

Hybrid Energy based Energy Harvesting and Nutrient Detection on the Agriculture Field using Internet of Things

M. Yamuna¹, K. Poojasri², P. Sowmiya³, K. Niraimathy⁴

^{1,2,3}UG Student, Dept. of Electrical and Electronics Engg., Sri Muthukumaran Institute of Tech., Chennai, India

²Assistant Professor, Dept. of Electrical and Electronics Engg., Sri Muthukumaran Inst. of Tech., Chennai, India

Abstract: Today, the farmers are experiencing unsure storms and water scarcity because of a worldwide temperature changes. The joining of standard cultivating procedures with most recent innovations as Internet of Things and Wireless device Networks may result in rural modernization. Remembering this circumstance, it's my way to deal with style gadget for mechanization of horticulture, partner in tending 'Internet of Things' principally based gadgets that is equipped for breaking down the apparent information at that point transmit profitable cultivating information to the client. These gadgets are controlled and checked from remote area and its information is handled and connected in rural fields. Astute Report Generator for proficient cultivating manages the simple testing of soil supplement. This report encourages rancher to comprehend the wellbeing of their cultivating land soil. This thus encourages rancher to choose, which are the reasonable harvests to sow at that specific season in that specific land. By examining the intermittent data from farmland, Soil Health Report card is organized and sent to rancher by methods for SMS, which helps the agriculturist in essential basic leadership. soil pH meter is used to know the dirt pH regard.

Keywords: soil moisture sensor, hybrid energy, nutrient detector, water pump, Agriculture field.

1. Introduction

We know that the agricultural sector requires manual work for sure due to various reasons. Nowadays farmers are facing many problems to grow up the fruits and vegetables for us. This is because it is very difficult to know the conditions of land such as water level, soil moisture and many more parameters without the physical presence of farmers at the agricultural farm. During the month of April, May; they find it very difficult to perform agricultural activities as the land dries within a certain period of time. So, here we are implementing a project which will give the whole data about the farm cultivation. By the help of these project farmers gets much relief in farm cultivation and the growth of crops will be not affected by these conditions.

2. Proposed system

In this proposed system we are overcoming the demerits of existing system. Here we are using microcontroller which will

acts as main memory of the project. Solar panel will be available as an energy resource and it will be boosted and given to the resource. Soil moisture is directly connected to the microcontroller which will measure the moisture of soil present. If the moisture of soil is less than threshold level, then microcontroller will command the driver circuit to turn ON the pump motors. Nutrient detection sensor is used to detect nutrient level in the soil and it will be intimated in the cloud. An IOT is connected to the microcontroller to display the data and control the water pump according to that.

3. Hardware

A. Implementation of proposed system

1) Soil moisture sensor

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity. Reflected microwave radiation is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

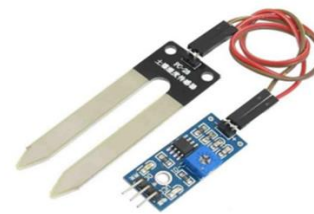


Fig. 1. Soil Moisture Sensor

2) P^H meter

A pH meter is associate instrument accustomed gauge

acidity or pH scale of an answer - otherwise referred to as pH. pH is that the unit of live that portrays the extent of sharpness or pH scale. it's measured on a size of zero to fourteen. The quantitative knowledge gave by the pH esteem communicates the extent of the movement of a corrosive or base as way as atomic number 1 particle action. The pH estimation of a substance is squarely known with the proportion of the atomic number 1 particle [H+] and also the hydroxyl group particle [OH-] fixations. Acids and bases have free atomic number 1 and hydroxyl group particles, separately. The affiliation between atomic number 1 particles and hydroxyl group particles in an exceedingly given arrangement is steady for a given arrangement of conditions, probably one are often controlled by knowing the opposite.

3) *Buck-boost converter*

The buck-boost converter is a type of DC-to-DC converter that has an output voltage magnitude that is either greater than or less than the input voltage magnitude. It is equivalent to a flyback converter using a single inductor instead of a transformer. A buck (step-down) converter combined with a boost (step-up) converter. The output voltage is typically of the same polarity of the input, and can be lower or higher than the input. Such a non-inverting buck-boost converter may use a single inductor which is used for both the buck inductor mode and the boost inductor mode, using switches instead of diodes,

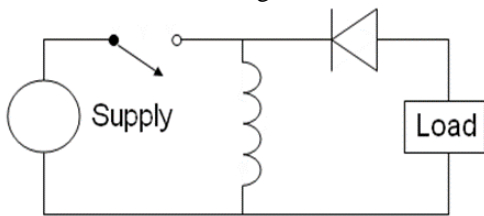


Fig. 2. Buck-boost converter

4) *UART*

A UART (Universal Asynchronous Receiver/Transmitter) is the microchip with programming that controls a computer's interface to its attached serial devices. Serial communication uses a communication protocol called UART which is an acronym for Universal Asynchronous Receiver Transmitter. It is a simple standard that can communicate peer to peer and even has a parity bit for error checking.

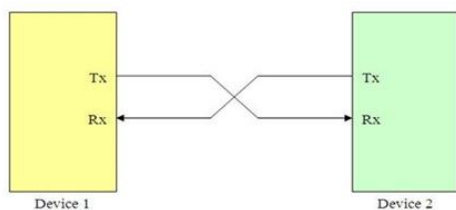


Fig. 3. UART

5) *Pump motor*

A pump motor is a DC motor device that moves fluids. A DC motor converts direct current electrical power into mechanical power. DC or direct current motor works on the principal, when a current carrying conductor is placed in a magnetic field, it

experiences a torque and has a tendency to move. This is known as motoring action. Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or wind power, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

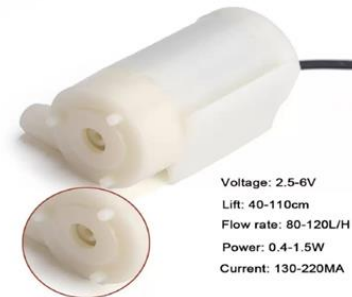


Fig. 4. Pump motor

6) *Solar panel*

Photovoltaic panel or solar panel absorb sunlight as source of energy to generate electric energy. A photovoltaic module is a packaged or array type. PV module constitute the photovoltaic array of a photovoltaic system that generates and supplies electricity for the motor. limited amount of power is generated which is efficient to operate pump motor

7) *Drive circuit*

The ULN2003 is a solid high voltage and high current Darlington transistor clusters. It comprises of seven NPN Darlington sets that highlight high-voltage yields with normal cathode clip diode for exchanging inductive burdens. The authority current rating of a solitary Darlington pair is 500mA. The darlington sets might be paralleled for higher current capacity. Applications incorporate hand-off drivers, hammer drivers, light drivers, show drivers (LED gas release), line drivers, and rationale cradles. The ULN2003 has a 2.7kW arrangement base resistor for each Darlington pair for activity specifically with TTL or 5V CMOS gadgets.

8) *Arduino UNO*

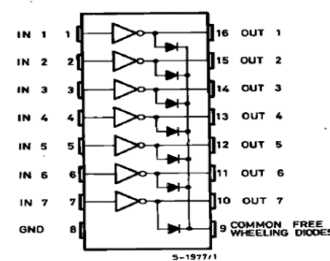


Fig. 5. Arduino UNO

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB

cable or power it with a AC-to-DC adapter. Arduino Uno has a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers

9) **LCD**

The most commonly used Character based LCDs are based on Hitachi's HD44780 controller or other which are compatible with HD44580. In this tutorial, we will discuss about character based LCDs, their interfacing with various microcontrollers, various interfaces (8-bit/4-bit), programming, special stuff and tricks you can do with these simple looking LCDs which can give a new look to your application

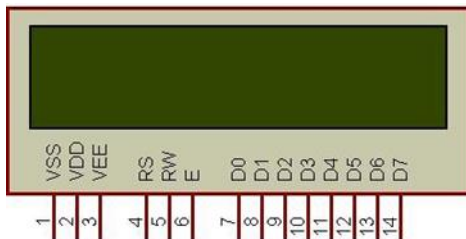


Fig. 6. LCD

4. Block diagram

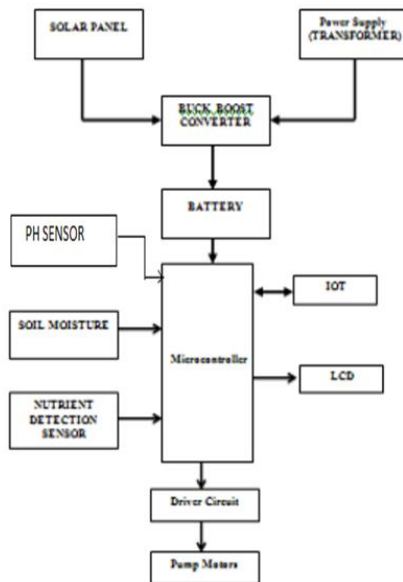


Fig. 7. Block diagram

5. Working description

In this system controller processes all the sensor data and upload it to the cloud. When the soil moisture sensor is immersed in to the agriculture field the sensor value will change and it will be detected by the microcontroller and it will turn off the pump motor. If the soil becomes dry then immediately the microcontroller will turn on pump motor for irrigation. Ph sensor is used to find the ph level of the water and to indicate in the LCD. Nutrition sensor will detect the presence of potassium or nitrate in the soil. It will be useful for the farmer to cultivate

the land according to the nutrition present. Instead of monitoring these data remotely we are transferring all the data in the cloud and the field can be monitored anywhere any time. From the solar the panel the battery will be charged. The limited power from solar will be boosted using buck boost converter.

6. Prototype



Fig. 8. Hardware setup

7. Conclusion

From the above block diagram, operation and flow chart it is concluded that the energy harvesting of IoT monitoring and control of agriculture fields. The measured data is sent to the Internet of Things (IoT) cloud from that IoT cloud the measured data is sent to mobile and web page. The user can observe the measured data using monitoring and control application running on their mobile phone or web.

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