Monitoring and Controlling of PLC based Automation System Using GSM Module

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Abstract - Main aim behind this project is to monitor and control a PLC based automated system wirelessly for industry as well as agriculture process. This can be achieved using GSM module. No person is required to do the process manually. Status of the field is sent to user by PLC via GSM module based on the input status of the sensors that are placed at the field. Person need only to send the reply about the process that is to be carried out and PLC will check the status of the SMS sent by person and take the action according to it. To implement this project I am going to use GSM SIM300 module, DVP 12SA PLC, Switches as a sensors, Motors as an output and RS485 to RS232 converter.

Keywords: PLC, GSM, Automation System

I. INTRODUCTION

In Industry a continuous monitoring and controlling is required. From the last few years PLC is used in many of the automation system due to its reliability and durability. PLC has become a part our lives same as controller and also as field of electronics and communication. GSM with controller is widely used to do things wirelessly from anywhere and at any time.

At the industry level the person can control the industry process by seating there continuously in the control room. At the agriculture field farmers are still visiting their field everyday and go to their field to spray the fertilizer, spray the pesticides, watering the plant etc. This project will help to automate the process such that they can monitor and control the process through the SMS via GSM module from anywhere and at any time.

In this Project I am using the GSM SIM300 module, Delta PLC DVP 12SA, and Mobile for SMS, Three switches as Sensors, three motors as output and WPLsoft software for programming delta PLC.

II. DETAILED STUDY

Some applications uses [1] two modules among them one is sensor module and another one is substation module. Sensor module consists of the AT89C2051 controller and watermark 200SS soil moisture sensor, GSM module and ZIGBEE module where all are interfaced with controller. Substation module consists of AT89S8253 controller, LCD Display, solenoid valves. Data from the field is gathered continuously by sensor module and passed to substation module through the ZIGBEE and substation module will perform the action accordingly and status is sent to the user through GSM.

Microcontroller 8085 based GSM technique for drip irrigation is used [2] where the wireless soil moisture sensors are used with pH meter and fertility meter to measure the condition of soil for irrigation. By measuring this two parameters controller will send the status of it field to farmer and according to reply from farmer, controller will start the process. Survey on the GSM based automated irrigation system is done [3] where different controllers are interfaced with GSM and compared and best among all is selected for the application. Here they have also used different technologies like Bluetooth, ZIGBEE etc. Home appliances can also be controlled by using GSM [4] where we can ON/OFF the home lights and fans from anywhere through mobile. Sometime it is require controlling more than one green house or agriculture field. Here also it can be controlled by using GSM module with controller [6] and can get SMS of the status of any green house at any time on user mobile.

III. PROPOSED ARCHITECTURE

Architecture contains the PLC as a central unit and sensors at the field side connected to PLC and output device is also at the field side to perform the action and GSM module connected to PLC for wireless communication with user. Block diagram of the system is shown in the figure 1.
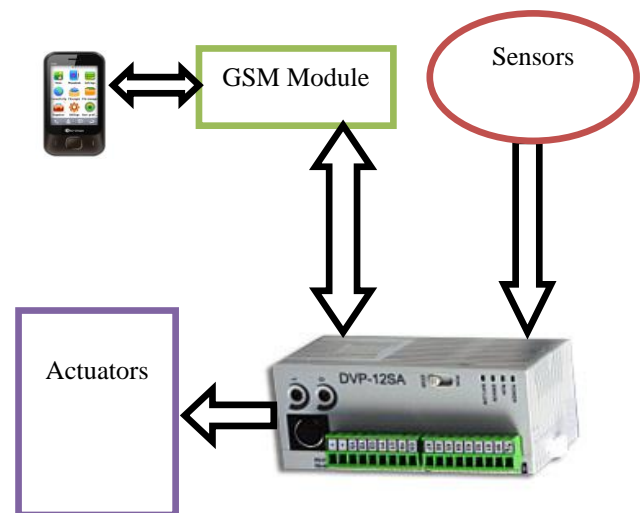

Fig: 1 Block Diagram

As shown in fig 1 sensor is connected as input to the PLC and actuator as output from the PLC to field. GSM module is connected to PLC as a bi-directional because GSM module will transmit and receive the SMS to and from the user.

Sensor and actuator can be used of any type. Here in this project I am going to use the switches as a sensors and DC motor as actuators to check the interfacing of GSM with PLC.

Components that are needed to interface the GSM with PLC are RS485 to RS232 converter, RS232 cable, SMPS for PLC power supply, GSM module and PLC.

A) RS485 to RS232 Converter

It is a converter that converts the rs232 communication port to rs485 communication port. It needs the separate power supply to convert the data. At rs485 side one connection is for power supply, two connections are for ground, and remaining two are for rs485A and rs485B.

Fig: 2 RS485 to RS232 Converter [7]

B) GSM Module

This GSM Modem can accept any GSM network operator SIM card and act just like a mobile phone with its own unique phone number. Advantage of using this modem will be that you can use its RS232 port to communicate and develop embedded applications. Applications like SMS Control, data transfer, remote control and logging can be developed easily.

The modem can either be connected to PC serial port directly or to any microcontroller or PLC. It can be used to send and receive SMS or make/receive voice calls. It can also be used in GPRS mode to connect to internet and do many applications for data logging and control. In GPRS mode you can also connect to any remote FTP server and upload files for data logging.

Fig: 3 GSM SIM300 Module [9]

C) Delta PLC DVP12SA

The name itself suggests the type of PLC and I/O it provides like DVP is a series name, 12 stands for (8+4) 8 inputs and 4 outputs, SA series as shown in fig 4. The delta PLC is cheaper than other brands of the PLC and easy to configure with any application of industry as well.

Fig: 4 DVP 12SA [8]

Fig 5 shows the flow chart of the proposed architecture. It shows that how the whole process will occur from start to end

and the simulation result of the program is shown in fig 8 and fig 9.
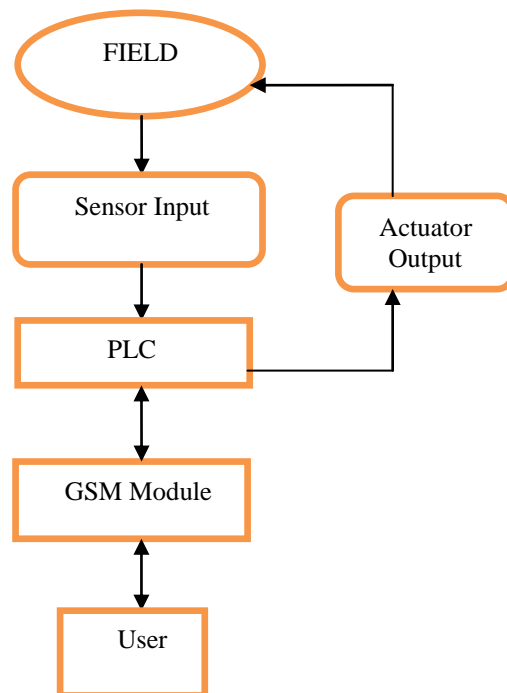

Fig: 5 Flow Chart of the Process

Steps of the Process (Flow Chart)

1) When any two sensors get ON out of three sensors (i.e. any two switches is pressed) GSM module will activate.
2) GSM module will send the particular SMS to user.
3) User will reply again to the GSM module.
4) GSM module will activate the PLC by sending the command to it.
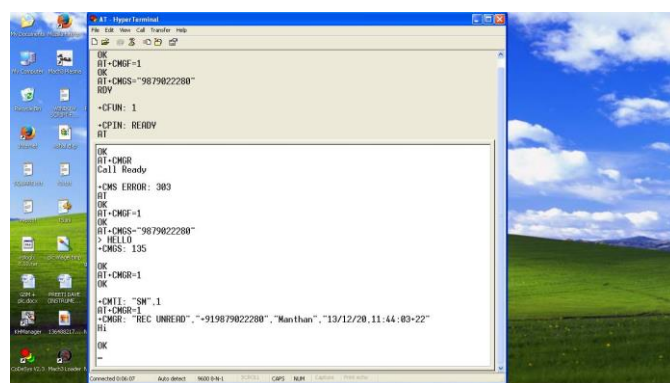5) PLC will send the command to the actuator and process will start.

Fig: 6 Status of GSM Module in HyperTerminal

Fig 6 shows the status of the GSM module and message transmitted and received in the module in HyperTerminal. In HyperTerminal we can check the module connected with computer and the message transmitted and received in that module.

Fig: 7 GSM Module interfaced with PLC

Fig 7 shows that How GSM can be interfaced with PLC. Here on left side ATC is written on the device is called the RS485 to RS232 converter and below device shown with many inputs and outputs slot is PLC and above that circuit is shown is GSM SIM300 module. RS485 to RS232 converter is middle device that connects the GSM with PLC. This device needs external separate power supply.

IV. RESULT AND SIMULATION

From the programming side first we have to configure the PLC in communication mode for communication purpose and that is common part for all PLC for communication. After that we have to SET memory bit (m1122 for delta PLC) for every AT commands to communicate with GSM module. Then we should enter the hex code for all the command including message that we want to send to the mobile.

After this we should load the program in PLC and connect the RS485 to RS232 converter at RS485 terminal provided in PLC and other end of cable should be connected to RS232 cable whose another end will be connected to GSM module.

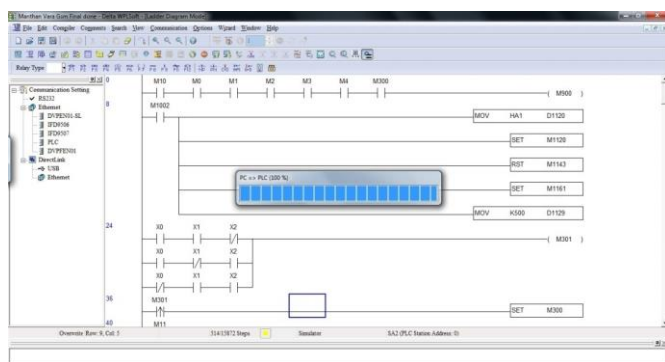As shown in the fig 8 Program is loading in to the PLC.

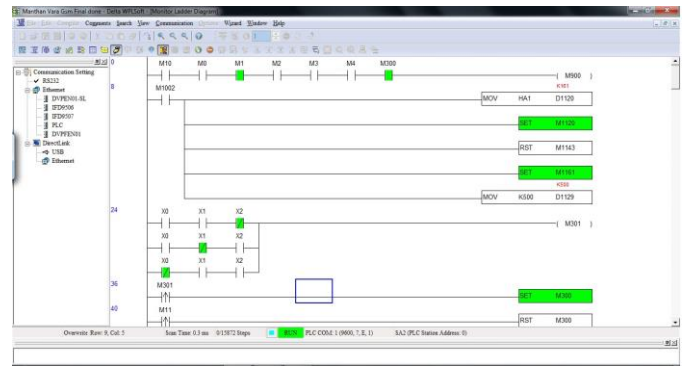**Fig: 8 Program loading in the PLC**

Fig: 9 Program is in the RUN Mode

Fig 9 shows that after the compilation program is in the online simulation mode. Online simulation is used to check that how program is running step by step.

V. CONCLUSION

From the simulation shown above we can conclude that interfacing of GSM with PLC is done successfully and thus we can use it at any PLC based industry for wirelessly monitoring and controlling of industry process and also we can use it for agriculture processes which are based on PLC.

FUTURE WORK

In the future we can extend the scope of PLC for wireless application by interfacing ZIGBEE and RF module with PLC and we can get same result as ZIGBEE and RF modules interfaced with controller.

REFERENCES

[1] Neelam R. Prakash, Dilip Kumar, Tejender Sheoran, "Microcontroller Based Closed Loop Automatic Irrigation System", International Journal of Innovative Technology and Exploring Engineering (IJITEE), ISSN: 2278-3075, Volume-1, Issue-1, June 2012.

[2] Rashid Hussain, JL Sahgal, Anshulgangwar, Md.Riyaj , "Control of Irrigation Automatically By Using Wireless Sensor Network ", International Journal of Soft Computing and Engineering (IJSCE),ISSN: 2231-2307, Volume-3, Issue-1, March 2013.

[3] Chandrika Chanda, Surbhi Agarwal, Er. B.Persis Urbana Ivy, AP(SG), "A Survey of Automated GSM Based Irrigation Systems", International Journal of Emerging Technology and Advanced Engineering , ISSN 2250-2459, Volume 2, Issue 10, October 2012 .

[4] Paper on the GSM and Controller based Control System for Home Appliances.

[5] M. GUERBAOUI, Y. EL AFOU, A. ED-DAHHAK, A. LACHHAB, B. BOUCHIKHI, "PC-BASED AUTOMATED DRIP IRRIGATION SYSTEM" , International Journal of Engineering Science and Technology (IJEST), ISSN : 0975-5462,Vol. 5,No.01,January 2013.

[6] Jay S. Sharma, Gautam D. Makwana, "Intelligent Crop Management System for Greenhouse Environment" ,International Journal of Science and Research (IJSR), India Online ISSN: 2319-7064, Volume 2 Issue 4, April 2013.

Websites:
[1] http://www.linengineering.com/LinE/contents/stepmotors/ pdf/RS485-232-card_v1_00.pdf
[2] http://www.delta.com.tw/product/em/control/plc/downloa d/manual/SA
[3] %20Instruction%20Sheet-English-20060112.pdf
[4] http://www.positronindia.in/datasheet/DS_PT0006.pdf