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WATER QUALITY MONITORING MANAGEMENT AND DISTRIBUTION FOR SMART CITIES

M. Karthikeyan, M. Saranya, P. vishnu

Electronics and Instrumentation Engg

K .S.Rangasamy college of technology Namakkal, Tamil Nadu

karthiemb25@gmail.com

Mr.T. Baranidharan,M.E.,phD

Electronics and Instrumentation Engg

K .S.Rangasamy college of technology Namakkal, Tamil Nadu

baraniinst@gmail.com

Abstract-The proposed system automatically distribute equal amount of municipal water to house tank every day. The process also includes leakage detection in pipeline. Through Radio Frequency at a range of 433MHz is used for controlling and monitoring the process. Reliance 4 SCADA Software is used for monitoring and controlling the process. Automatic SMS program is dumped in order to send SMS to the house owner through GSM800a module if water is filled. An Emergency water pump is installed for emergency use. People can get additional 100 litres if they need beyond their regular water supplied.

Keywords: level sensor, flow sensor, scada, GSM module, RF module.

I-INTRODUCTION

Introduction- Water is the important resources of all living things in the earth. In some people are not getting the sufficient amount of water because of unequal distribution of water. Today tank level control system is found to be common. In smart cities the people are not getting equal amount of water. In the conventional method needs man power to control needed to plant where everything should have to manually monitor. So many technologies have increased for this process. By using different type of controllers like P, PI, PID controller etc. The other Technology like PLC, embedded are going popularly in which the controlling unit is mainly in a separate location and controlled by a control panel. Thus, a sudden change in the tank level from the field is difficult to control.

In our project it is mainly used to monitoring and distribution. In that the cities can have only the limited amount of water. our proposed system is when the water from the main tank is connected to the sub tank by the solenoid valve. The flow sensor is used measure the level of water. Our system is mainly interfaced with the SCADA.

II-SYSTEM DESCRIPTION

A literature review discusses the project information in a particular subject area within a certain time period. Collecting information from other resources such as journal, articles, books summarize the needed and object of the project.

Our proposed system is mainly consists of three parts. They are control and monitoring, water distribution and leakage detection. The control

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monitoring and water distribution is mainly connected with the RF module.

In that monitoring and control the main water tank is connected to the micro controller through the signal from signal float switch. Here we are using the 3-channel relay. The RF transmitter can get the instruction from the micro controller. SCADA is mainly used for controlling and monitoring purposes.

In that water distribution part the area water tank is connected to the pipes. By using the flow sensor the flow of water can be measured. In that also the tank is connected to the microcontroller. Here the level of water tank is measured by using the ultrasonic sensor. The microcontroller can send the intimation command to the GSM module. The microcontroller can get the information through the receiver.

The leakage can be detected by using the flow sensor. They are connected to the micro controller. It can be seen in the LCD display.

III-METHODOLOGY

The methodology in this project consist of hardware and software interfacing components.

GSM Module:

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz. The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip(MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply . Using this modem, you can make audio calls, SMS, Read SMS, attend the incoming calls and internet ect through simple AT commands.

RF module:

There are three Wireless RF Modules, Transmitter, Receiver and a Transceiver. These RF Modules aredesigned to serve as a tool for electronic design engineers, developers, hobbyists and students to perform wireless experiments. These modules make it easy for any NON RF Experienced developer to add Wireless RF Remote Control to their project. NO RF Knowledge required. The RF Modules are in a PCB (Printed Circuit Board) form with a 17 Pin 0.1 Inch spacing header that fits directly into most all prototyping boards. They are easy to use boards that include encoders, decoders, addressing, RF data processing and even the antenna, in a simple fully range tested board that is ready to plug right into your project. Just apply +5VDC, ground, and the communication pins you require and enjoy hassle free wireless communications. The Transmitter, Receiver and Transceiver all have 9600 baud serial interfaces and standalone, 3 function switch inputs and outputs. The modules can communicate over distances up to 250 feet. The boards operate on +5V and easily interface to your Basic Stamp 2 or Basic Stamp 2sx.

Ultrasonic sensor:

Ultrasonic transmitter emitted an ultrasonic wave in one direction, and started timing when it launched. Ultrasonic spread in the air, and would return immediately when it encountered obstacles on the way. At last, the ultrasonic receiver would stop timing when it received the reflected wave. As Ultrasonic spread velocity is 340m / s in the air, based on the timer record t, we can calculate the distance (s) between the obstacle and transmitter, namely: s = 340t/2, which is so called time difference distance measurement principle.

Distance Measurement formula is expressed as: L= CXT. In the formula, L is the measured distance, and

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C is the ultrasonic spreading velocity in air, also, T represents time (T is half the time value from transmitting to receiving).

The principle of ultrasonic distance measurement used the already-known air spreading velocity, measuring the time from launch to reflection when it encountered obstacle, and then calculate the distance between the transmitter and the obstacle according to the time and the velocity. Thus, principleof ultrasonic distance measurement is the same with radar.

Flow sensor:

Measure liquid/water flow for your solar, water conservation systems, storage tanks, water recycling home applications, irrigation systems and much more. The sensors are solidly constructed and provide a digital pulse each time an amount of water passes through the pipe. The output can easily be connected to a microcontroller for monitoring water usage and calculating the amount of water remaining in a tank etc.

Solenoid valve:

This solenoid can be actuated down at 6VDC (although it was a little slower to open). Here is the current draw table for various voltages. We suggest a TIP120 or N-Channel power FET with a 1N4001 kickback diode to drive this from a microcontroller pin. For a power supply, a 9V 1A or 12V 1A power adapter will do the job. If you want a beefier water valve, we also carry a brass version which does not

Controlling unit:

TheATmega328Pprovidesthefollowing features: 4K/8K/16K/32KbytesofIn-System ProgrammableFlashwithRead-While-Write capabilities,256/512/512/1Kbytes EEPROM,512/1K/1K/2KbytesSRAM, 23generalpurpose I/Olines,32general purpose workingregisters,threeflexibleTimer/Counters withcomparemodes,internalandexternal interrupts,aserialprogrammableUSART, abyte-oriented2-wireSerialInterface,anSPIserial port,a6-channel 10-bitADC(8channelsinTQFPandQFN/MLF packages),aprogrammable WatchdogTimerwithinternalOscillator,andfivesoftwar eselectablepower savingmodes.The IdlemodestopstheCPUwhileallowingtheSRAM,Timer /Counters,USART,2-wireSerialInter-face,SPIport,andinterruptsystemtocontinue functioning.ThePower-downmodesavesthe registercontentsbutfreezestheOscillator,disablingallot her chipfunctionsuntil thenextinterruptorhardwarereset.InPower-savemode,the asynchronoustimer continuestorun,allowing theusertomaintainatimerbasewhiletherestofthedevicei ssleeping.TheADCNoiseReductionmodestopstheCP Uand allI/Omodulesexceptasynchronoustimerand ADC,to minimize switchingnoiseduringADCconversions.InStandbym ode,thecrystal/resonatorOscillatoris runningwhilethe

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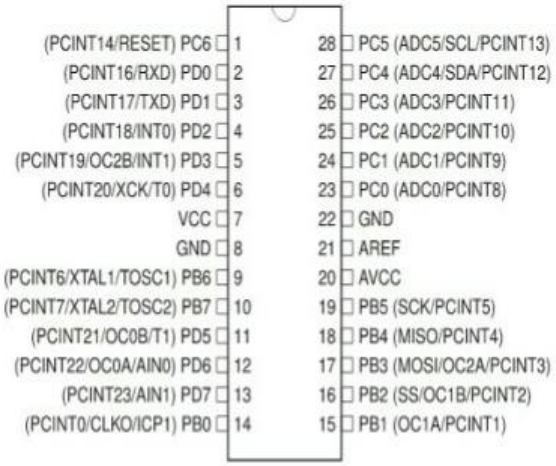
rest ofthe deviceis sleeping.Thisallowsveryfaststart-upcombinedwithlow powerconsumption.



ThedeviceismanufacturedusingAtmel'shighdensityn on-volatilememorytechnology.The On-chip ISPFlashallowstheprogram memory tobereprogrammed.In-Systemthrough anSPI serialinterface,byaconventionalnon-volatilememoryprogrammer,orbyan On-chipBootprogramrunningonthe AVRcore.TheBootprogramcanuseanyinterfaceto download the application programintheApplication Flashmemory.SoftwareintheBootFlashsection will continuetorunwhiletheApplicationFlashsection isupdated,providingtrueRead-While-Write operation.Bycombiningan8-bitRISCCPUwithIn-SystemSelf-ProgrammableFlash ona monolithic chip,theAtmelATmega328Pisapowerful microcontrollerthatprovidesahighlyflexibleandcostef fectivesolutiontomanyembeddedcontrolapplications.

TheATmega328PAVRissupportedwithafullsuiteofp rogramandsystem developmenttoolsincluding:CCompilers,MacroAsse mblers,Program debugger/Simulators, In-CircuitEmulators,andEvaluationkits.

Arduino:

Arduinois a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNULesserGeneralPublicLicense (LGPL) or the GNUGeneralPublicLicense (GPL),[1] permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits.

The project's board designs use a variety of microprocessors and controllers. These systems provide sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ("shields") and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, for loading programs from personal computers. The microcontrollers are mainly programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler toolchains, the Arduino project provides an integrateddevelopmentenvironment (IDE) based on the Processinglanguage project.

The Arduino project started in 2005 as a program for students at the InteractionDesignInstituteIvarea in Ivrea, Italy,[2] aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, andmotiondetectors.

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Proteus Design Suite:

TheProteus Design Suite is an Electronic Design Automation (EDA) tool including schematic capture, simulation and PCB Layout modules. It is developed in Yorkshire, England by Labcenter Electronics Ltd with offices in North America and several overseas sales channels. The software runs on the Windows operating system and is available in English, French, Spanish and Chinese languages..

Product Modules:

The Proteus Design Suite is a Windows application for schematic capture, simulation, and PCB layout design. It can be purchased in many configurations, depending on the size of designs being produced and the requirements for microcontroller simulation. All PCB Design products include an autorouter and basic mixed mode SPICE simulation capabilities.

Microcontroller Simulation:

The micro-controller simulation in Proteus works by applying either a hex file or a debug file to the microcontroller part on the schematic. It is then co-simulated along with any analog and digital electronics connected to it. This enables it's used in a broad spectrum of project prototyping in areas such as motor control,[1][2] temperature control [3][4] and user interface design.[5] It also finds use in the general hobbyist community[6][7] and, since no hardware is required, is convenient to use as a training[8][9] or teaching tool.[10][11] Support is available for co-simulation of:

- Microchip Technologies PIC10, PIC12, PIC16,PIC18,PIC24,dsPIC33 Microcontrollers.
- Atmel AVR (and Arduino), 8051 and ARM Cortex-M3 Microcontrollers
- NXP 8051, ARM7, ARM Cortex-M0 and ARM Cortex-M3 Microcontrollers.
- Texas Instruments MSP430, PICCOLO DSP and ARM Cortex-M3 Microcontrollers.
- Parallax Basic Stamp, Freescale HC11, 8086 Microcontrollers.

PCB Design:

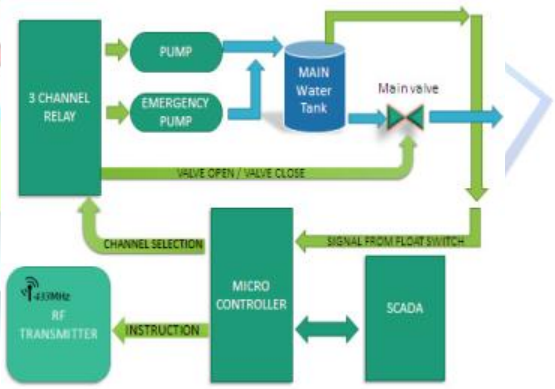
The PCB Layout module is automatically given connectivity information in the form of a netlist from the schematic capture module. It applies this information, together with the user specified design rules and various design automation tools, to assist with error free board design. Design Rule Checking does not include high speed design constraints.[12] PCB's of up to 16 copper layers can be produced with design size limited by product configuration.

3D Verification:

The 3D Viewer module allows the board under development to be viewed in 3D together with a semi-transparent height plane that represents the boards enclosure. STEP output can then be used to transfer to mechanical CAD software such as Solidworks or Autodesk for accurate mounting and positioning of the board.

IV- BLOCK DIAGRAM

MONITORING AND CONTROLLING



In that the main water tank is connected to the main valve. Here the signal can be send from the float switch to the micro controller. In that the RF transmitter can get the instruction from the micro controller. The SCADA is mainly used for monitoring and controlling process.

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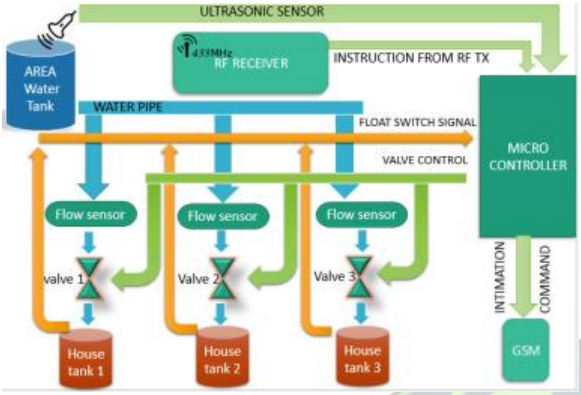
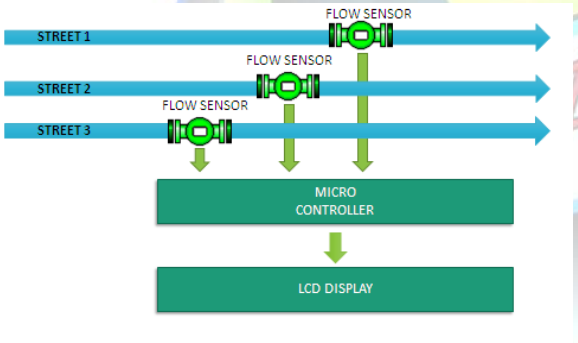


DISTRIBUTION

In this process the area water tank is connected to the micro controller it get signal from the float switch. Here the flow sensor is used to measure the flow of water. The level of water is measured by using ultrasonic sensor. The micro controller can get the instruction from the RF receiver.

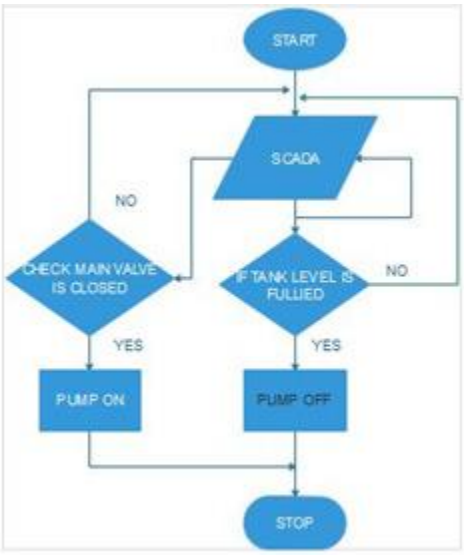


LEAKAGE DETECTION

In that leakage of water can be identified by using the flow sensor. The sensor can be connected to the microcontroller. The micro controller is interfaced with the LCD display for the output.

V-FLOW CHART

MONITORING AND CONTROLLING



The system starting with the SCADA process. It is mainly used to monitor the overview of the entire process. In that if the tank level is filled the pump will be turned off and it stops. If the condition is false it check the main valve is closed it turned to pump on and it goes stop condition.

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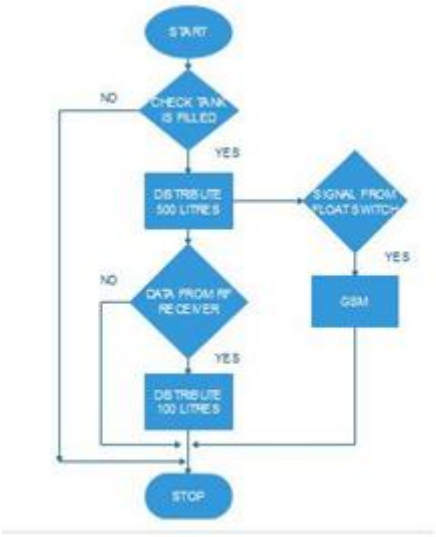
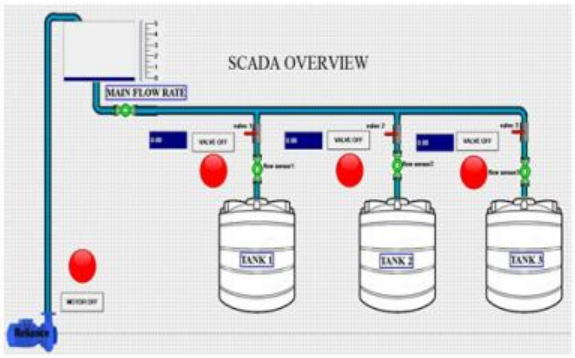


In that distribution the process starting from whether the tank is filled or not. If the condition is true it distribute 500 liters of water and it get signal from the float switch. And if the people need extra amount of water they indicate in the GSM module. Suppose if the condition is false they get the information from RF receiver and distribute the 100 liters of extra water if they need.

VI-CONCLUSION

In conclusion, the effective low cost automation system for water distribution process. The automation intimation for people about their water tank level. And then the automatic household water tank filling. And finally easy way to find the leakage detection in pipeline.

SYSTEM OVERVIEW



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