

GSM-Microcontroller Based Remote Control of Sprinkler Irrigation

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Abstract: GSM-Microcontroller based Remote Control of Sprinkler Irrigation is a new concept in the field of the irrigation for doing irrigation work remotely without any risk of accident due to electric shock, hard work and working in difficult environment condition. This system discards the conventional methods of irrigation work. In present work the author has designed and developed a automatic sprinkler irrigation system which is controlled and monitored by a microcontroller interfaced with display device, current flow sensor, solenoid valves and GSM modems. Given command to stop, start, interrupt and parameters under monitoring are stored in a memory based upon which microcontroller takes decision to run the system. Provision of protection against dry run and overload of motor coupled with centrifugal pump is also incorporated. Options using selector switches make this system compatible with single phase motor and three phase motor. It obsoletes the mechanical work of farmers by automatically changing over sprinkler water lines in sequence after running for a period of set time decided by farmer and switch off the water pump house motor upon completion of irrigation work using GSM modems interfaced with microcontrollers.

I. Introduction

1.1 Sprinkler irrigation

This method of irrigation help us to save water and easy to use on uneven land. In sprinkler system, water is piped to one or more central locations in the field and distributed by high-pressure sprinklers using impact mechanism drive of nozzle.

1.2 Need for automation in sprinkler irrigation system

In Conventional farming a crop require irrigation multiple times from cultivation to the harvesting. Irrigation is required by crops in adverse weather conditions. A farmer has to face a lot of unavoidable problems and hardships while doing irrigation work.

1.3 Problems in sprinkler irrigation are

- Water pump houses are generally located far from the fields. To start and stop the motor a farmer have to go to water pump house and he remained to and fro between fields and water pump house for just switching ON/OFF the Motor.
- Sprinkler water pipe lines are required to change over manually after a while to cover all area of crop under irrigation, during this process a farmer is required to take off his clothes to avoid water on clothes & during winter season it is a cumbersome job for a farmer.
- Conventional process causes wastage of time, electrical power & water
- Risk of electric accidents as starter panels are poorly maintained at water pump houses and in most of cases are not earthed properly.
- At night time and in adverse weather conditions a farmer's tendency is to avoid switching off the motor when required causing huge wastage of electric power and precious water.

1.4 Benefits to the farmer using automatic sprinkler irrigation system are

- Saving of time water, Electric power, money & hard labor work.
- No risk of electric accidents, wild animals like snakes etc
- No impact of adverse weather conditions on farmer.

1.5 Selection of GSM technology

GSM (Global System for Mobile Communication) is a public service available at no cost to the user. Nowadays mobile hand set is not new to the farmers. Every where farmers can be seen using mobile phones and they are very much conversant with mobile hand set. There is no extra cost of communication equipments. Using GSM technology, a motor can be controlled and monitored from every corner of the world .It has no bar of distance like Infrared, Bluetooth, Radio waves etc.

II. Basic Design Of The System

The basic design of the GSM based remote control of sprinkler irrigation system is shown in Fig.1.1. The system makes use of a micro-controller that acts as the brain of the entire system. It controls the transmission and receiving of signals commands to the motor, sprinkler system from the mobile device using a GSM modem that allows for the usage of AT commands which can be used to read the messages from the modem. A GSM mobile device is used as first mobile station for transmitting section from which the farmer sends text messages that contain commands and instructions to the second mobile station, which is based on a specific area in the water pump house & agricultural field where the control system is located. The received SMS message is stored in the SIM memory of GSM Modem and is then extracted by the micro-controller and processed accordingly to carry out specific operations. The relay driver (ULN2003) is used to drive the relay circuits which switches the motor connected and solenoid valves in sprinkler water pipe line. The LCD is used to indicate the status of the operation performed by the micro-controller and also its inclusion makes the overall system user-friendly

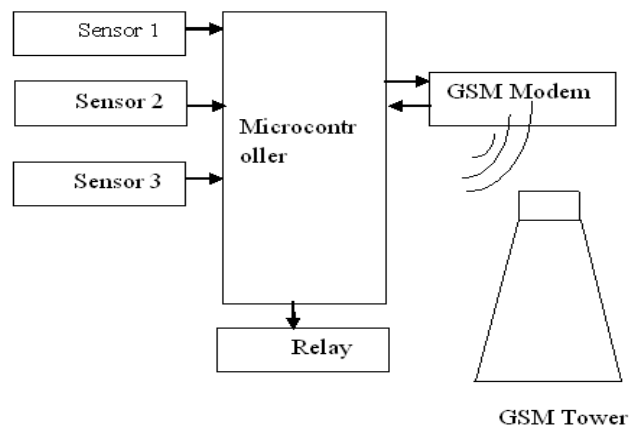


Fig.2.1. GSM based automation.

III. Literature Review

Saito et al. in [1] developed home gateway system for interconnecting home network consisting of IEEE1394 AV network and X10 power line home automation network with Internet. This provided remote access functions from Internet for digital AV appliances like Digital Video Camera, Digital VCR connected to IEEE1394 network and home appliances like TV, desk lamp, electric fan connected to X10 controller

Chen Peijiang et al. in [2] describe a remote monitoring system based on SMS of GSM. The system includes two parts which are the monitoring center and the remote monitoring station. The monitoring center consists of a computer and a TC35 GSM communication module. The computer and TC35 are connected by RS232. The remote monitoring station includes a TC35 GSM communication module, a MSP430F149 MCU, a display unit, various sensors, data gathering and processing unit.

Van Der Werff et al.in [3] proposed a mobile-based home automation system that consists of a mobile phone with Java capabilities, a cellular modem, and a home server. The home appliances are controlled by the home server, which operates according to the user commands received from the mobile phone via the cellular modem. In the proposed system the home server is built upon an SMS/GPRS (Short Message Service/General Packet Radio Service) mobile cell module Sony Ericsson GT48 and a microcontroller Atmel AVR 169, allowing a user to control and monitor any variables related to the home by using any java capable cell phone.

IV. Block Diagram

Approach to achieve objective in this paper is based upon the block diagram in Fig.4.1. Microcontroller receive command from farmer and takes control of electric motor & sprinkler system for irrigation work.

Microcontroller also provides protection to motor in respect of dry run, phase failure and power failure, and underground water pipe line burst due high pressure.

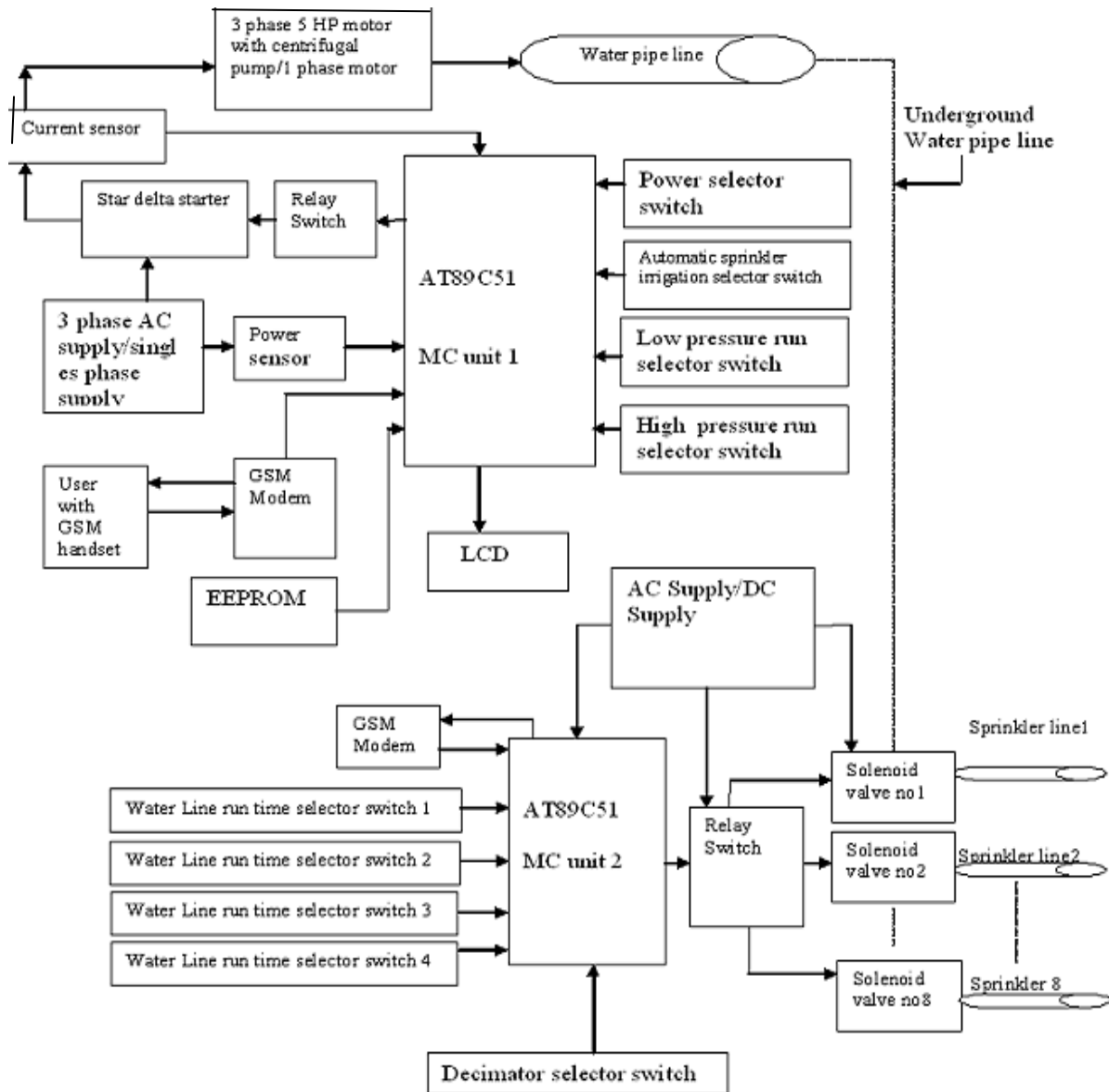


Fig.4.1. Block Diagram of GSM-Microcontroller Based Remote Control of Sprinkler Irrigation.

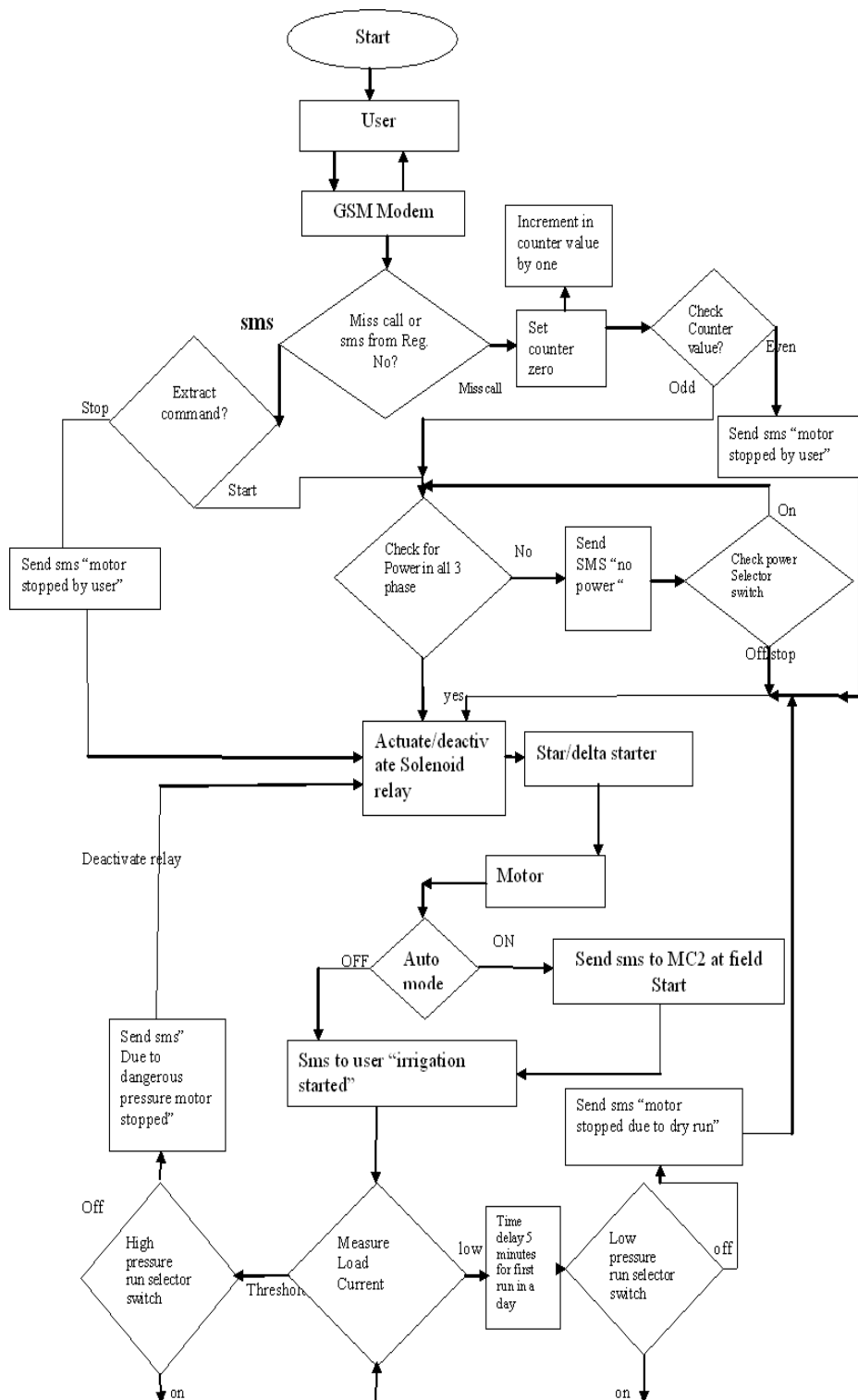
V. Scope Of The Work

It is evident that lots of problems are faced by the farmers, while doing irrigation works at farms which are generally far away from the house of the farmer. A farmer also has risk of the life due electric shock accident while operating electric motor at his pump house. So it is the need of the hour to design an automatic irrigation system which resolves all the problems faced by a farmer. There are so many wireless technologies available on which purposed work can be carried out, but a farmer in general is not so rich that he can afford a costly technology, so here we need to make use of the devices which are already with the farmers cutting the cost system. GSM technology is preferred over all other wireless communication technologies because every farmer nowadays are using GSM mobile handsets and they are very much conversant in respect of its use.

From the above observations it is evident that various technologies and methodologies have been used in wireless data transmission from one location to another location. It can be observed that GSM based wireless data transmission is very powerful. So GSM-Microcontroller based remote control of sprinkler irrigation system designed is helpful to farmers in controlling irrigation works using a mobile phone.

VI. Methodology

Flow Chart of GSM-Microcontroller Based Remote Control of Sprinkler Irrigation is designed by following the sequential steps mentioned in Fig. 6.1.



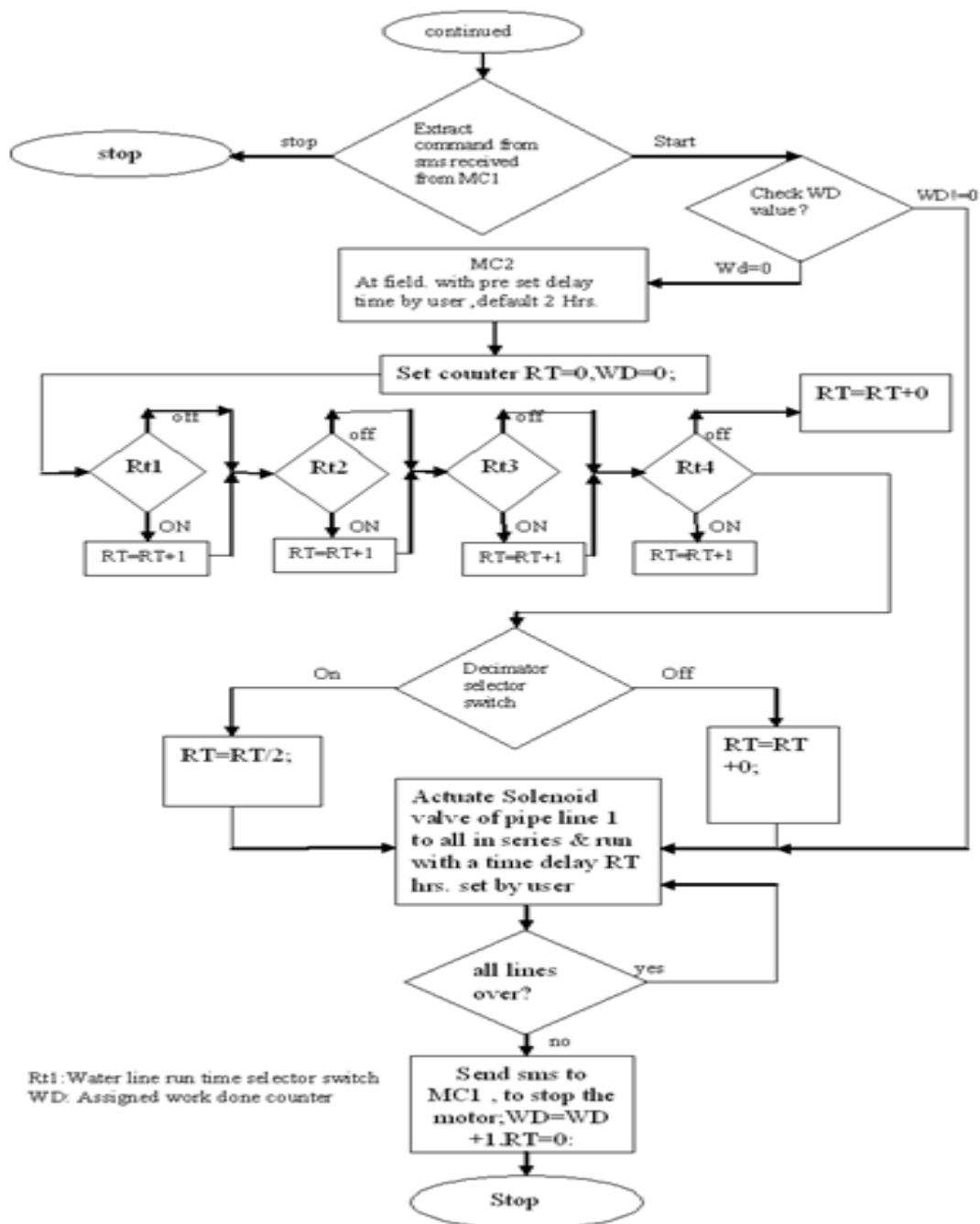


Fig.6.1. Flow Chart Showing Methodology to carry out presented work.

VII. Results

Design & development of GSM Based Remote Control of sprinkler irrigation system has been successfully completed. The output of the implemented system, several testing has been performed to ensure its executed and produce the intended result. The system is designed to receive SMS & miss call from user mobile phone to GSM modem interfaced to the microcontroller circuit. This can be performed by dialing the mobile phone number which has been set in the microcontroller program. The incoming message is deleted by the microcontroller upon completing the requested process, and the message does not longer exist in the connected mobile phone which acts as GSM modem. The system then replies a message to user mobile phone reporting the status of the devices (turned ON or turned OFF). The status message is to remind the user regarding the current state of the irrigation work.

VIII. Discussions

This project work is a small implication of our concept in automation and monitoring a system. The practical applications of this project are immense and can have vast level of implementation. This small concept can be used in fields such as transport, remote sensing, robotics, home automation, and many other related fields where continuous monitoring and regulation is needed. So this is not the end of the project but rather is a step towards exploring other possibilities that it brings with it.

IX. Conclusion

The GSM Based Remote Control of sprinkler irrigation system was successfully developed and met the objectives. The system can automatically switch ON and OFF the motor of the pump house as well sprinkler water line change over process remotely using SMS. The integration of software and hardware has performed a good task in producing the coordination between two units located far away from each other. However, there are several weaknesses had been identified which can be further improved in the future such as the system could provide better performance by intelligently sending notification upon leakage of water in the underground water pipe line, provide a flexible function by supporting both manual and automatic control as well as provide an option for the user to control the appliance through web-based system & system will not work in the absence of cellular service provider signal. In addition, the system is very practical when the pump house location & fields are away from home due to it can control the sprinkler irrigation work remotely as long as the mobile phone gets the signal coverage.

Future Scope

The remote control system run properly and stably and it could implement all the desired and planned functions. This is because the software was designed in a proper way, and the test process run step by step. It is a practically proven application that farmer do not need any other applications to remotely control the irrigation work .With a little change in software & hardware this application can be used in the vehicles for ignition & turning on AC as well as to control the domestic electric appliances remotely users just need to send SMSs with a regular phone.

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