

Review of Bluetooth Based Solar Water Pumping Irrigation System

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Abstract

The deficit in electricity and high diesel costs affects the pumping requirements of community water supplies and irrigation; so using solar energy for water pumping is a promising alternative to conventional electricity and diesel based pumping systems. Solar water pumping is based on photovoltaic (PV) technology that converts solar energy into electrical energy to run a DC or AC motor based water pump. An automated irrigation system was designed based on Bluetooth to use in the agricultural crops. The Bluetooth is a wireless radio communication between the farmers Smartphone and the Arduino. The Bluetooth is preferred because of its cost efficient, so that it can be affordable to almost all farmers. This paper describes the details of the design and instrumentation of wireless network, control of irrigation system with correct soil, water, and temperature.

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I. Introduction

Water irrigation worldwide is generally dependent on conventional electricity or diesel generated electricity. Solar water pumping minimizes the dependence on diesel, gas or coal based electricity. Irrigation is the delivery of water to grow crops. The irrigation system helps the farmers to have less dependency on rain-water for the purpose of agriculture. The types of irrigation are Tanks, Well, Canal. Some 53.5 billion gallons of groundwater are used daily for agricultural irrigation. In today's irrigation method, 2000 more cubic km of water will be needed per year. It is mainly used to monitor temperature, humidity, light intensity and water level. In this paper, an automatic irrigation system that works based on Bluetooth wireless network by the use of Arduino UNO is designed in order to reduce the manual work of farmers using Bluetooth based smart wireless sensor network. Water is a basic component of all life. Water is also a very precious natural resource that must not be wasted. If too much water is applied the problems rise up depending upon the soil texture. Irrigation is artificial way of watering the soil for the proper growth of the plant. It is mainly used in the places where rainfall is less. Irrigation also helps to suppress the weeds growing in the agricultural fields. The old methods used for irrigation it was manual irrigation using buckets and watering cans, by using sprinkler irrigation, localized irrigation, drip irrigation etc. But by using these techniques we can predict the amount of water that is to be watered or the sufficient quantity of water that a crop needs.

Wireless technologies have been growing fast in recent years. These technologies depending on the range of communication between sensor nodes. This wireless sensor based system monitors the water requirement for a crop continuously and sends the data to the main system which controls the flow of the water. The sensors used for measurement of soil moisture can also measure temperature of the soil to solve the problems related to soil for a particular crop. Soil moisture sensor senses the environmental and soil conditions which can be send back to the system for achieve the excellent & efficient performance. System measures information of soil moisture content stored in it and sends it to the main system with the help of microcontroller and other electronic devices.

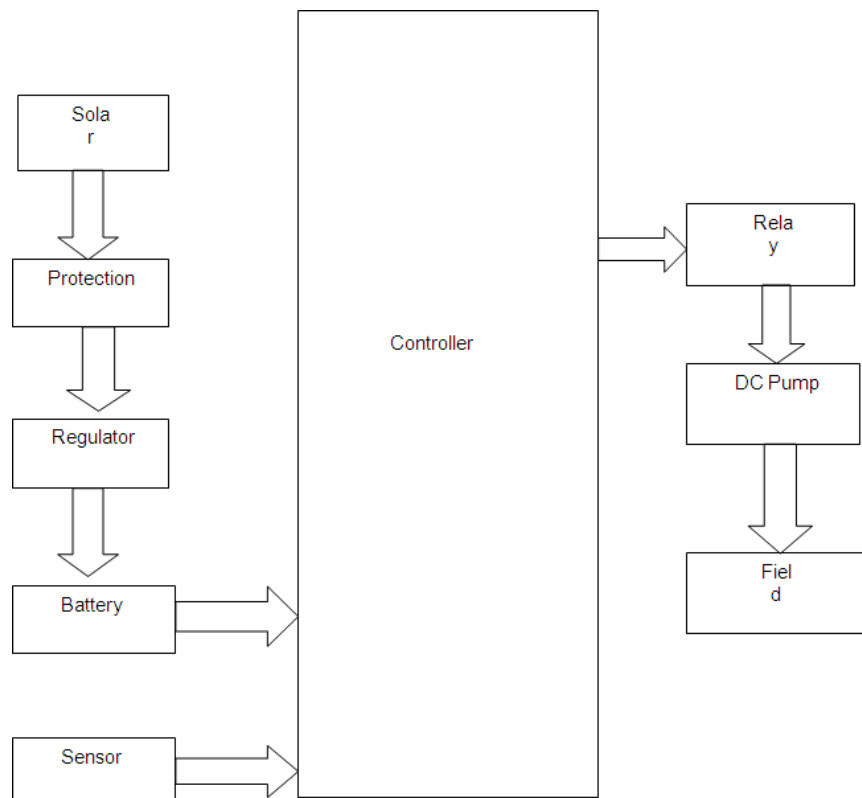
In recent few years rapid growth in irrigation system. The user communicates through BLUETOOTH.

According to food and agricultural organization of united nation, the average minimum daily energy requirement is about 1800 kilocalories per person. India ranked 116, with an average daily dietary consumption of 2360 kilocalories in 2006-2008. To fulfill these enormous food requirements, agricultural field needs paramount of water for irrigation. Hence there is a necessity of smart irrigation system which closely monitors and controls the amount of water applied to the fields. The sensors employed in the system are Soil moisture and LDR which record the real time values of the physical parameters and feed them to microcontroller which are displayed on the as well as wirelessly transmitted.

The real time values are compared with reference values pre-fed into the microcontroller by the microcontroller for detection of motor operation. The paper describes the proposed model in five sections – first

one being the introduction which states the need of the system. The second section gives a brief summary of work done earlier in this topic. Details of the system are included in the third section along with component description. The fourth part states the results obtained followed by a concluding section.

Block Diagram



Components

Hardware requirement:-

- Arduino
- Solar
- Battery
- Moisture detector
- Regulator
- Cardboard
- Bluetooth
- Regulator

Arduino:-

Component description

Arduino is an open-source hardware and software company, project and user community that designs and manufactures single-board microcontrollers and microcontroller kits for building digital devices.

Arduino boards are available commercially from the official website or through authorized distributors.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers can be programmed using the C and C++ programming languages, using a standard API which is also known as the "Arduino language". In addition to using traditional

compiler toolchains, the Arduino project provides an integrated development environment (IDE) and a command line tool (arduino-cli) developed in Go.

Solar :-

Solar power is the conversion of energy from sunlight into electricity, either directly using photovoltaic's (PV), indirectly using concentrated solar power, or a combination. Concentrated solar power systems use lenses or mirrors and solar tracking systems to focus a large area of sunlight into a small beam. Photovoltaic cells convert light into an electric current using the photovoltaic effect. Photovoltaics were initially solely used as a source of electricity for small and medium-sized applications, from the calculator powered by a single solar cell to remote homes powered by an off-grid rooftop PV system. Commercial concentrated solar power plants were first developed in the 1980s. As the cost of solar electricity has fallen, the number of grid-connected solar PV systems has grown into the millions and utility-scale photovoltaic power stations with hundreds of megawatts are being built. Solar PV is rapidly becoming an inexpensive, low-carbon technology to harness renewable energy from the Sun. The current largest photovoltaic power station in the world is the Pavagada Solar Park, Karnataka, India with a generation capacity of 2050 MW.

Battery:-

A battery is a device consisting of one or more electrochemical cells with external connections¹ for powering electrical devices such as flashlights, mobile phones, and electric cars. Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to small, thin cells used in smart phones, to large lead acid batteries or lithium-ion batteries in vehicles, and at the largest extreme, huge battery banks the size of rooms that provide standby or emergency power for telephone exchanges and computer data centers.

Batteries have much lower specific energy (energy per unit mass) than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting chemical energy to mechanical work, compared to combustion engines.

HCO5 Bluetooth Module:

HCO5 is a serial port Bluetooth which is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband. It uses CSR Blue core 04- External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm [9]. It is interfaced with microcontroller ATMEGA 328 and smart phone. It receives the command regarding the type of crop to be irrigated which is given by the farmer who is remotely operating the phone. The crop name along with their specific schedules is coded in the control algorithm of the microcontroller. Hence, the field is irrigated as per the schedule by selecting the desired crop name.

Relay Driver:

It is a microcontroller ATMEGA 328 based system which controls all the devices connected in the system. The soil moisture sensor, light intensity sensor are connected to the input pins of the microcontroller. The water pump and the servo motor are coupled with the output pins. If the reading of the sensor depart from predefined range the microcontroller turns on/off the pump. The servo motor is used to control the flipper's angular position thus ensuring adequate distribution of water and sunlight to the soil.

II. CONCLUSION

The manual control employed by the farmers to irrigate the fields is a tedious and inefficient way consuming a lot of water thereby resulting in wastage of water. Especially in dry areas where there is already scarce water in addition to inadequate rainfall, irrigation becomes difficult. Hence, the need for an automatic system which precisely monitors and controls the water requirements of the field and also protects the crops from high intensity light is witnessed. This need is met by the smart irrigation prototype described in this project. The proposed system was employed on a garden plant and tested and a significant amount of water was saved. Although the prototype is limited in the sense that large scale implementation is hard and a bit tedious. The prototype can be utilised in controlling the pest infection in plants by a little modification.

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