E-IRRIGATION: An Automation of Irrigation using Wireless Networks

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Available online at www.isroset.org

Received: 28 Oct 2013                 Revised: 17 Nov 2013              Accepted: 12 Dec 2013                   Published: 30 Dec 2013

Abstract—The major influencing parameter of Indian economy is agricultural. Also in agricultural the most important factor is irrigation. Irrigation must be in time and proper for a better crop yield. The major irrigation is performed using electric water pumps. Irrigation by electric water pump introduced problems of frequent, intermittent, low voltage supply. This causes monitoring the supply of power and hurdles in irrigation. The unreliable power supply and frequent power cuts disturb the farmers and it leads to decrease the efficiency of farmers. This turns into the movement of farmer’s from farming to urban area. In this paper I introduced a system which shows how automation of irrigation is performed to solve the problems introduced by intermittent electrical power supply. In this paper I designed an embedded system which is controlled by sending a SMS from mobile phone. This embedded device can control maximum 8 devices.

Keywords—Agriculture and irrigation, WSN, GSM.

I. INTRODUCTION

India is the country of agriculture. Most of the people of India live in villages and are fully dependent on agriculture. The heart of the agriculture is irrigation. Most of the farmers are dependent on tube wells for irrigation. And supply of power to agricultural areas is limited to only a fixed hour in a day which is not predictable always. The frequent power cuts and low voltage supply create big hurdle to the farmer and thus it needs continuous manual monitoring. Lately, there has been significant interest as regards electrical monitoring[1-2].Additionally, several studies have been carried out to monitor electrical changes[3-4-7] and lots of work has been done for this [5-6-10]. The object of our system is to provide a solution for these problems. By using this proposed system a farmer can monitor power on/off, voltage supply level from home or any where using a mobile phone as well as he can switch on or off the motor from anywhere far from the actual field. The system at the field consists of-

AT command supporting GSM mobile phone

1. AT-89c51 Microcontroller
2. Max 232 IC.
3. Voltage regulator 7805.
4. Computer
5. Relays, for controlling the motor on/off for irrigation.
6. Power supply
7. Mobile for data transmission
8. LCD for monitoring the current reading of all the parameters.

II. PROBLEMS IN AGRICULTURE

The backbone of Indian economy is Agriculture; nearly 20% of the farmers are dependent on electric water pumps for irrigation which demands electricity. The research study conducted by K V S Ram Chandra Murthy (2009) shows that there is a growing demand for electrical energy for irrigation requirements in India and many states electrical utilities companies have been facing acute shortage of power which has led to unrest in the farmers. On top of the power shortage issues, increased demand for power in urban areas (due to globalization, IT, BPOs), have further deteriorated the power supply to agriculture sectors along with frequent and unreliable power cuts and low voltages. Also, It has been observed that source of electrical energy generation is slowly depleting. The underground water level is slowly falling down and forests are being cut which reduces the rainfall as well. With increasing area available for cultivation and the need for increasing the productivity from the farm land, there is a growing need for electrical energy for irrigation. The generation of electricity is not growing proportionately to the demand. The supply to agriculture is limited to few fixed hours throughout the day. Agriculture receives power mostly during mid night (off-peak) as this reduces the cost of electricity supply for the transmission and Distribution Company. Because of the unpredictable nature of supply of electrical energy, the farmers have to be on their guard all the time. They have to immediately switch on their equipment after electricity supply resumes. Since the supply to agriculture is mostly during non-peak hour, the farmers are made to wait for the whole day for electricity supply to resume so that they can start their equipment for irrigation purposes. We see results of this in reduction in productivity, wastage of labor, and equipment lying idle. Moreover, most
of the times the farmers would be engaged in one corner of
the field where as the equipment would be installed at
another place. It becomes imperative for a farmer either to be
physically available at the equipment site or employ a labor
only to switch on the equipment when electricity supply
resumes. The frequent, intermittent, low voltage supply of
power to the agriculture sector has caused a big headache to
the farmers who are just spending their time monitoring the
supply of power. And due to the fluctuation if their
equipment burns or have other technical problems then they
waste hours for just withdraw the pump out of the bour and
get it repair and reinstall the equipment back to its proper
place. The highly unreliable power supply with frequent
power cuts have not only lowered the efficiency of farmers
but also have led to the frustration of the farmers to give up
agriculture and move on to urban areas for better prospects
in the globalized world. In this thesis, I am going to discuss
an example of how the mobile technology can benefit
millions of farmers by providing a solution for the irrigation
problems due to an intermittent electrical power supply in
rural India.

III. ARCHITECTURE OF E-IRRIGATION
Motor controls, such as ON/OFF can now be controlled by
my proposed System using the mobile SMS technology.
“This System” is directly connected to electric motor or any
other home appliance controls. The system informs the
farmer availability of electric power through SMS. Once the
farmer receives the message, he can decide to send an SMS
message to the unit on the motor unit, to start the electric
motor using his mobile from anywhere. He need not have to
be near the farm or field or even in his house. He can be
anywhere outside tending to his various activities. Since this
system works on mobile network, the farmer can receive
messages wherever there is wireless network (roaming).
Once the farmer sends an SMS to the system, it decodes the
message. Based on the message code, let us say 1, it will
turn ON the motor and if the code is 2, will turn OFF the
motor. Also, he can set a timer to turn off motor
automatically for a predetermined time.

Some of the other useful messages sent by our system are:

a. Power supply indication – sends a message indicating the
availability of electric supply to motor

b. Low voltage indication – sends a message indicating
voltage level or single phase supply to decide whether
sufficient power voltage is available to turn on the motor.

c. Monitoring of agriculture appliances remotely.

The objective of this system is to make a farmer’s life easier.
Using this, a farmer can do his water irrigation anytime,
from anywhere without worrying about frequent power cuts,
fluctuation of voltages, lack of water or the period of water
that is required to be pumped. Following are some of the
benefits a farmer can derive by installing this system:

- Higher Production - Operations using SMS codes on
  wireless mobile network, a farmer can be potentially
  anywhere conducting other works, yet at the same
time, be operating irrigation activity remotely

- Efficient Utilization of Electric Power – Motor
  operations (ON and OFF) are automatically
  controlled – when enough water has been pumped,
  the motor is switched off automatically and hence
  saves power energy

- Significant Decrease in Wastage of Water – There is
  no wastage of water due to automation of Motor
  operations (ON and OFF)

- Operation Cost is Reduced – Proposed system will
  not turn ON the motor until the required conditions
  are not available.
IV. EXPECTED OUTCOME OF E-IRRIGATION

This system sends a message indicating the availability of electric supply to motor as well as it can also send a message indicating voltage level or single phase supply to decide whether sufficient power voltage is available to turn on the motor. We can also control other appliances of irrigation such as autoswitch or electric bulb at the field by using this system.

This graph shows the voltage reading with time measured by E-IRRIGATION.

![Graph shows results.](image)

V. CONCLUSION

In this paper, we report the results of real-development of E-IRRIGATION system which is designed and implemented to realize automated agriculture. The solution gives the information about electric supply. This system can increase the operational efficiency of a farmer and can make his life easier. The advancement of technology has helped rural India, particularly farmers; This system presents the mobile technology as the solution for irrigation problem.

VI. FUTURE SCOPE

At present this system can provide information about the electric supply, but in future we can control various appliances related to agriculture such as drip irrigation system as well as we can monitor environmental and agricultural parameters such as temperature, humidity etc at the field by enhancing the system.

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