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# IOT Based Monitoring of Temperature in Industrial Oven

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**ABSTRACT:** Automation has become a huge scope in the modern world. It's mainly because of the evolution of Industry 4.0. The rapid growth of the technologies like Artificial Intelligence (AI), Machine Vision and IoT based applications, support us to live a sophisticated living. Indian firms are thriving towards such kind of automation, which earns them revenue by cutting-off the extra allowances on the manual operations currently being used. Our project combines mechanical, electrical and IT oriented aspects for initializing the automation process of temperature monitoring through IoT based applications and showers ways for further improvements that can be done on the same.

## I. LITERATURE REVIEW

The paper proposed an intelligent door system using Internet of Things, which detects and send the email notification to the owner about the intrusion. It logs all the intrusion data into google spreadsheet of owner's google drive account. ADXL345 accelerometer detects the change in motion of the door. Raspberry pi has been used to read sensor data. Sensor data is sent to the Amazon Web Services Internet of Things (AWSIoT) console. AWS Simple Notification Service (SNS) will send out email notification to the concerned owner based on the AWS IoT console message based on the messages from the AWS IoT console. All the intrusion logs are also stored in google spreadsheet by OAuth2.0 protocol to access related google Application program interface (APIs). The proposed system can be used as a prototype in strengthening door security in many applications such as bank burglary, home invasions, Ram-raiding, office door breaching and lock picking

The paper proposed IoT based attendance system. Attendance system is designed with the use of micro controller ESP8266 12e and OLED display. OLED display shows the names of the students whose fingerprint is scanned. A fingerprint module R305 has been used to scan and recognize the fingerprints. Other components used are wires, switches, and PCB. The system has a transmitting module to send the fingerprint matched ID. A server in attendance system receives fingerprint matched ID from the transmitting module. After processing the data, student attendance is calculated in percentage. A student can check their attendance through the android application provided by the system. This application facility sends push notifications when assignments are issued by teachers or the attendance of particular student is low. The System can be used for security purposes where high-level security is desired.

The paper proposed smart pollution detection and tracking system. The Pollution from the vehicle is sensed using the MQ7 Arduino which is connected to the Arduino board which in turn is connected to the GPS module. The Amazon AWS IoT is connected to Arduino board using MQTT connection. This enables a secure connection with the Arduino. The data that is received is checked against the threshold value. If the value exceeds the threshold value then notification is sent to the users mobile phone. MQ7 Gas sensor is preferred to be the cheapest and it can be coded with an Arduino board which enables easy implementation.

The paper proposed IoT based Intelligent Safety & Location Tracking Device for Old Age & Women. The purpose of the system is to assist parents to locate missing or lost women and children. It works using GPS and SMS and detects the child location. The System sends the location to parents using GPRS module. An application is helpful for parents that will allow them to send a location request to a child side then retrieve the location from the request reply and point it on a map. Another application is also provided for child side that gathers the necessary information of the smart

phone that will be used to locate the smart phone. In the case of extreme emergency, an SOS button is available in the system which sends the location of the device to registered mobile for help from parents or person. The System is comparatively low-cost solution and performance of the device is accurate and reliable. The web version is used to see current the location and send updated location to server. This system use ARM-LPC2138 as microcontroller and for GPS S1216R module has been used. The server has been created using FileZilla tool. One server collects the data from the system and sends it through GPRS.

## II. PROBLEM STATEMENT

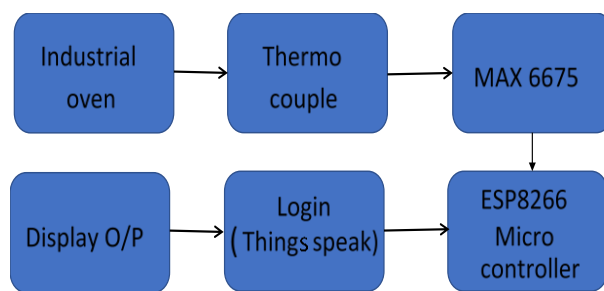
When we approached the company for our project work they provided us four different problems which was existing and unsolved for many years. They asked us to select anyone of the given problems and complete it successfully.

The template is used to format your paper and style the text. Automating the industrial oven temperature display. Analysing the ways to reduce the formation of burr. Analysing and providing solution for edge chipping in gang saw cutting machine. Solutions for stopping the breakage of old drill bits used for riveting holes at high load.

## III. PROJECT IDEA

With the help of mechatronics system and IoT, we can automate this whole process. We can use the micro controller in such a way that the output from the ADC can be directly fed to the micro controller and which in turn gives the data to the software using Wi-Fi module and using a web page we can connect the MC and the system thus making way for the constant display of the temperature. The coding of the MC can be done using the Arduino IDE and the power supply to the circuit can be drawn from a battery source or some other mode of current which needs to be discussed in detail. The Things Speak is a free IoT analytics cloud platform, from where the data can be recovered for future reference and can be secured only when it is accessed by the company created access key.

### A. Schematic layout of the proposed idea

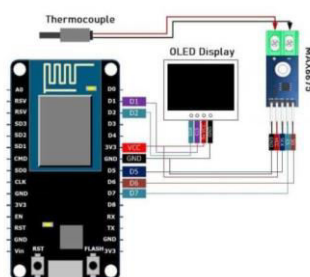


(a)

### B. Outline of the setup

#### Circuit Diagram: MAX6675 & ESP8266

The circuit diagram for interfacing MAX6675 Thermocouple with NodeMCU ESP8266 is given below.

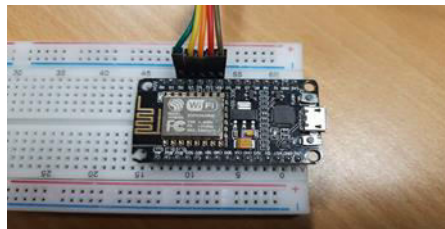


(b)

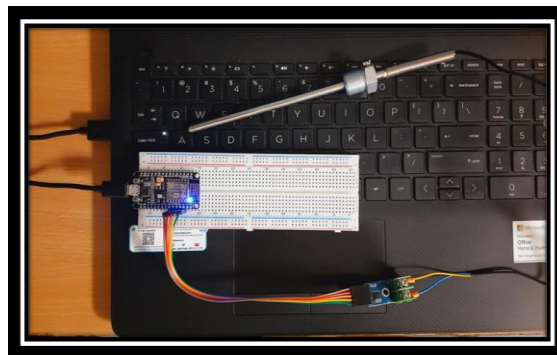
### C. Proposed solution for the problem statement

Functioning-Thermocouple connected to MAX6675, which gives Analog signals to the ESP8266 MC, which in turn converts the input with the aid of Arduino code into digital output which is connected to a HTML website and things speak.

The thermocouple input from the PR502 is fed to MAX6675 through series connections. The MAX6675 converter gives Analog signals to the ESP8266 MC, which in turn converts the input with the aid of Arduino code into digital output, which is connected a HTML website and Thing Speak.

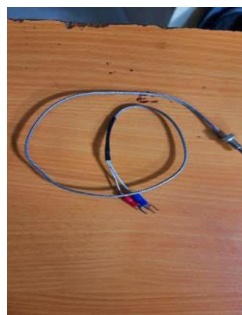


(c)



(d)

[1] Note - It is a J-Type Thermocouple made up of iron and constantan. It ranges up to 750°C. There is another type called the K-Type which ranges between 1250°C it is made up of chromel and alumel we used this only for trials, as the company uses J type at present.



(e)



(f)

### Working of Components

- [2] The **MAX6675** performs cold-junction compensation and digitizes the signal from a type-K thermocouple. This converter resolves temperatures to 0.25°C, allows readings as high as +1024°C, and exhibits thermocouple accuracy of 8LSBs for temperatures ranging from 0°C to +700°C.



- In our setup, we have tested with both J-Type (the one which company uses) and K-type thermocouples.
- The Rane Industrial oven works at the range of 130°C - 170°C, so it can be the best device for connecting thermocouple and ESP8266 MC without any problems.
- The **ESP8266** is a low-cost **Wi-Fi** microchip, with a full TCP/IP stack and microcontroller capability, produced by Espressif Systems in Shanghai, China. It is capable of either hosting an application or offloading all **Wi-Fi** networking functions from another application processor.
- In our setup, it plays an important role in transmitting the data received from oven to the display, when the output screen and the ESP8266 MC are connected to the same Wi-Fi network using its inbuilt Wi-Fi module.
- It requires minimal power supply at the range of 3.3V range. It requires type-B cable for connecting with the power socket.

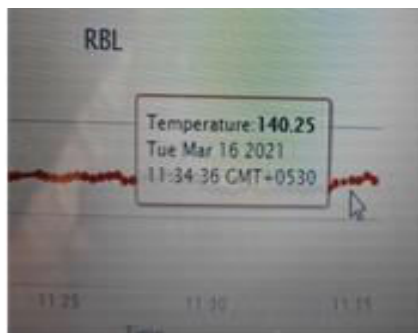


(g)

- Thing Speak enables sensors, instruments, and websites to send data to the cloud where it is stored in either a private or a public channel.
- It provides instant visualizations of data posted by your devices to Thing Speak.
- It is often used for prototyping and proof of concept IoT systems that require analytics.
- The temperature data of oven gets transmitted to this platform, and we can visualize the readings in graphs and can be retrieved as excel sheet in the format of **Date , Time and Temperature**.
- We can set the time zone for time limit, login and password for the platform for its security while accessing the data stored in the cloud by the company for future reference.



(h)



(i)

## IV. BILL OF MATERIALS

SL.NO	BILL OF MATERIALS		
	DESCRIPTION	QTY	COST
1.	ESP8266 - 12E WIFI MODULE	1	500
2.	MAX6675 + THERMOCOUPLE J TYPE	1	600
3.	JUMPER WIRE	5	50
4.	BREAD BOARD	1	100
5.	ADAPTER	1	250
		TOTAL COST	1500

## V . INFERENCE

After all the observations & demo's, we found the best solution among many proposed methods, which is more feasible for the given challenging cross-domain problem. We had developed a new product which collects and transmits the data, with Arduino code as its backbone.

In simple words, our setup for the online monitoring of the oven temperature using IoT platform, has reduced the extra allowances of manpower on manual measurements of the temperature and has generated a significant amount of profit to the company. Furthermore, improvisations that can be made on the product with future technological developments were also marked for future enhancements of our setup.

Our product is very cheap for installing and proper maintenance of the product will produce the constant and accurate measurements throughout its lifetime. Concluding the thesis, our new product for the online monitoring of the temperature has run successfully and would generate even more profits to the company through proper maintenance and using the marked further enhancements.

## A. Further improvisations

Creating their own website for the output of the given setup instead of Thing Speak platform in case of privacy issues, with the assistance of IT team. Type-B charging adapter of 3.3V is required for ESP8266 MC for its working. Currently, the product is running with Arduino code, with technical developments in the future, even the product can also be tried with PLC programming at the currently used low cost for Arduino. Currently, there are no provisions to run the product with PLC programming as we faced the connectivity issue in the first proposed method.

Back-up power supply and Wi-Fi connection should be provided for smooth running of the product at abnormal times.

The setup can be further enhanced with more upgraded electrical devices in future.

The total setup cost can be reduced by bulk purchases.



(j)

More accuracy can be achieved with the help of more precise electrical components with detailed study, which can further improve the efficiency of the process.

#### ACKNOWLEDGMENT

We express our heartfelt gratitude to **Mr. Govardhan**, Corporate HR, for referring us to do the project in his esteemed company.

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We wish record thanks to the encouragement that we received from our Internal Guide **Mr.G. Kaliraj, M.E.**

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