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SENSOR BASED SMART AGRICULTURE USING IOT

S.shyam sundar
Dept. Electronics and communication engineering
Easwari engineering college,Chennai.

B.Balan , M.Tech
Assistant professor
Dept. Electronics and communication engineering
Easwari engineering college,Chennai.

***Abstract*—** This paper describesthe construction and integration of multiple sensor into single board with reduced decoupling effect, relay being a part of the board while integrating noise will be produced due to heavy load consumption to prevent this I proposed using sensor fusion technology as being used for numerous applications.The proposed system is an AVR based wireless sensor node and it has the features of continuous monitoring of specified parameters with easy deployment procedures and increase the battery lifetime. In this paper IOT has been established by ESP8266 module which helps in data transmission from remote location in farm to the user. The sensor node consists of various sensors to monitor the values of soil moisture content, Rain intensity, current consumed by the motor by which calculating the dry-run condition and over load condition of the motor and it also helps in providing details of the current consumption of the motor.

Keywords: AVR Board, IOT, ESP8266, Sensors, Sensor Fusion, Dry-Run, Over Load.

I. Introduction

In recent years we have seen rapid development in the area of IOT. In all sectors starting from smart cities to smart villages, Though IOT has been introduced in agriculture it has not been able to completely flourish as the technology advancement has not been able to access by the farmer. At the same time it also requires doing multiple application of farm for this purpose multiple sensors have been integrated into a single board.

In agriculture, Farms being in remote places it's difficult to access and control the activities of the farm during odd hours. At the same time current fluctuations on farm causes damages to motor. In order to prevent these problems I have proposed to design a current sensor integrated with relay to control the motor. AVR microcontroller being used as it's an idle option for low current consumption when compared with other microcontrollers.

II Literature Survey

Prof.R.RJadhav, Pratmesh P Pandit, Shubham P Pal have induced GSM technology to control Three Phase Motor, but has a disadvantage that it does not cover complete utilities of Three Phase Motor. They have also not mentioned about the type of the GSM module used.

Jaypal.J.Ravibhaskar, Afshan.Y.Mulla, Amol.J.Baviskarhave termed the usage of IVRS technology in irrigation system, the main advantage of this paper is that they widely focus on latency involved in executing the complete process of control operation. Since their focus is on efficient irrigation system they have also implied soil moisture detection for efficient irrigation. But they don't focus on loads generated by the Three Phase Induction motor.

Mr. AJJ Mouton, Prof.C Smith,Mr.G.E Smith have implied technology in large scale farming especially in South Africa. They have also implied using the same GSM but for communication in large field they have used SCADA and they have also focussed on motor protection by concentrating on relay loads. This technology is very useful in implying remote areas where the accessibility is very minimum.

NikeshGondchawar, Prof.Dr. R. S. Kawitkar The highlighting features of this project includes smart GPS based remote controlled robot to perform tasks like weeding, spraying, moisture sensing, bird and animal scaring, keeping vigilance, etc. Secondly it includes smart irrigation with smart control and intelligent decision making based on accurate real time field data. Thirdly, smart warehouse management which includes temperature maintenance, humidity maintenance and theft detection in the warehouse

III. Hardware System

Microcontroller:

AVR microcontroller atmega 328p has been used it's an 8 bit microcontroller with RISC Instruction set. The microprocessor provides flexibility by operating in wide voltage range starting from 1.8v to 5.5v.

Oled:

The Oled has been used to display current status of the motor and current consumption of the motor which will be helpful for farmer to easily understand and to access we are using keypad panel separately.

Keypad panel:

The panel has been used to select the HP of the motor based on setting current calculation will be done accordingly and the details of the current calculation will later explained.

Soil Moisture Sensor:

The Soil moisture sensor has been used to detect the moisture content of the farm and update the details to the user.

Rain Drop sensor:

The rain drop sensor has been used to indicate the intensity of the rain and control the motor accordingly.

Current sensor:

The current sensor has been designed using hall effect sensor to calculate the current consumption of the motor and control it.

Relay:

30A DOAT relay has been used to control the operation of the motor. 30 A relay can tolerate peak current during intial stages.

Altium Designer:

Altium software has been used to design the pcb, sensor fusion technology has been implemented to prevent the noise problems.

ESP8266:

It act as anWifi module to gather details of the sensor and transmit the same to the user and to control the motor in auto mode. It also helps farmer to access the farm from remote place.

The general block diagram has been used to explain the working of the proposal which includes all the hardware components.

IV. System Integration

For efficient integration of system Altium software has been used to design schematic and pcb layout. The system integration is divided into two parts one is motor Board and another Farm board

Motor Board Integration:

The current sensor has been used to sense the current consumed by the motor. For cutting Motor off should calculate the current consumed based on HP of the motor. Mostly in agricultural farms 3 to 5 HP motor is used

For eg. $power\ consumed = 3 * 746 = 2238\ w$
Based on the watts we should calculate the current consumed as shown below

$$current\ consumption\ of\ motor\ with\ 100\%\ efficiency = \frac{2238}{230} = 9.7\ A$$

By looking at the data sheet we should know the efficiency of the motor probably efficiency will be around 60% to 80%.

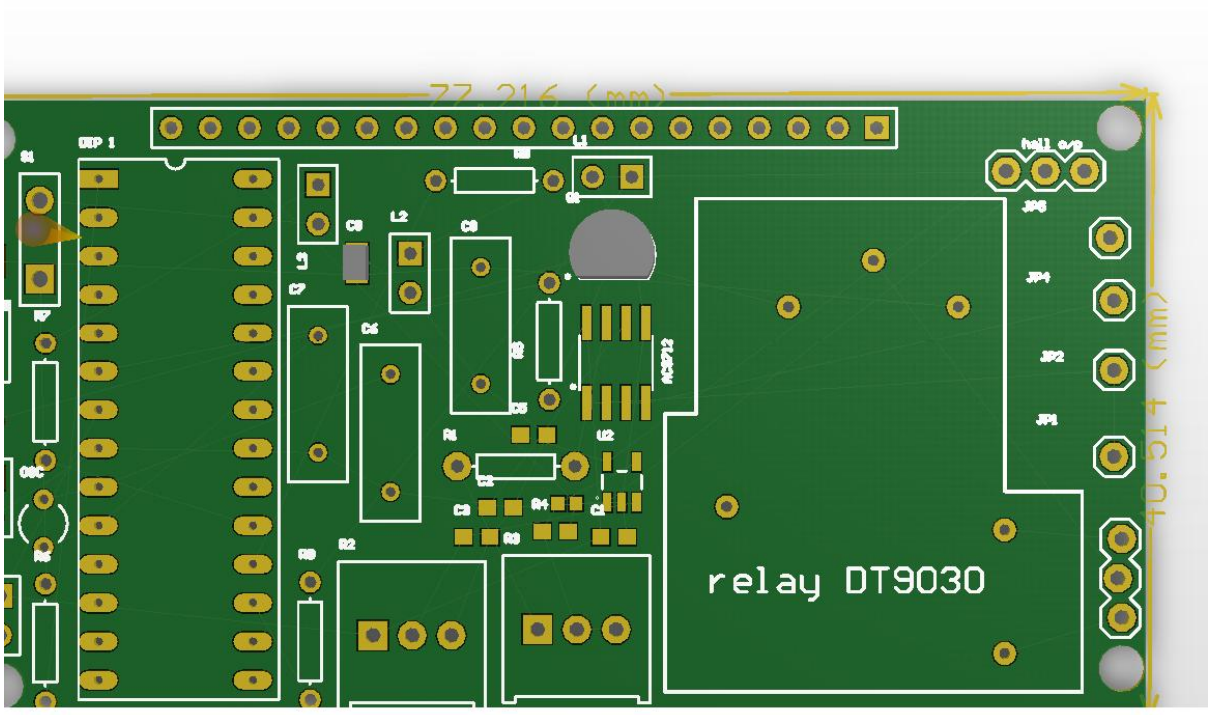
In case of 60%

$$current\ consumption\ of\ motor\ with\ 60\%\ efficiency = \frac{9.7A}{0.6} = 16.6A$$

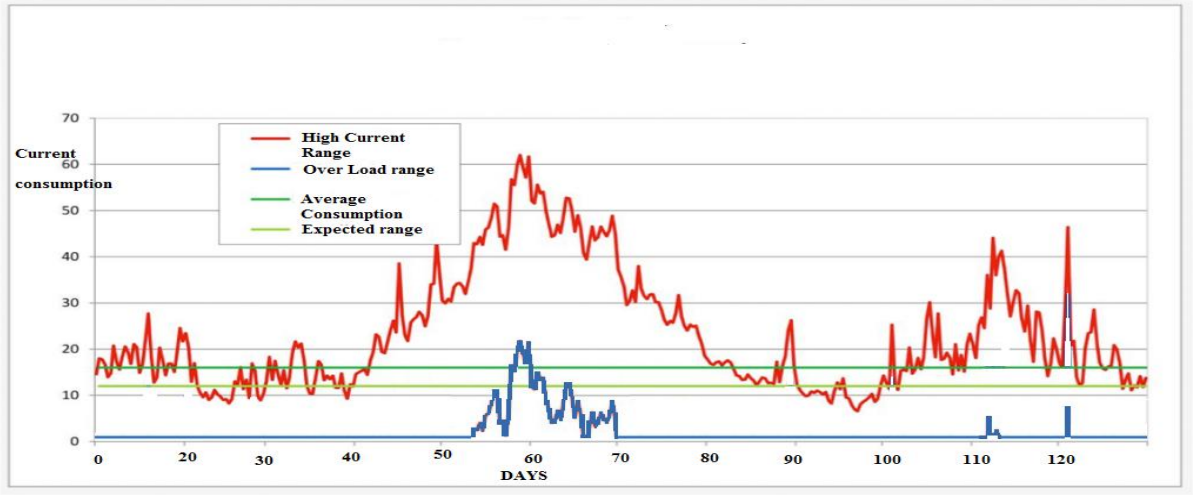
In case of 80%

$$current\ consumption\ of\ motor\ with\ 80\%\ efficiency = \frac{9.7A}{0.8} = 12.1A$$

If the current consumed by 3HP motor is greater than 16.6A then it's considered as OVER LOAD, if the current consumed is less than 9.7A then it's considered as dry-load.

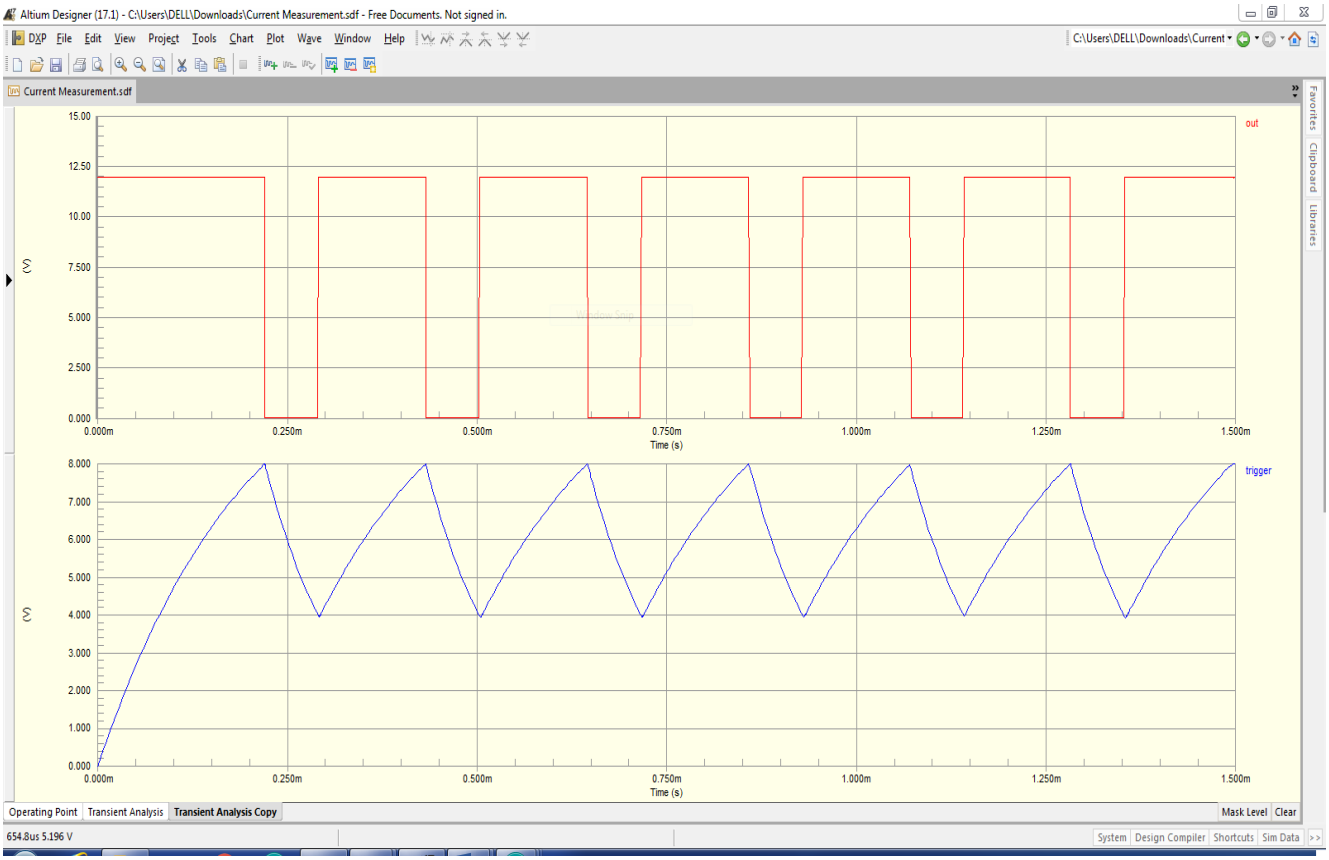


Cloud:
Thing Speak cloud has been used to moniter the data continuously from the hardware (i.e) from the motor. It calibrates the data accordingly and design a graph, the values based on the graph is denoted in the below picture



The Graph clearly denotes the current consumption of the motor and also denotes the exact time when the range exceeds (i.e) during the time of overload it has clearly notes.

Results:



V. Conclusion

Agriculture are gradually being replaced and enhanced by more sophisticated and accurate digital and electronic device. A high percentage of agriculture revenue is lost to power loss, incorrect methodsof practising. This is reduced by the use of smart sensors.The proposal is to perform the agriculture in smart and more efficient way. In addition, this method advocates for the use of the Internet of Things. The power consumption of board and all the details will be provided as feedback to the farmers. e.g., energy consumption, soil moisture level, and temperature.

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