Industrial Monitoring and Controlling System on Pressure Machines Using Internet of Thing (IoT)

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Abstract. Millions of devices are connected to the internet, in this day life needs to remotely control several devices. This paper proposed the IoT application in the industry, which is an early fire prevention system. This system uses a temperature sensor (LM35), a smoke sensor (MQ2) and a microwave sensor. This sensor is connected to arduino and arduino is connected to Esp 8266 in order to send data to the server. Data that has been sent to the server will be accessed by a smartphone or computer, so users can monitor the temperature in the factory. This system works automatically when there are indications of fire then the alarm will be sound. This system can be monitored remotely, if the graph on the application shows an indication of a fire then the electricity in the pressing machine will be turned off via the user's smartphone application. So that fires can be prevented early on. The results show that The system can work automatically based on the algorithm, and can be monitored remotely using IoT either via a computer or smartphone.

Keywords: IoT, monitoring, controlling, sensor, industry

1. Introduction

Millions of devices are expected to be connected to form a system that creates a wide distribution network. Which can allow monitoring and controlling various kinds of devices remotely [1]. The Internet of Things has the potential to change the world as the Internet did, maybe even better. Most of these challenges result from the vulnerability of IoT objects and integration from the physical world to the virtual world through smart objects. This interaction must also be observed in terms of IoT security [2]. With the existence of IoT, human life is made easier, however, privacy and security factors must be a concern for researchers now [3].

Research on IoT is widely discussed by researchers now. Their discussion of the challenges, security, architecture, utilization and use of IoT in human life, and the development of IoT to this day. Migration from Internet to the Internet of Things, many smart dynamic objects that will be connected to the Internet. interaction and collaboration together from any devices in varieties location, an adequate architecture and routing process become a very important need [4-5].

Aplication of IoT to maintain the speed of the three phase induction motor [6], the result shows that reduces the harmonic content of motor current and increase the motor efficiency. Vibrations, temperature, speed, moisture, voltage and current consumption. monitoring system for motor based IoT resulted high autonomy system, friendly installation and low maintenance costs [7-8]. Application and development of intelligent buildings based IoT technology is needed, it proved that application of the IoT provides a new method for the effective control of intelligent buildings [9-10].
IoT technology has been applied in various fields. This paper tries to apply IoT in the industry, especially in work safety in factories, one of them is early fire prevention at the factory. The purpose of this research is to design and implement a monitoring and controlling system implemented in the industrial world. Monitoring is used to monitor the risk of fires that occur at any time based on temperature data and carbon dioxide level received by the sensor. In addition, the system is equipped with microwaves which will detect people in the factory area. So that if there are people in the factory must be saved so that his life can be saved. In order to secure the factory, the system is equipped with an IoT system that can control the flow of electricity in the plant remotely. If there is a risk of damage, the electricity will be cut off remotely via a smartphone.

2. Methodology

2.1. System Design

This research is divided into several stages: system design, implementation, and testing. The system is designed both hardware and software. An overview of the design is depicted in Figure 1. The monitored system is the temperature in the work area around the pressing machine. The system is equipped with a temperature sensor, in this research used LM35. This sensor is connected to arduino and arduino is connected to Esp 8266 in order to send data to the server. Data that has been sent to the server will be accessed by a smartphone or computer, so users can monitor the temperature in the factory. The actuator in this system is a button on the pressure machine that can be controlled manually or remotely using the user's smartphone.

![Figure 1. System design](image)

2.2. Testing

Testing is done in several stages. The first stage is testing the sensors used, MQ2, LM 35, and microwave sensors. The second testing phase is by testing the IoT system used. The second stage of testing is carried out on a monitoring system by analysed the results of the resulting graph, which can be accessed from a smartphone or from a computer. The third stage is testing the control system to shut down and turn on the pressing device remotely using the application.

3. Results and Discussion

The algorithm used in this study is that if the data received by the temperature sensor in the instrument is more than 50° Celsius, the alarm will be on. When MQ2 detects carbon dioxide or there is smoke, the
alarm will on automatically. When the temperature in the instrument reaches 50°Celsius and MQ2 detected carbon dioxide and smoke then the alarm will sound.

Integration of hardware and software is one important thing for the system to work well. System integration produces system that can work according to designs that were previously designed. The circuit produced in this system is illustrated in Figure 2

![System hardware](image1)

**Figure 2.** System hardware

Testing process a conducted to analyze the performance of sensors can work well. The first test was carried out on a microwave sensor. The test results show that the microwave sensor can detect the presence of humans in the factory. Subsequent testing by giving treatment to the temperature sensor or LM35. This sensor is given a varied temperature with the aim of testing the reliability of the sensor. The results show the alarm sounds automatically as a sign that the temperature exceeds the setting limit. Testing result at temperatures are depicted in Table 1.

| No | Temperature (° Celsius) | Alarm Response |
|----|-------------------------|----------------|
| 1. | 25                      | Off            |
| 2. | 35                      | Off            |
| 3. | 40                      | On             |
| 4. | 45                      | On             |
| 5. | 50                      | On             |

MQ2 testing using carbon dioxide or smoke gas on the sensor as illustrated in Figure 3. The results obtained are if there is carbon dioxide gas then the alarm sounds. Meanwhile, if there is no carbon dioxide, the alarm will not sound. This condition proves that the MQ2 sensor has worked well.

![Testing on MQ2 sensors](image2)

**Figure 3.** Testing on MQ2 sensors
Remote monitoring system is done by connecting and sending data received by the microwave sensor, LM35 sensor, and MQ2 sensor through the server. These three data are sent to the server via the internet as in Figure 4.

![Figure 4. Server Thingspeak](image)

To be accessible online, Internet of Thing (IoT) technology is needed. This technology using electronic components connected to device via WiFi, this component is Esp 8266. Esp 8266 will send data to the server and the user can access the data sent by the sensor via the user’s laptop or smartphone. The results of an IoT based tool are illustrated in Figure 5.

![Figure 5. Integrated system using IoT](image)

The system has been integrated, and to find out how it works, the next step is to test the integrated system. The test results are presented in Table 2.

| No | Microwave | Sensor LM35 (° Celcius) | Sensor MQ2 | Alarm |
|----|-----------|-------------------------|------------|-------|
| 1. | Detected  | 25                      | Detected   | Off   |
| 2. | Detected  | 35                      | Detected   | Off   |
| 3. | Detected  | 40                      | Detected   | Off   |
| 4. | Detected  | 45                      | Detected   | Off   |
Test results show the system has worked well. While the monitoring system that is integrated with IoT can also work well. The results of trials using IoT are illustrated in Figure 6. In Figure 6 shows that the user can monitor the temperature remotely, as well as a graph of the value of the sensor variable can be seen with a graph that is on the user's smartphone. Users can also control by pressing the button on the application on the smartphone.

4. Conclusion
The system is designed to detect fire indications. This system can work automatically and can be monitored remotely using either IoT via a computer or smartphone. The control system can work well if there is an indication of fire, so the machine will be controlled remotely through an application on a smartphone. Testing shows by turning off and starting the engine has been successful and works well.

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