

IoT Based Industrial Security Control and Monitoring System Using NodeMCU

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Abstract: There are many sudden accident is happened in various industries recently. So now a day's security has become an important issue in everywhere. Developing this trend a new intelligent smart security system of industry based on various wireless sensor/actuator, Node MCU microcontroller with IoT network is proposed in current research paper. This innovation namely IoT Based Industrial Security Control and Monitoring System Using NodeMCU detect any Chemical overflow or leakage, Gas leakage, Fire/Boiler explosion or short circuit and sensing temperature, humidity, undesired sound by various smart sensor. So it can measure any environmental deviation and monitored the update condition of the industries and inform the proprietor by Email &SMS through internet. So it's not a matter the proprietor stays in far or near. After knowing current condition it can take proper action which protect the industries from accident and saves many lives. A traditional security system gives the signal by alarms. Here Internet of Things is used to communicate with the device for sending and receiving required information and data through internet. So it can be controlled and monitored from anywhere & anytime through computer, mobile or any smart device. Moreover combination of embedded electronics and computer programming is the significant outcome of the work. The more advantages of this device are it is a portable device and it can be driving both mobile & computer by internet.

Keywords: NodeMCU, Ultrasonic sensor, Gas sensor, Temperature sensor, Flame sensor, Temperature monitoring.

I. INTRODUCTION

IoT stands for the Internet of Things. It refers to the connection of devices other than computers and smart phones to the Internet [1]. Devices on the IoT range from cars, kitchen appliances, alarm systems, and medical devices like heart monitors. It is basically anything that can connect to the Internet that isn't traditionally considered a thing you'd connect to the Internet. Smart intelligent system consists of the automation and security both is included on it. The smart system has been smartest when the highest security system has been added on it [2][3]. A smart system is highly automated system. This is called intelligent because of having a computer system to monitor the whole system and take a decision after taking corresponding signal from the sensor. Smart intelligent industrial security system is one that has highly advanced automatic systems for controlling lighting and temperature, multi-media equipment for monitoring and activating security apparatus (alarms and alerts) associated

with windows and doors and many other functions. This system appears "intelligent" because its computer systems can monitor many aspects of daily life. It is packed with various technologies and sensors to gather information about the current status in the smart home (e.g. where is the user located, what does the occupant do, current temperature etc.) and the other hand the target of such a house is to increase the quality of life of the user. Besides protecting home against intruders, there are many advantages to investing in a home security alarm system [5][7].

II. IMPLEMENTATION

This home automation and Security system functioning based on web based application. Users have to open any browser using mobile or computer. Users have to insert specific IP address as URL address. After that user show a password box [8][9]. Putting password user can see full web application and control home appliance. The following figure shows the overall design of this project

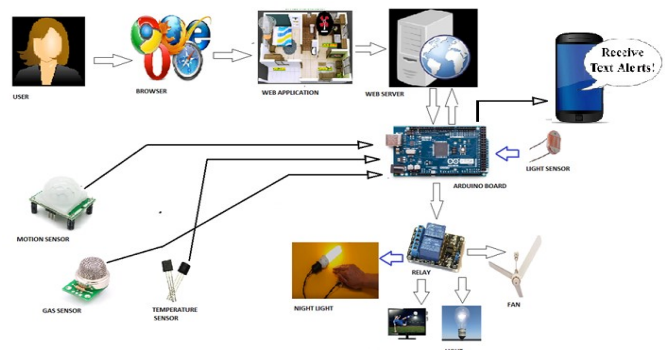


Figure-1: Implementation order

To maintain all home appliances user using mobile phone or pc browsing specific IP as URL he can access the dashboard. After completing log in authentication user can access the control panel and control the light fan. When user click on light button to turn on light then a signal pass to web server. This web server actually is Ethernet web server. The web server gets the signal and passes it to NodeMCU board. Then the NodeMCU check the switch current status. If light is already on it shows that light is ON as yellow bulb or find that light is off then it turn on the light. Gas, motion and temperature sensor frequently pass information to NodeMCU

board. If gas or motion detects then a signal pass to web server through NodeMCU board. The web server gives the notification in web application. And a notification sms send to user mobile with the help of gsm module.

How Controlling Electrical appliances

The following figure easily describes how the electrical home appliances are controlled and monitor. Using any browser from mobile or computer user access to web application through a specific IP address. After log in he can see the application. User can see the current status of electrical appliance. Either it's on or off [10]. When user click on fan to turn on the signal passing to NodeMCU Mega microcontroller using Ethernet shield.

- Ultrasonic sensor -for controlling industrial pump
- Temperature sensor -for controlling industrial temperature fluctuation
- Gas sensor-for determining gas leakage
- Flame sensor- for determining fire
- Sound sensor-for determining sound intensity

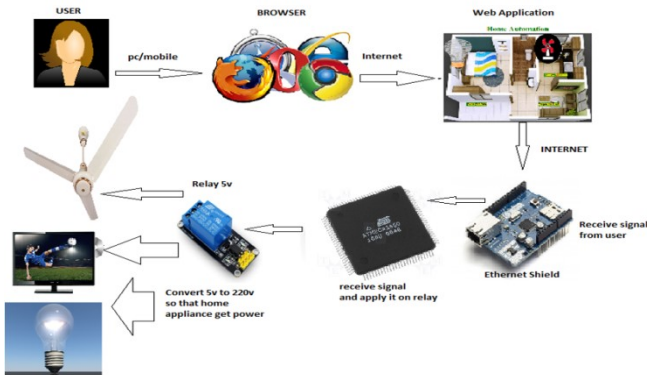


Figure-2: How the electrical appliance are controlled & monitored

According to signal, the microcontroller turn off or turn on the relay connection. If relay need much voltage it takes from external source. Such this way the electrical appliance is controlled and monitored. These following sensors are used to design of industrial security system.

NodeMCU with Ultrasonic sensor

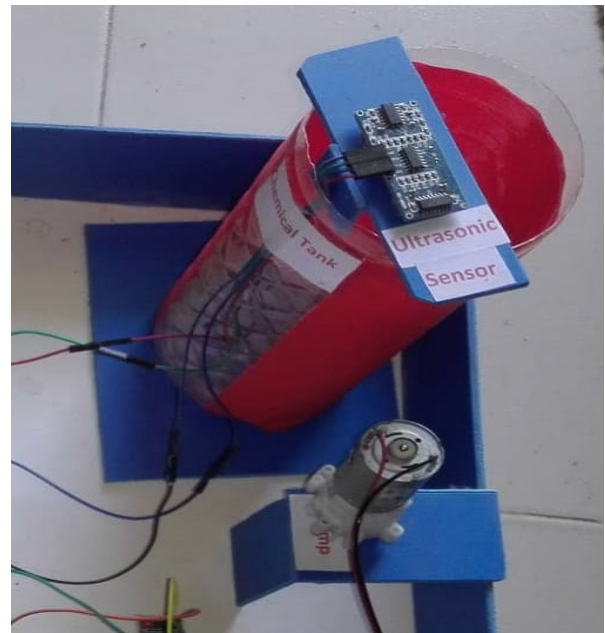
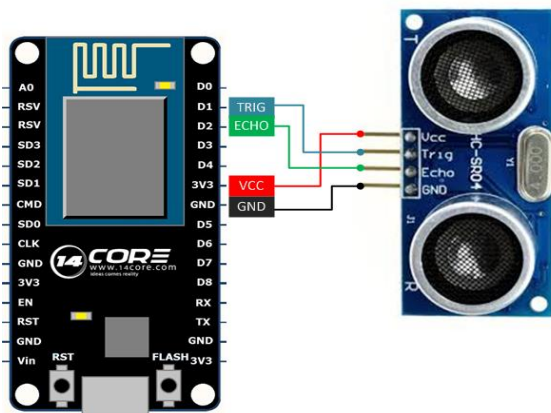


Figure-3: Chemical or water level measure& pump on/off using ultrasonic

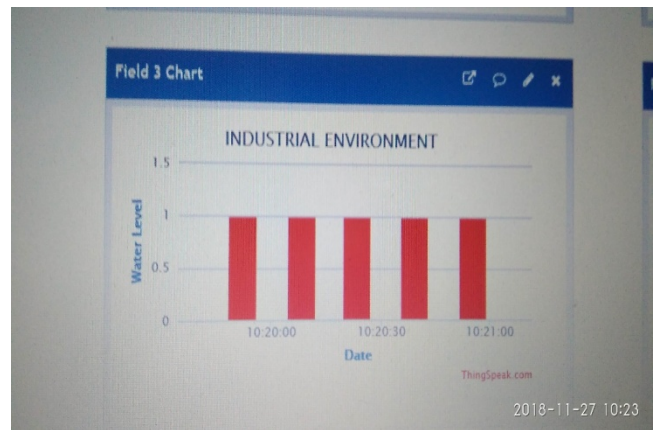


Figure-4: Chemical or water level monitoring from internet



Figure-5: Chemical tank

NodeMCU with Temperature sensor

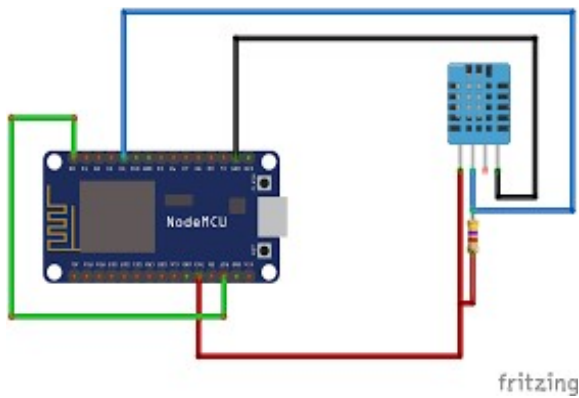


Figure-6: DHT interfacing with NodeMCU

Connection

- DHT11 sensor (+) pin will be connected to 3.3V
- DHT11 sensor (-) pin will be connected to GND pin
- Output of DHT11 sensor is connected to GPIO5 pin of ESP8266

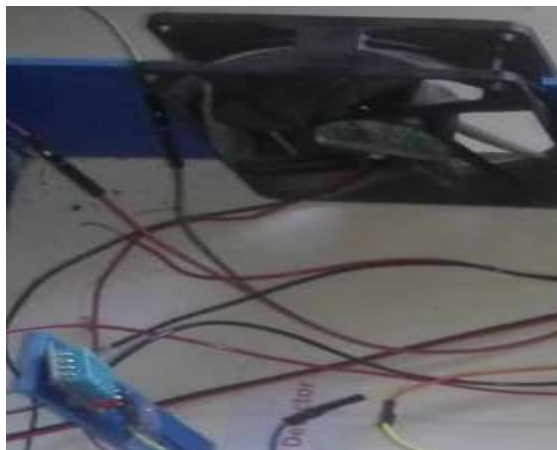


Figure-7: Cooler control using DHT

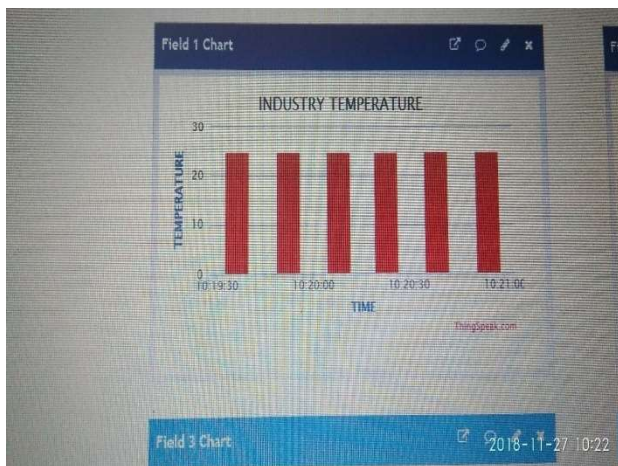


Figure-8 Temperature monitoring from internet



Figure-9: TEMP high & Cooler ON

NodeMCU with Gas sensor

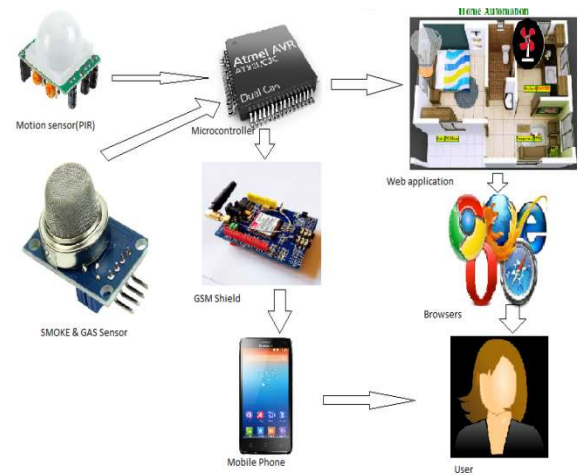


Figure-10: How the MQ-2 gas sensor works.



Figure-11: Gas level monitoring from internet



Figure-12: During Gas high light & buzzer ON

NodeMCU with Flame sensor

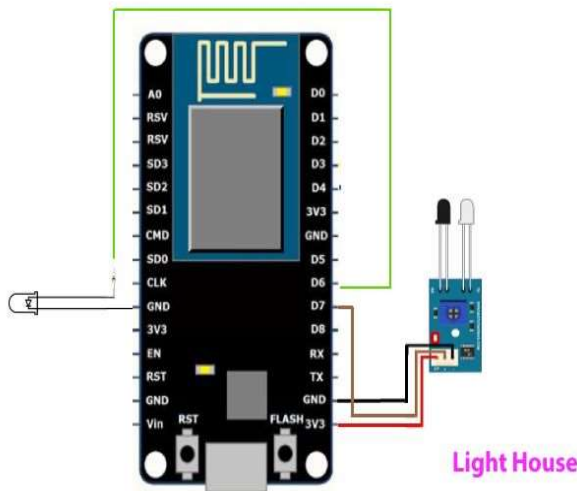


Figure-13: Flame sensor interfacing

NodeMCU with Sound sensor

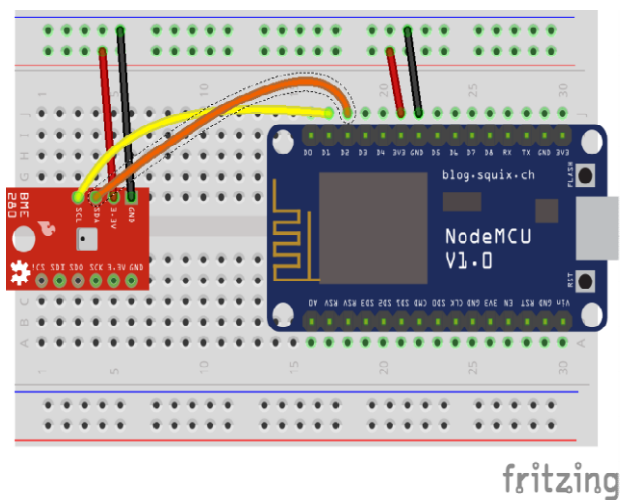


Figure-14: Audio sensor interfacing

The Overall Monitor & Control System View

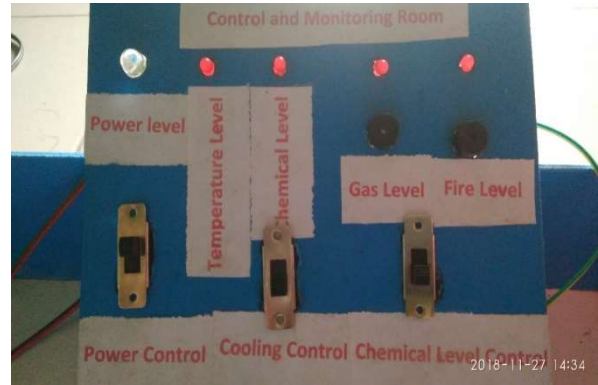


Figure-15: Analog view

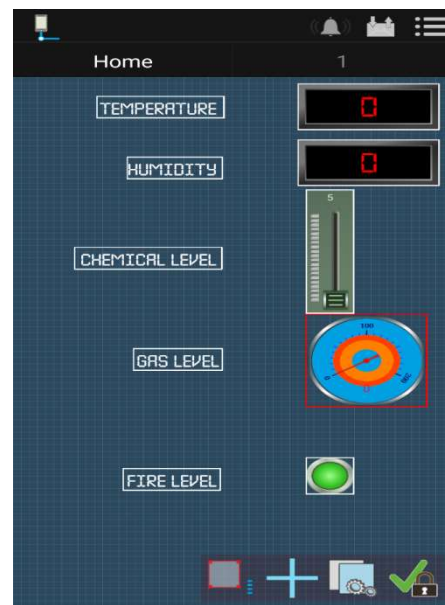


Figure-16: Mobile view

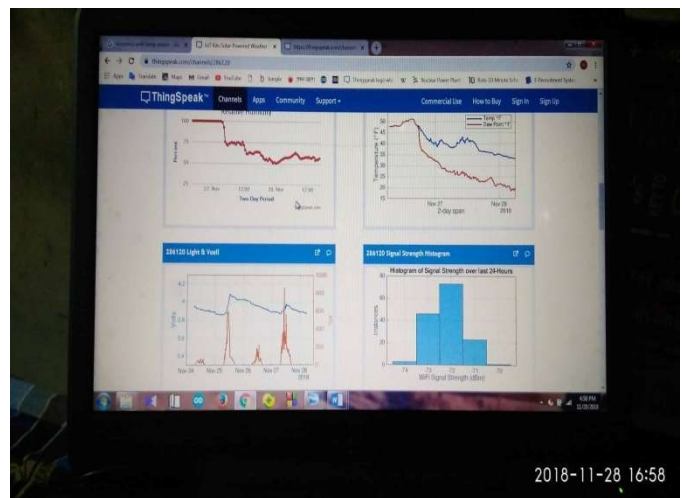


Figure-17: Complete monitoring by internet from anywhere

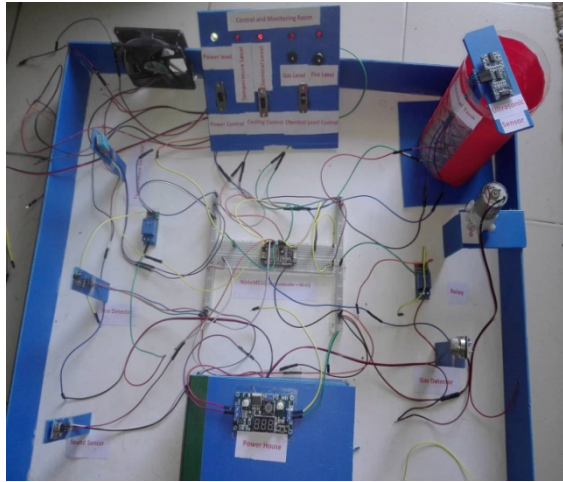


Figure-18: Final implemented System (front view)

Parts list with cost estimation

Name	Quantity	Price
NodeMCU	1	500tk
Ultrasonic sensor	1	200tk
Temperature sensor	1	200tk
Gas sensor	1	200tk
Flame sensor	1	200tk
Sound sensor	1	200tk
PUMP	1	200tk
Cooler	1	180tk
Battery	2	600tk
Adapter	1	200tk
Bread board	1	200tk
Relay	3	250tk
Jumper wires	4pac	200tk
Resistors	1pac	50tk
LED	10pic	50tk
Ethernet cable	1	100tk
Sheet board	2	400tk
Switch	3	50tk
Soldering iron	1	200tk
Glue gun	1	200tk
Knife	1	100tk
AC wires		50tk
PAPER	4	1000tk
Others		200tk
TOTAL		6000+

III. DISCUSSION

To complete this smart security system there has to face a lot of problems. After overcoming this problem the system now work accurately. The problem is occurred in the power supply section. The regulated IC cannot give 2A current. Some modules are not functioned without that power supply. The IR sensor detects the infrared ray from the sun. So that module do not work properly when sun ray present on that place where it is placed. The voice controlled apps cannot detect proper command when noise present around it [11]. So it is very difficult to control it on that environment. The 1sheadl cannot connect easily to the android phone. After overcoming these difficulties the system is working properly.

IV. LIMITATION

Through we try hard to do best but this project has some limitation [12]. I try to list some laminations

- Before buying real IP address this project just work only intranet not over internet
- User can't get the password customization facility
- If sensors are damage or not working properly there will be occurred serious site effect.

V. CONCLUSION

This security System is cheaply made from low-cost available components and can be used to control more than others. This system is easily adjustable at any industry or office space. The designed system was tested a number of times and successfully control from different place. Finally, this security system can be also implemented over Bluetooth, Infrared and WI-FI connectivity without much change to the design. Hence, this system is scalable and flexible.

VI. FUTURE WORK

In this project we have a large scope to develop and working with this project. We try to list some task which would be added in future [13].

- Add a camera and using image processing try to find out known and unknown face. If detect known face system can send sms and email with picture and information about this face which is store in previous.
- We can make the web application more users friendly. Can be added voice commands technology
- Adding some safety issues like when gas leakage or smoke found the system automatically takes necessary steps to reduce the losses.
- Face detection function give this system advanced which fulfill the demand of human being.
- With the replace of spy camera by CCTV camera this will be more accuracy to identify the intruder.
- By Adding the CO₂ gas cylinder on this system to extinguish fire automatically.

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