RTC) The high-performance Atmel 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1KB EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts,serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

B. GPRS/GSM MODULE SIM800

The SIM800 modem has a SIM800 GSM chip interface while enables easy connection with the computer or laptop using the USB to Serial connector or to the microcontroller using the RS232 to TTL converter. SIM800 - GSM/GPRS module Designed for global market, SIM800 is a quad-band GSM/GPRS module that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. Spec-ifications: SIM800 Quad Band GSM Module Voltage Supply Required- 9VDC to 12VDC with atleast 2A Peak Current Capability TTL Rx and TTL Tx and DB9 Connector Based RS232 Outputs External Finger type antenna Switching Reg-ulator Based Power Supply Features: Bands: GSM 850MHz, EGSM 900MHz, DCS 1800MHz, PCS 1900MHz Coding schemes: CS-1, CS-2, CS-3, CS-4 Tx power: Class 4 (2W), Class 1 (1W) Small package: 23 * 23 * 3mm Low power: down to 1mA in sleep mode TCP/IP AT firmware Operating temperature: -40C to +85C Audio channels which include a microphone input and a receiver output.One SIM card interface

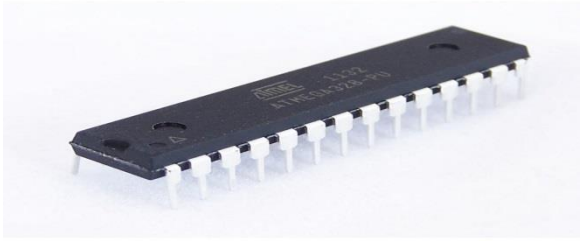

Fig. 3. ATMEGA328 Microcontroller

Fig. 4. GPRS/GSM Module sim800

III. SENSORS

A. LM35 Temperature sensor

0.5C Temperature Sensor with Analog Output with 30V Ca-pability. The LM35 series are precision integrated-circuit tem-perature devices with an output voltage linearly-proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trim-ming to provide typical accuracies of C at room temperature and C over a full -55C to 150C temperature range. Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 A from the supply, it has very low self-heating of less than 0.1C in still air. The LM35 device is rated to operate over a -55C to 150C temperature range, while the LM35C device is rated for a -40C to 110C range (-10 with improved accuracy). The LM35-series devices are available packaged in hermetic TO transistor packages, while the LM35C, LM35CA, and LM35D devices are available in the plastic TO-92 transistor package. The LM35D device is available in an 8-lead surface-mount small-outline package and a plastic TO-220 package.

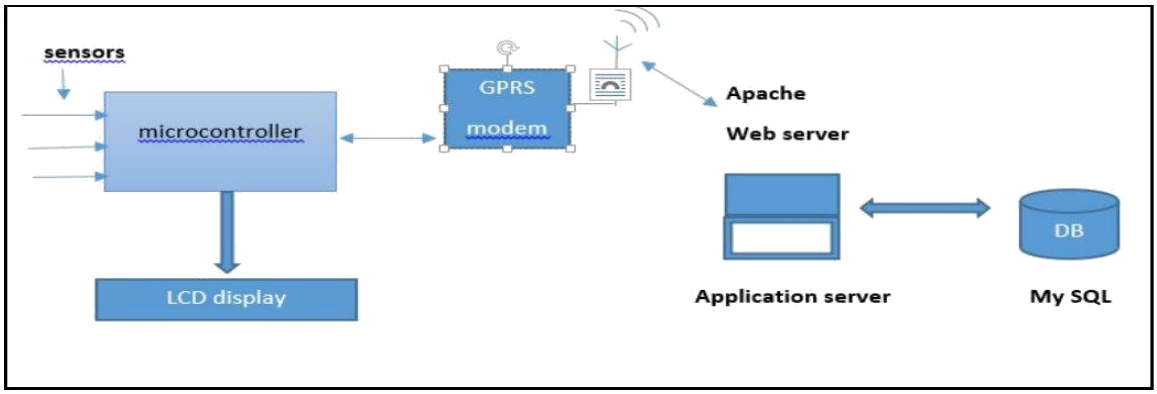

Fig. 2. Proposed System

Fig. 5.LM35 Temperature sensor

Features Calibrated Directly in Celsius (Centigrade) Linear + 10-mV/C Scale Factor 0.5C Ensured Accuracy (at 25C) Rated for Full -55C to 150C Range Suitable for Remote Applications Low-Cost Due to Wafer-Level Trimming Operates from 4 V to 30 V Less than 60-A Current Drain Low Self- Heating, 0.08C in Still Air Non-Linearity Only C Typical Low-Impedance Output, 0.1 O for 1-mA Load Fig. 6.

B. PIR Motion sensor

PIR sensors allow you to sense motion, almost always used to detect whether a human has moved in or out of the sensors range. They are small, inexpensive, low-power, easy to use and dont wear out. For that reason they are commonly found in appliances and gadgets used in homes or businesses. They are often referred to as PIR, Passive Infrared, Pyroelectric, or IR motion sensors. PIRs are basically made of a pyroelectric sensor (which you can see above as the round metal can with a rectangular crystal in the center), which can detect levels of infrared radiation. Everything emits some low level radiation, and the hotter something is, the more radiation is emitted. The sensor in a motion detector is actually split in two halves. The reason for that is that we are looking to detect motion (change) not average IR levels. The two halves are wired up so that they cancel each other out. If one half sees more or less IR radiation than the other, the output will swing high or low. Along with the pyroelectic sensor is a bunch of supporting circuitry, resistors and capacitors. It seems that most small hobbyist sensors use the BISS0001 (Micro Power PIR Motion Detector IC), undoubtedly a very inexpensive chip. This chip takes the output of the sensor and does some minor

Fig. 6.PIR sensor

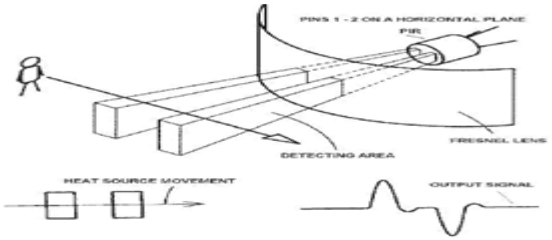

Fig. 7.Working of PIR Sensor

processing on it to emit a digital output pulse from the analog sensor. For many basic projects or products that need to detect when a person has left or entered the area, or has approached,

PIR sensors are great. They are low power and low cost, pretty rugged, have a wide lens range, and are easy to interface with. Note that PIRs wont tell you how many people are around or how close they are to the sensor, the lens is often fixed to a certain sweep and distance (although it can be hacked somewhere) and they are also sometimes set off by house pets. Experimentation is key! Some basic stats These stats are for the PIR sensor in the Adafruit shop which is very much like the Parallax one. Nearly all PIRs will have slightly different specifications, although they all pretty much work the same. If theres a datasheet, youll want to refer to it Size: Rectangular Output: Digital pulse high (3V) when triggered (motion detected) digital low when idle (no motion detected). Pulse lengths are determined by resistors and capacitors on the PCB and differ from sensor to sensor. Sensitivity range: up to 20 feet (6 meters) 110 degrees x 70 degrees detection range Power supply: 3.3V - 5V input voltage.

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C. DHT11 humidity sensor

Fig. 8. DHT11 humidity sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a
The Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. The more water that is in the soil means the better the conductivity between the pads will be and will result in a lower resistance, and a higher SIG out. To get the SparkFun Soil Moisture Sensor functioning all you will need is to connect the VCC and GND pins to your Arduino-based device (or compatible development board) and you will receive a SIG out which will depend on the amount of water in the soil. One commonly known issue with soil moisture senors is their short lifespan when exposed to a moist environment. To combat this, weve had the PCB coated in Gold Finishing (ENIG or Electroless Nickel Immersion Gold). We recommend either a simple 3-pin screw pin terminal or a 3-pin jumper wire assembly (both can be found in the Recommended Products section below) to be soldered onto the sensor for easy wiring. There is a new technique which we are going to use that is motor starting using android application.

Fig. 9. SEN-13322 Soil moisture and humidity sensor

IV. ALGORITHMS

The MD5 algorithm is a widely used hash function pro-ducing a 128-bit hash value. Although MD5 was initially designed to be used as a cryptographic hash function, it has been found to suffer from extensive vulnerabilities. It can still be used as a checksum to verify data integrity, but only A and B. against unintentional corruption. Like most hash functions,MD5 is neither encryption nor encoding. It can be reversed by brute-force attack and suffers from extensive vulnerabilities as detailed in the security section below. MD5 processes a variable-length message into a fixed-length output of 128 bits. The input message is broken up into chunks of 512-bit blocks (sixteen 32-bit words); the message is padded so that its length is divisible by 512. The padding works as follows: first a single bit, 1, is appended to the end of the message. This is followed by as many zeros as are required to bring the length of the message up to 64 bits fewer than a multiple of 512. The remaining bits are filled up with 64 bits representing the length of the original message, modulo 264. The main MD5 algorithm operates on a 128-bit state, divided into four 32-bit words, denoted A, B, C, and D. These are initialized to certain fixed constants. The main algorithm then uses each 512-bit message block in turn to modify the state. The processing of a message block consists of four similar stages, termed rounds; each round is composed of 16 similar operations based on a non-linear

function F, modular addition, and left rotation. Figure 1 illustrates one operation within a round. There are four possible functions F; a different one is used in each round

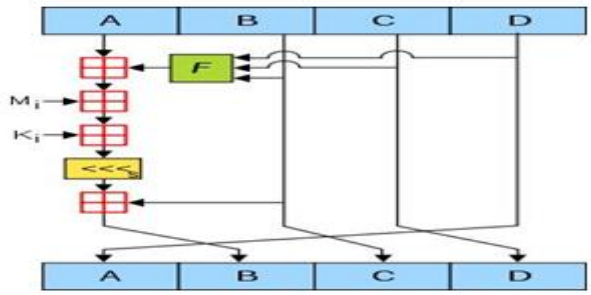

Fig. 10. MD5

The SHA (Secure Hash Algorithm) is one of a number of cryptographic hash functions. A cryptographic hash is like a signature for a text or a data file. SHA-256 algorithm generates an almost-unique, fixed size 256-bit (32-byte) hash. Hash is a one way function it cannot be decrypted back. SHA-256 (secure hash algorithm, FIPS 182-2) is a cryptographic hash function with digest length of 256 bits. It is a keyless hash function; that is, an MDC (Manipulation Detection Code). A message is processed by blocks of 512 = 16 32 bits, each block requiring 64 rounds. Basic operations Boolean operations AND, XOR and OR. Bitwise complement, denoted by . Integer addition modulo 232, denoted by A + B. Each of them operates on 32-bit words. For the last operation, binary words are interpreted as integers written in base 2. RotR(A, n) denotes the circular right shift of n bits of the binary word A. ShR(A, n) denotes the right shift of n bits of the binary word A. AkB denotes the concatenation of the binary words

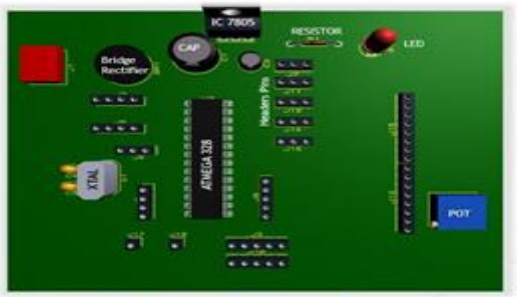

Fig. 11. Proposed System

V. SERVER MONITORING

Fig. 12. Connectivity

After creating the hardware part of the project each and every hardware is connected to the people with the help of the internet of things(IOT).Software part will be created with the help of php, mysql, html, css.For database php and mysql. Web browsers are software applications that allow users to retrieve data and interact with content located on web pages within a website.Web applications are, therefore, computer programs allowing website visitors to submit and retrieve data to/from a database over the Internet using their preferred web browser. The data is then presented to the user within their browser as information is generated dynamically (in a specific format, e.g. in HTML using CSS) by the web application through a web server.

VI. CONCLUSION

Thus the smart irrigation system based on wireless network of sensors will be developed. As our project is sponsored by Grampanchayat (Dahegaon gondi), we have good opportunity to develop a system that will be installed in farms for the analysis of collected data. Thus by developing such system will be a small step to support Digital India.

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