

Automation and Monitoring in Farming

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Abstract: Farming plays an ultimate role for survival in this world. It provides maximum food requirement for the human being to live in this world. But in this era of advance technologies with invention of IoT, The Automation is replacing the traditional methods which gives huge range of improvement in the Fields. In this project we are using various parameters like soil moisture sensing prob, water level sensing prob, motion sensor , humidity and temp sensor. By using all this sources we are building solar based advanced automation smart farming . It will support farmers do farming quiet easier and also save human struggle and reduces their expenses. Farmers can operate all this parameters from anywhere using GSM module.

Keywords: Farming

I. INTRODUCTION

Automation & Monitoring in Farming is a concept to build a smart farming automation & monitoring system which can monitor various parameters of farming such as surrounding temperature, surrounding humidity, soil moisture level, water tank level, surrounding motion, etc. with the help of various sensors like DHT11 temperature + humidity sensor, PIR motion sensor, soil moisture sensing probes, water-level sensing probes, etc. In order to control various output devices/machines & give alert message over GSM/SMS the system monitors and processes various parameters/data from different sensors whenever events like motion detection, empty water tank, & excess wetness level of soil occurs. This system also consists of buzzer/sounder which beeps/sounds in case if movement is getting found to keep animals & predators away from farms and crops.

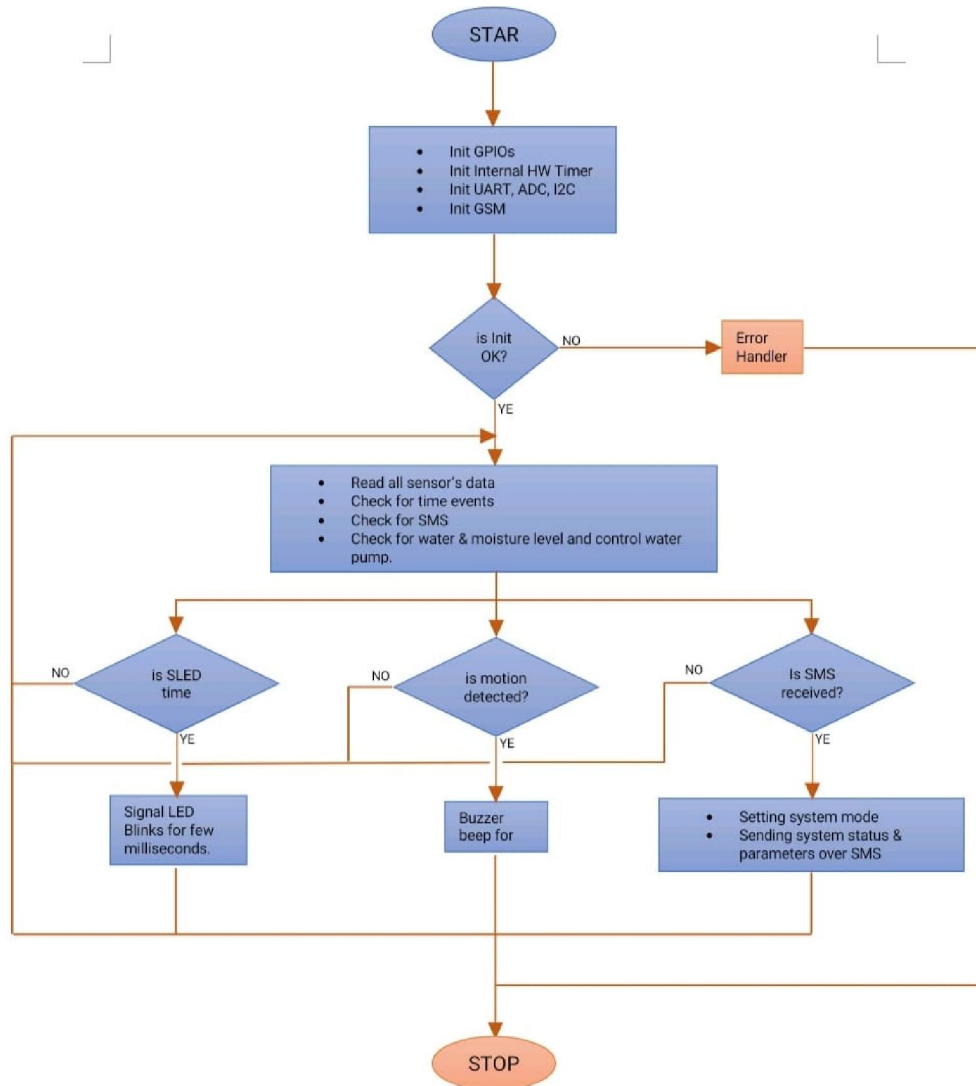
With the help of soil moisture sensor this system automatically identifies soil moisture level and controls water pump accordingly. It is also integrated with water level sensor which senses water tank level and gives indication accordingly. For monitoring purpose an 16x2 LCD is used. This 16x2 LCD display is used to appear various system factors and sensory information such as surrounding temperature, humidity, soil moisture level, water tank level, pump status, & alert notifications. For indication purpose few different colour LEDs (Red, Green, Blue) are used which gives different status indications. Out of this indication LEDs a blue coloured LED is used as a heart-beat indication of the system which blinks after every 2 seconds.

This system also has a SIM800L GSM module which is utilize for sending SMS notification in case of danger. This SIM800L GSM is also used to control system parameters and devices over SMS/Text message. The complete system design is based on Microchip Technologies Pvt. Ltd. AVR ATmega8L microcontroller. This microcontroller is a base-line 28-pin DIL 8-bit AVR microcontroller which is a low-cost, low-power, and feature-rich controller available. This microcontroller is programmed using embedded C++ programming language in Atmel Studio 7 IDE. As it is a backbone of complete system it is responsible for processing various input data/signals from various sensors and modules and control output devices accordingly based on algorithm/logic.

The complete system is battery and solar powered. It consists of 12v lead-acid battery which powers complete system. This battery is re-chargeable and can be re-charged with the help of solar panel and solar charge-controller. The solar panel is connected to solar charge-controller which charges battery and also protect battery from over-charge, over-discharge, and short circuit events.

II. SYSTEM FLOWCHART

System flow chart shows the whole work-flow process and shows the sequence of functions that is being done in the system. Here, the flow-chart is used to define and simplify the process that is being implemented in the system.



III. SYSTEM STRUCTURE

3.1 Hardware Used

A. ATmega8A/L Microcontroller

The ATmega8 is a weak-power CMOS 8-bit microcontroller depend on the AVR RISC architecture. By implementing strong command in a single clock cycle, the ATmega8 fulfil production approaching 1 MIPS per MHz, permit the system designer to enhance power consumption ver-sus processing speed. Tables must be numbered using uppercase Roman numerals.



B. DHT11 Sensor

DHT11 Temperature & Humidity Sensor property a temperature & humidity sensor compounded with a assessed digital signal output. By utilizing the exclusive digital-signal-acquisition method and temperature & humidity sensing mechanism, it protect high accuracy and high strength. This sensor associated with a resistive-type humidity

measurement component and an NTC temperature measurement component, and combine for effective performance 8-bit microcontroller, provides excellent quality, quick response, anti-interference capacity and profitable.



C. 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, lowpower, easy to use and don't 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 below 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

D. 16*2 LCD Display

The term LCD stands for liquid crystal display. It is one kind of electronic display module used in an extensive range of applications like various circuits & devices like mobile phones, calculators, computers, TV sets, etc. These displays are mainly preferred for multi-segment light-emitting diodes and seven segments. The main benefits of using this module are inexpensive; simply programmable, animations, and there are no limitations for displaying custom characters, special and even animations, etc.



E. SIM800L GSM Module

The SIM800L is a quad-band GSM/GPRS module, that works on frequencies GSM850MHZ, EGSM900MHZ, DCS1800MHZ and PCS1900MHZ where it can meet all the space requirements in user applications, such as smart phone, PDA and other mobile devices. It has a microSIM slot. antenna for the network signal, microphone, speaker pin outs and ring. The power supply requirements for this module is restrictly 3.4 to 4.4V DC with the minimum 2A. (Note: Do not use this directly to the Arduino board or any 5V source without regulator, it also needs a voltage translator for better serial communications).



F. Solar Panel

A solar panel is a collection of small solar cells spread over a large plate. These cells work together to generate power that can be used for different purposes.



When light strikes the cell, a certain portion of it is absorbed within the semiconductor material. And, the energy of the absorbed light is transferred to the semiconductor. The energy knocks electrons loose, allowing them to flow freely towards the storage device.

- Monocrystalline / polycrystalline silicon solar cells connected in series
- Solar cells laminated between UV resistant polymer (EVA) and high transmission toughened glass surface.
- Rugged weather-proof nylon terminal box for output connections.
- Mechanical load test and UV.
- IR thermography and reliability test for junction box.
- Insulation resistance and wet leakage current.
- Bypass diode thermal test.

G. Lead Acid Battery

Lead acid batteries are the most commonly used type of battery in photovoltaic systems. Although lead acid batteries have a low energy density, only moderate efficiency and high maintenance requirements, they also have a long lifetime and low costs compared to other battery types. One of the singular advantages of lead acid batteries is that they are the most commonly used form of battery for most rechargeable battery applications (for example, in starting car engines), and therefore have a well-established established, mature technology base,

A lead acid battery consists of a negative electrode made of spongy or porous lead. The lead is porous to facilitate the formation and dissolution of lead. The positive electrode consists of lead oxide. Both electrodes are immersed in an electrolytic solution of sulfuric acid and water. In case the electrodes come into contact with each other through physical movement of the battery or through changes in thickness of the electrodes, an electrically insulating, but chemically permeable membrane separates the two electrodes. This membrane also prevents electrical shorting through the electrolyte.



H. Solar Charge Controller

Solar Charge Controller is an electronic device that manages the power going into the battery bank from the solar array. It ensures that the deep cycle batteries are not overcharged during the day and that the power doesn't run back to the solar panels overnight and drain the batteries. Some charge controllers are available with additional capabilities, like lighting and load control, but managing the power is its primary job.



3.2 SOFTWARES USED

A. Atmel Studio

Atmel Studio is a integrated development platform for developing and debugging all AVR and SAM microcontroller applications. The Atmel Studio IDP gives you an environment to write, build, and debug your applications written in C/C++ or assembly code.

Operating System: Windows

Available for: Student

B. Proteus ISIS & ARES

In-system programming (ISP), or also called in-circuit serial programming (ICSP), is the ability of some programmable logic devices, microcontrollers, and other embedded devices to be programmed while installed in a complete system, rather than requiring the chip to be programmed prior to installing it into the system. It also allows firmware updates to be delivered to the on-chip memory of microcontrollers and related processors without requiring specialist programming circuitry on the circuit board, and simplifies design work Prog-ISP

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D. Pulse View

PulseView is a Qt-based logic analyzer and oscilloscope GUI for sigrok. SmuView is a Qt-based sigrok GUI for analog test and measurement devices like multimeters, power supplies or electronic loads.

IV, ADVANTAGES

1. Solar powered and mobile operated pumps save cost of electricity.
2. These improves data collection process and helps in wireless monitoring and control.
3. The use of solar energy can be a revolutionary advancement for the agricultural sector, by adding value in many ways
4. An increase in capital equipment results in increased working efficiency which also increases worker's safety at the workplace as they are not required to perform tough activities during farming.
5. The farming automation system has been very much beneficial for the farmer as it reduces manual labor and also makes farming more efficient

6. main advantages of using solar energy are :1. Energy savings2. Environmental benefits3. Long performance warranties
7. Water level sensor can measure the discharge of open water channel for irrigation modellingto better predict future water availability in agriculture
8. Bluetooth module based agriculture motor control saves the farmer's time and money
9. Measuring soil moisture help the farmers tomanage their irrigation systems more efficiently.

V. CONCLUSION

In this paper, we presented cost efficient solar powered smart agricultural system to enhance agricultural production by using sensor nodes with energy harvesting capabilities. The nodes were equipped with soil moisture, temperature, and humidity sensors along with a power converter. The power converter was capable of connecting a solar panel to the node in order to provide energy harvesting capabilities to recharge the battery and could obtain the remaining voltage level across the battery. Through the use of experiments in a controlled environment, we were able to demonstrate how using an energy harvesting device can greatly extend the lifetime of anode. In addition, the experimental results also demonstrated the possibilities of the system and how it was able to collect and transmit data through the network

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