Investigating the Performance of Various Sensors For Automotive Electronics Applications

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ABSTRACT : In this paper the performance of a various sensors is monitoring and control is carried out for industrial, green house, automotive electronics application, it also verifies the designing parameter and in stabilities of the system. The paper will be commenced by a basic understanding of the sensors, and the reason for choosing such components in this circuitry. Further simulation of a model circuit on simulating software PROTUS and analyze various sensors output in different condition. At last the simulated model is validated using hardware and it successfully implemented and tested under different places.

I. INTRODUCTION

In recent days, the industrial parameter such as temperature, humidity, pressure, velocity, acceleration, distance etc are need monitoring and control. This is one of the most upcoming issues in the industrial sectors. If the parameters are not monitored and controlled properly, it leads to a harmful situation. In that kind of harmful situations, again the man power is required to control the parameters. Sometimes, if this control process may not be handled properly, it results in an occurrence of major accidents. So, every process in the industrial sector requires more man power which is also having issues with the unavoidable manual mistakes. With the use of upgraded technologies, it is very easy to overcome the greater issues in the industrial automation.

The proposed system is designed for testing and control the real time performance of various sensors needed in industrial atomization. The initial section of the paper discusses the sensors and their utilization for monitoring of various industrial parameters. The system is designed to collect data from various sensors, monitor it with the set limit and give the control action. At last the result in different condition is discussed.

II. Hardware section

The system block diagram is shown in figure, it consist of Microcontroller, Signal conditioner, Stack of Sensors, Display device, Power supply etc.

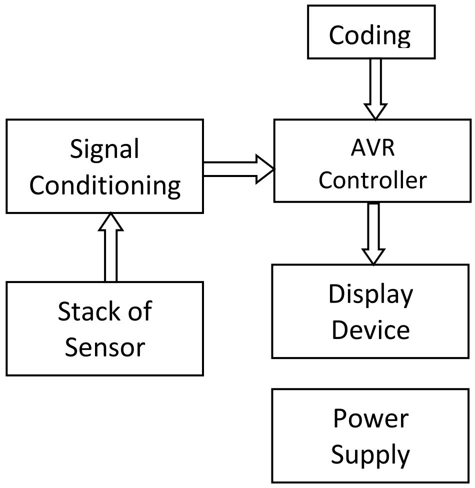


Fig 1System Block diagram

1) Microcontroller The microcontroller proposed for our system is ATmega32A which is a low-power CMOS 8-bit microcontroller based on the AVR enhanced RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega32A achieves throughputs approaching 1 MIPS per MHz allowing optimization of power consumption versus processing speed. To handle numerous tasks in the system the microcontroller Needs to be capable of executing more instructions at a time, thus ATmega32A is efficient for computation with an enough programmable flash memory of 32K Bytes.

2) Signal Conditioning The parameters such as temperature, pressure, humidity, and velocity are analog signals. A physical quantity is converted into electrical signals. We need an signal conditioning such as analog to digital converter (ADC) and Digital to Analog converter (DAC), which is an electronic circuit that converts continuous signals into discrete form or discrete form to analog form so that the microcontroller can read the data. ADC and DAC converters are the most widely used devices for data acquisition [7].

3) Stack of Sensors

a) Temperature Sensor: The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling.The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

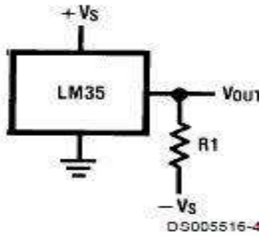


Fig 2 Full Range Centigrade Temperature Sensor

The LM35 can be applied easily in the same way as other integrated-circuit temperature sensors. It can be glued or cemented to a surface and its temperature will be within about 0.01°C of the surface temperature. This presumes that the ambient air temperature is almost the same as the surface temperature. The LM35 temperature sensor for value of R1 = –VS/50 µA, respective voltages are measured for corresponding sensed temperatures- VOUT = +1,500 mV at +150°C = +250 mV at +25°C = –550 mV at –55°C.

b) IR Sensor: An infrared sensor is an electronic device that emits in order to sense some aspects of the surroundings. It measures the heat of object as well as detects the speed. It is used in security systems and speed detection system.

Fig 3 IR sensor

c) Gas Sensor: MQ2 fire sensor is sensitive to smoke and flammable gases like LPG, butane, propane, methane, hydrogen and alcohol. Resistance of the sensor is different depending on the type of the gas. In built potentiometer allows adjusting the sensor sensitivity according to the gas that wanted to detect.

Figure 4: Gas Sensor

d) Speed Sensor MOC 7811

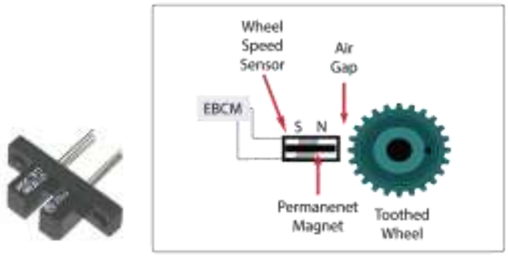


Fig 5 Speed Sensor

Fig.5 MOC 7811 shows Speed Sensor. It has internally LED & transistors. It gives output in between ground & +vs. By measuring pulses in between these two outputs we measured the speed of device in rpm. That output of speed sensor is directly connected to the interrupt pin/

e) Pressure Sensor MP3V5050:

As per system requirements for measuring pressure of device the MP3V5050 series silicon piezoresistive Pressure Sensor is selected. This sensor provide a very accurate and linear voltage output, directly proportional to the applied pressure. Fig.6 shows various types of pressure sensor. [15]

Fig.6 Pressure Sensor

4) Display Devices

Liquid Crystal Display (LCD) Module

In recent years the LCD is finding widespread use replacing LEDs (Seven Segment LEDs or other multistage LEDs because of the following reasons:

Its ability to display numbers, characters and graphics. This is in contrast to LEDs, which are limited to numbers and a few characters. Incorporation of a refreshing controller into the LCD, thereby relieving the CPU of the task of refreshing the LCD. Ease of programming for characters and graphics.

Requirements of display of LCD

1. It should be reprogrammable.

2. Illumination should be good.

3. It must be dust resistant.

4. Power consumption must be less.

5. Turn on delay should be less.

III. Proposed System

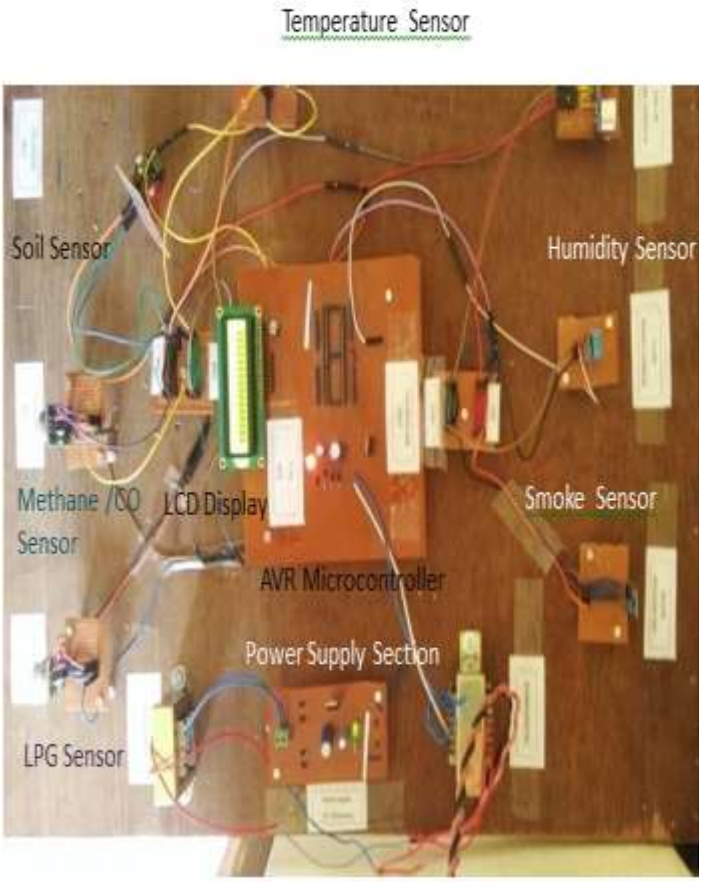


Fig.7 Proposed System

IV. Simulation Model

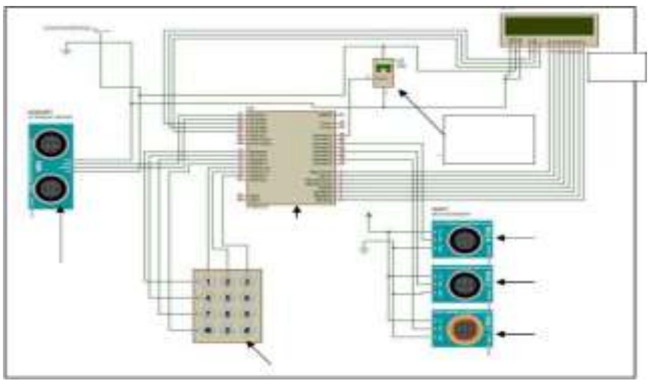
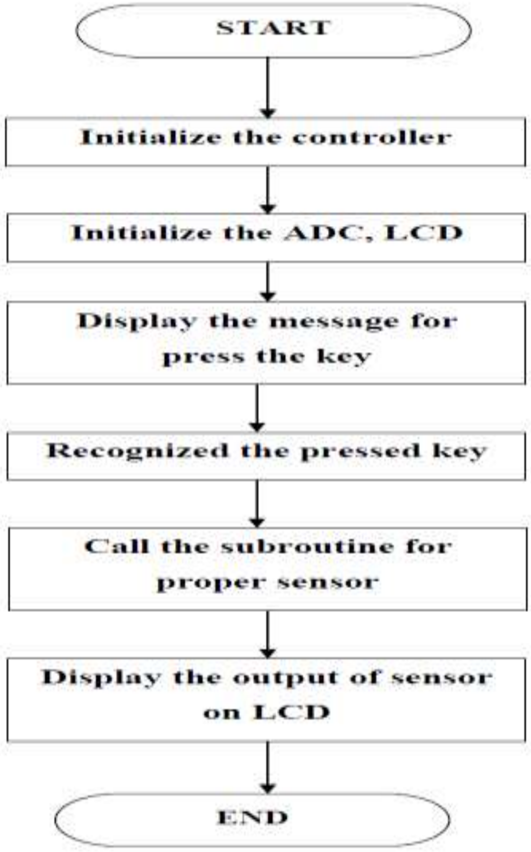


Fig.8 Protus simulation model

V. Flowchart



VI. Result Analysis

Table 1

Temperature Sensor (LM35)	
Sensor I/P (0C)	O/P voltage(v)
5	0
22	0.16
38	0.32
55	0.48
72	0.64
88	0.81

Output of Temperature sensor LM-35

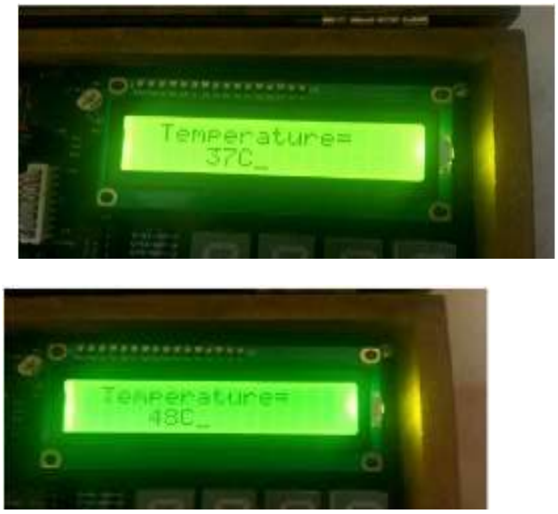


Fig.9 Reading Temperature sensor

Table 2

Humidity Sensor(DHT 11)	
Sensor I/P (%RH)	**O/P Voltage(v)**
11	0.5
26	1
42	1.5
58	2
73	2.5

Output of humidity sensor **DHT11**

Fig.10 Reading humidity sensor

Output of Ultrasonic Sensor

Fig.11 Reading of ultrasonic sensor

Output of Soil Moisture Sensor

Fig.12 Reading of Soil Moisture sensor

Laboratory setup for testing gas sensors on various pressure

Fig.13 Laboratory picture

Picture shows three cases of measured values for butane, methane and propane. Tests were performed in a room of dimensions 3 m 5 m and 2.5 m of height. The gases were introduced at three different pressures A, B and C (pressure A is the highest and pressure C is the lowest). Then, the volume of gas in the room was measured for 80 seconds. Note that for the case of higher pressure (A) the gas sensor responds faster and the measured gas concentration is also higher. In the opposite situation is the case of lower pressure (C). When any of the above threshold levels (dashed lines) is exceeded, the detector activates an alarm indicator light for 5 seconds to confirm the detection and prevent false alarms. When this time is up, if the level of detection is maintained, the alarm for the mobile application is activated. When the detector, in alarm state, detects a gas concentration level of less than 10% L.E.L for a certain time, it deactivates the alarm indicator light and the alarm output for the mobile application.

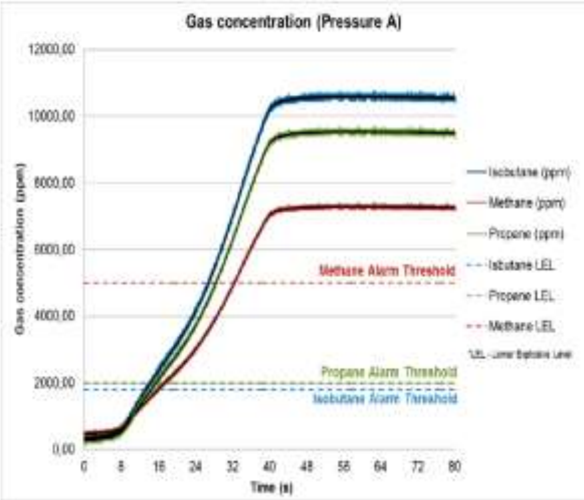


Fig.14 Graph of Gas concentration (Pressure A)

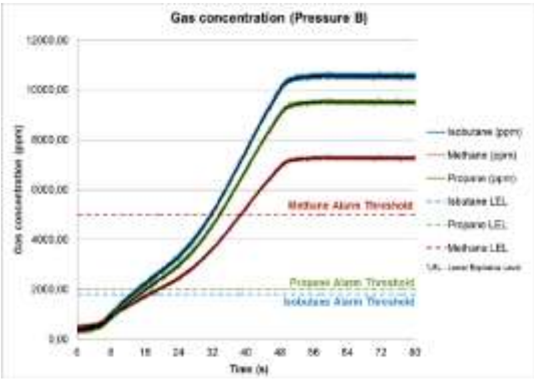


Fig.15 Graph of Gas concentration (Pressure B)

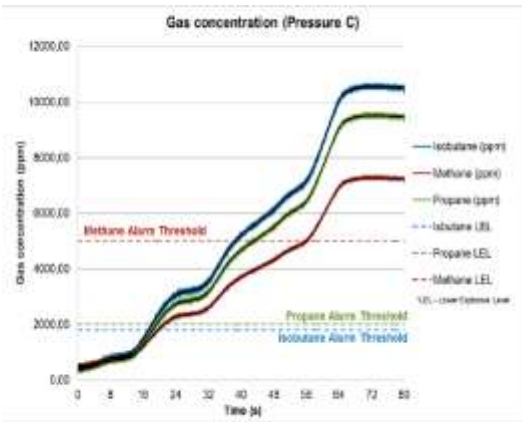


Fig.16 Graph of Gas concentration (Pressure C)

Methane Sensor(MQ-4)	
Sensor I/P (PPM)	O/P Voltage(v)
155	0.5
310	1
465	1.5
621	2
776	2.5
931	3

Carbon monoxide Sensor(MQ-7)	
Sensor I/P (PPM)	O/P Voltage(v)
155	0.5
310	1
465	1.5
621	2
776	2.5
931	3

Fig.17 Reading of Gas sensors

CONCLUSION

The main objective of the project to design embedded system for monitoring the various physical parameters like temperature, humidity, distance and various gases in industries as well as the green house is achieved by implementing the system which monitors the physical parameters in industries as well as green house.

Temperature and humidity sensor:-

Temperature and humidity sensor is used to sense the temperature and moisture in green house and industries. For increasing the crop the temperature and humidity is essential factor, crops needed suitable temperature and humidity for growth. In industries the production required the suitable temperature and humidity. All processes depend on temperature because heat makes molecules move or vibrate faster, resulting in faster chemical reactions. Accurate measurement of the temperature of products in retail frozen food cabinets requires particular care.

Soil moisture sensor:-

In green house for growth of crop it is necessary to determine the water content in soil. The growth of water content is depends upon the water content in soil. This sensor is used to sense the water content in soil it gives output in percentages.

Distance sensor:-

This sensor is used to sense distance. This sensor is used in robotics to avoid the obstacles. This sensor is also used in various production process to determine the distance.

Gas sensors:-

Gas sensors are used to detect the hazardous gas in industries. In our system we use the MQ series gas sensor i.e MQ-2, MQ-6, MQ-7 sensors to sense the gases MQ-2 sensor is used to sense the smoke in various industries. MQ-6 sensor is used to detect the LPG gas, LPG is one of the hazardous gas in the industry which causes harm to human being as well as the production process. MQ-7 sensor is used to detect the CO gas, CO is one of the hazardous gas in the industry which causes harm to human being as well as the production process. We have test the system and it give the expected result.

References

[1] M.P.Aher, D.N.Kyatanavar, M.A.Sayyad "Advanced WSN Based Green House Monitoring and Controlling with GSM Terminal" Vol-1 Issue-4 2015 IJARIIEISSN(O)-2395-4396.

[2] Jayashri Ingale, Dr. P. H. Zope |Aadhar enabled ration distribution and monitoring using smart card | IJSSBT volume 6 | Number 1 | January 2018| Print: 2277-7261| Online: 2278-3857

[3] P. V. Mane-Deshmukh, B. P. Ladgaonkar0, S. C. Pathan, S. S. Shaikh "Microcontroller Pic 18f4550 Based Wireless Sensor Node to Monitor Industrial Environmental Parameters" International Journal of Advanced Research in Computer Science and Software Engineering, Volume 3, Issue 10,October 2013 ISSN: 2277 128X.

[4] P. H. Zope, Harshal Dahake | Design And Implementation Of Messaging System Using Braille Code For Virtually Impaired Persons | International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering | Vol. 5| Issue 7| July 2016| ISSN (Print) : 2320 – 3765| ISSN (Online): 2278 – 8875 |DOI:10.15662/IJAREEIE.2016.0507001 -5977-5984| Impact Factor -5.62.

[5] Mr. Jadhav sunny P, Mr. Gaikwad Siddesh R, Mr.Hase Kiran D, Mr. Mandlik S. B. "Industrial Parameter Monitoring and Controlling Using Gsm and Web Server" IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) e-ISSN: 2278-1676,p-ISSN: 2320-3331, Volume 9, Issue 2 Ver. VI (Mar – Apr. 2014), PP 71-73.

[6] Sawant Supriya C, Dr. Bombale U. L., Patil T.B "An Intelligent Vehicle Control and Monitoring Using Arm", International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 4, October 2012.

[7] Madhukar chavan, V. S. Sryavanshi " AVR Microcontroller Based Temperature Control System with Real Time Data Logger" Volume 2, Issue 11, November 2014 International Journal of Advance Research in Computer Science and Management Studies. ISSN: 2327782 (Online).

[8] Prof. Pranit P. Kathale, Jyoti Mankari, Payal Shire "A Review on Monitoring and Controlling System for the Operation of Greenhouse Environment"International Journal of Advanced Research in Computer Science and Software Engineering Volume 5, Issue 4, 2015 ISSN: 2277 128X.

[9] Raghu Vidap, Guruling Shahane " Development and implementation of arm microcontroller based co gas monitoring system." International Journal of Advances in Engineering & Technology, Oct., 2015. ©IJAET ISSN: 22311963.

[10] Anil.H.Sonune, S.M.Hambarde "Monitoring and Controlling of Air Pollution Using Intelligent Control System." International Journal of Scientific Engineering and Technology ISSN: 2277-1581 Volume No.4 Issue No5, pp: 310-313 01 May.

2015.

[11] Miss.Potdar Snehal Dilip "Zigbee & Ethernet Based Monitoring & Controlling Of Real Time Industrial Parameters" International Journal of Advanced Research in Electronics and Communication Engineering (IJARECE) Volume 3, Issue 1, January 2014.

[12] Mr. P. V. Karande, Prof. Zameer Farooqui, Prof. S.R. Madkar "Wireless monitoring of Soil moisture& humidity using Zigbee in Agriculture" International Journal of scientific research and management (IJSRM) ||Volume||3||Issue||2||Pages|| 2062-2066||2015||.

[11] SargunaPriya.N, Jothi Mani.M, Amudha.P "Monitoring and Control System for Industrial Parameters Using CanBus" International Journal of Engineering Trends and Technology (IJETT) – Volume 9 Number 10 - Mar 2014.

[13] Suganya.R, Suseendhar.P "Online Monitoring of Green House Gas Leakage in Industries". IJREAT International Journal of Research in Engineering & Advanced Technology, Volume 1, Issue 6, Dec-Jan, 2014.

[14] Snehal Thakur,P. H. Zope , Nidhi Solanki | Study Of Wireless Sensor Network For Iot Application | International Journal of Advanced Electronics & Communication System | Approved by CSIR-NISCAIR | ISSN No- 2277-7318 | Vol-6 No-2 (2017) | PP 6-12

[15] P. H. Zope, Harshal Dahake | Design and Implementation of Messaging System Using Braille Code for Virtually Impaired Persons | International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering | Vol. 5 | Issue 7 | July 2016 | ISSN (Online): 2278 – 8875 | Impact Factor-5.621.

[16] Bhushan N. Patil, P. H. Zope, K. S. Patil | Development of Low Cost TDR System for Soil Moisture Measurement |International Journal of Advanced Research in Education & Technology| Vol. 2| Issue 3| July to Sept-2015| Impact Factor-1.568.