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SOLAR BASE WIRELESS REMOTE MOTOR STARTER

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Abstract — *The proposed system for Wireless Remote Motor Starter performs the operations such as wireless water pumping, fence detection and intruder sensing using GSM. The acknowledgement from solar energy is the vital part of the design. The applicability of the prototype includes design and instrumentation of variable rate irrigation, a wireless sensor network, and software for real-time in-field sensing and control of a site-specific precision linear-move irrigation system. Efficient water management is a major concern in many cropping systems in semiarid and arid areas and this can be employed to ensure efficient water supply to the fields that can be achieved by adapting the proposed system, which is GSM based.*

Keywords-*GSM modem, Intruder sensor, Solar panel, IR sensors, RS-232, Max232, ATMEL 89C51,LM567 tone decoder.*

I. INTRODUCTION

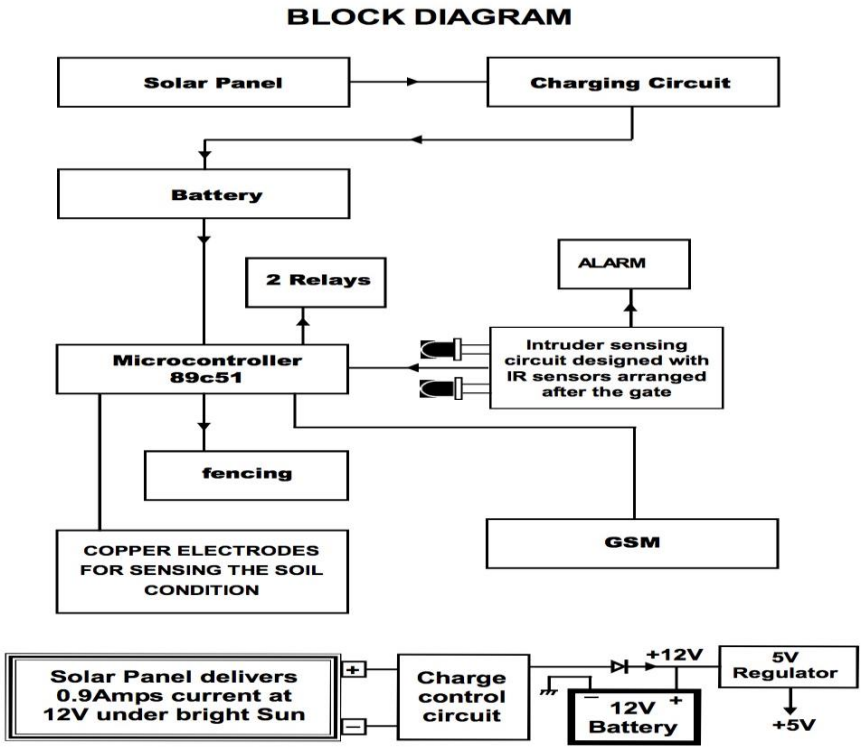
In India agriculture is the most important occupation of the people. More than 60% of our total population depends for their subsequent survival on agriculture. After independence due to various development theories introduced in the field of agriculture, production of food grains has been continuously increasing. The entire Indian economy depends on agriculture. Any fluctuation in agriculture income will directly affect the India's national income. In this regard, a thought is given to develop a project, which can control water-pumping motor with the GSM technology. Recent developments in wireless communications and electronic devices have considerably contributed to the evolvement of low cost densely deployed sensor networks. Many applications of wireless sensor network (WSN) are useful only when connected to an external network. In this project work we are proposing a low cost wireless sensor network, which will transfer monitored parameters to the outside world using an existing Global System for Mobile communications (GSM) network.

II. PRINCIPLE OF OPERATION

In this paper work, In view of importance on drip irrigation is considered as vital such that by sensing the soil moisture content, water supply can be controlled using the GSM technology. The main purpose of this system prototype is to measure the parameters as well as transmit the same to the android device by the microcontroller. The purpose is to develop a system, which can be used for real time applications by placing the sensors in the soil and can be monitored continuously. For this purpose a small pumping motor is used, by energizing it water can be supplied to the fields or individual plants. This pumping motor is intimated to work on, through the mobile when the soil is found to be dry, and the pumping motor is switched OFF automatically when the soil is found back, in wet condition. For sensing the soil condition in order to operate upon it, copper electrodes are used. The copper electrodes sense the condition of soil and send a message to the concerned mobile about the same. This can control the pumping motor through the mobile. Similarly, using proximity sensor (IR), an intruder-sensing circuit is designed and an alarm is set to activate whenever the sensor is interrupted in any way. Provision is also made in such a way that whenever any intruder is detected, the electric fence can be activated through the mobile. The proposed system designed using microcontrollers comes under embedded systems.

III. FUNCTIONAL DESCRIPTION

For better understanding, the total module is divided into various blocks and each block explanation is provided here with working details of each and every block.



3.1 SOIL MOISTURE SENSOR:

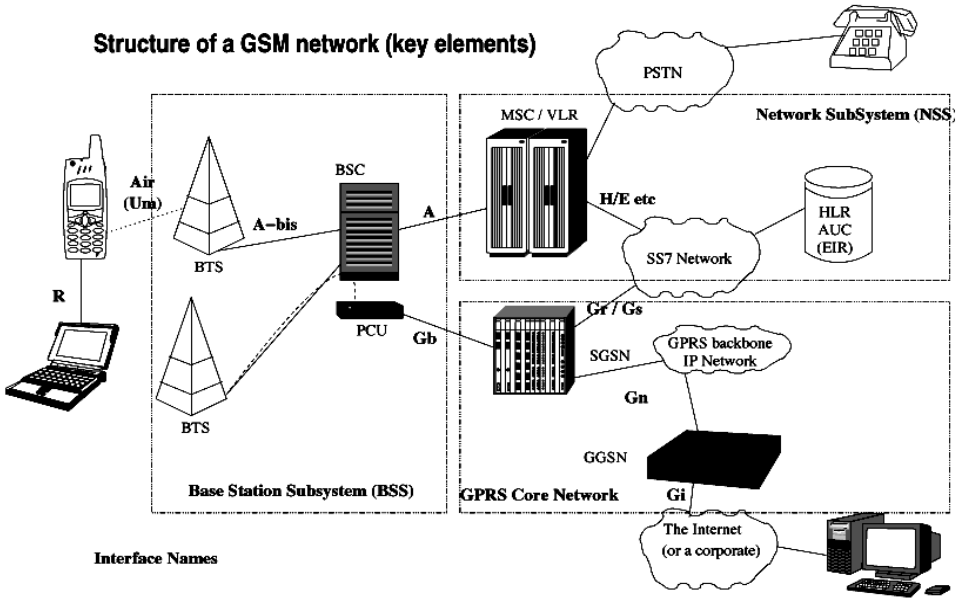
Soil moisture sensors are typically referred to as sensors that estimate water content volumetrically. Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture 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.

3.2 INTRUDER SENSOR:

The intruder sensing circuit is a designed using proximity sensor i.e., IR (Infrared) sensors along with LM 567 tone decoder chip. Depending on the sensor interruption, the controller activates the alarm and also sends an SMS to the authorized mobile. If required the user can send a reply SMS to activate the electric fence. Depending on the SMS received by the GSM modem, which will be read by the controller and will control the electric fence through relay contact.

3.3 GSM MODEM:

A GSM modem is a wireless modem that works with a GSM wireless network. Semen's GSM Smart Modem is a multi-functional, ready to use, rugged unit that can be embedded or plugged into any application. The Smart Modem can be controlled and customized to various levels by using the standard AT commands. The modem is fully type-approved; it can speed up the operational time with full range of Voice, Data, Fax and Short. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate. Computers use AT commands to control modems. Both GSM modems and dial-up modems support a common set of standard AT commands.



3.4 RS-232:

RS-232 was created for one purpose, to interface between Data Terminal Equipment (DTE) and Data Communications Equipment (DCE) employing serial binary data interchange. So as stated the DTE is the workstation and the DCE is the modem or other communications device. Often the workstation will be the computer, but here microcontroller is used to transmit the temperature data to the concern mobile. This converter chip is needed to convert TTL logic from a Microcontroller (TxD and RxD pins) to standard serial interfacing for PC (RS232).

3.5 MAX-232

The module consists of the sensors (copper electrodes and fuse), micro controller (89S52), GSM modem, relays, etc. The interfacing of the controller with the GSM modem cannot be done directly because they belong to two different logic families i.e., the micro controller is of CMOS logic family and the GSM modem is of TTL logic family. So the signals of one device are not be read by the other device directly. There should be a mediator to communicate between these two devices. In order to do such function an IC MAX 232 is used in the module, which is connected with the serial port RS 232 connector. The MAX 232 IC consists of two transmitter and two receiver pins. So it functions in bi-directional i.e., the CMOS signals from the controller are converted into TTL signals and are fed to the GSM modem and the TTL signals from the GSM modem are converted into CMOS signals that will be fed to the micro controller.

3.6 SOLAR PANEL:

Solar energy is generally present in the form of solar IR radiance. The PV cell works in the principle of Photoelectric effect; light striking on solar cell is converted to electric energy. Silicon or other semiconductor materials make these cells. A typical silicon solar cell generates about 0.5 volts in normal operation. Large number of solar cells is connected in series, forming a module to meet the voltage requirement of the system. Large number of solar modules is connected to make arrays. The rating of a solar module is given by the maximum output or maximum power it can deliver. The output of a solar module depends on the number of cells in the module, type of cell and the total surface area. The output of a module changes depending on the amount of solar IR radiance, the angle of the module with respect to the sun, the temperature of the module and the voltage at which the load is drawing power from the module.

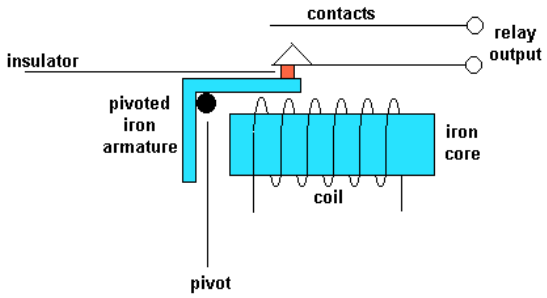
3.7 BATTERY AND CHARGING CIRCUIT:

The life of the battery will decrease when it is charged with high-voltage and high current. Anyhow the current produced here is very less; it is not harmful to the battery, where as for the voltage it must be regulated. Here for charging the battery from the voltage derived from the solar panel a charging circuit has been designed. In the charging circuit a 15V positive voltage regulator 7815, a silicon Epitaxial-Base Planar NPN transistor and a diode are used. The output voltage from the solar panel is connected to the input pin of the positive voltage regulator as well as the collector of the NPN transistor 2N3055. In the voltage regulator first pin is the input second is the ground pin and the third is the output pin that is connected to the base of the transistor 2N3055. The emitter of the transistor is connected to the battery positive terminal with a diode. So when the transistor conducts, the solar panel voltage at the collector passes through the

transistor and charges the battery. The output of the positive voltage regulator is used to drive the transistor by which the battery gets charged up.

3.8 RELAY SECTION:

A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form, the switch is operated by an electromagnet to open or close one or many sets of contacts. These contacts can be either Normally Open (NO), Normally Closed (NC), or changeover contacts. A relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier. So a relay can be defined as an automatic electromagnetic/electronic switch, which can be used to make or break the circuit. The relay used in this is electromagnetic relay. The electromagnetic relay is basically a switch (or a combination of switches) operated by the magnetic force generated by a current flowing through a coil. Essentially, it consists of four parts an electromagnet comprising a coil and a magnetic circuit, a movable armature, a set of contacts, and a frame to mount all these components. However, very wide ranges of relays have been developed to meet the requirements of the industry. This relay is nothing but a switch, which operates electromagnetically. It opens or closes a circuit when current through the coil is started or stopped. When the coil is energized armature is attracted by the electromagnet and the contacts are closed. That is how the power is applied to the signals (indicators).



IV. APPLICATIONS, MERITS AND DEMERITS

4.1 Applications:

This prototype offers a remote access to field conditions and real-time control and monitoring of the variable-rate irrigation controller. It is of great use in the places especially rural zones where solar energy is a major source. Site-specific irrigation system using sensors enables maximum productivity saving water.

4.2 Merits:

Diverse applications and low maintenance costs of solar energy is a huge merit. High storage capacity using RF circuit is provided. There is an easy availability of networks for GSM modem. High transmission quality is present due to RF transmission. Secured communication process occurs. It is a technologically advance application.

4.3 Demerits:

Solar panel is weather dependent and hence might not provide uniform intensity of power. It also occupies greater space. RFID signals donot follow a particular frequency range and might cause an interruption.

V. CONCLUSION AND FUTURE SCOPE

The prototype of the proposed system to control motor with the help of GSM is successfully developed, and a demo unit is fabricated and the results are found to be satisfactory. The concept of the design can be used for real time applications for measuring other parameters like wind speed, pressure, phase availability, humidity, etc. The temperature sensor used here is very sensitive and hence it can be used to acquire atmosphere temperature accurately. It can be used as electrical instrument for measuring the atmospheric temperature. By incorporating additional sensors for the parameters mentioned, this system can be implemented for real time operations.

At present preference is given for the compactness in the system, therefore the controller 89C51 is selected here. Another advantage of using this tiny device is that it can perform of the function of control action in addition to the efficient monitoring.

This also enables us to reduce the manpower involvement in agricultural fields thereby increasing the scope of automation in fields. The GSM application provided a lot of scope to consider this implementation at various locations such as hotels, factories, commercial complexes, etc. The implementation of solar energy for the complete working of the prototype enables the independency of mankind on power cuts in rural parts of the country. And it also implements the efficient utilization of power. The intruder sensing circuit and the fence circuitry can be extended to any other application in urban zones as well. Hence the project ensures a tremendous scope of improvement and applications.

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