

[intro]

Good morning. We are **group 3** from 2F. Today, we would like to introduce our STEM project to you.

[problem]

In the Sustainable development goal, we would like to solve goal3, subgoal 9, which is to reduce illnesses and death from hazardous chemicals and pollution, so we would like to design a product to avoid accidents from toxic gas poisoning.

[idea]

We would like to develop a system that keep on monitoring the presence of a certain gases and give warning to people. If a certain gas is detected, the device will send warnings to people around it and users can check the exact concentration of the gas in the air through a system.

[2 systems]

We have developed 2 systems with one of them using the Char Siu board and another using a native Arduino Uno created by Arduino.cc. And we will compare the two systems later on.

[char siu]

Firstly, we would introduce the system making use of the char siu board. This is our prototype for the product. The one in the middle is the charsiu board and the 2 objects on the left is the gas sensors. One of them is an MQ-3 sensor, which is used to detect the concentration of alcohol. The other one is an MQ-7 sensor, which is used to detect the concentration of carbon monoxide, which is toxic to our body. In addition, there is a potentiometer installed. It is used to test for the system as a part of the prototype. When the specific gas is detected by the sensor, the charsiu board will send an email using IFTTT to notify user about the accident and the buzzer will buzz to warn the people around it.

[Arduino]

This is our prototype using an Arduino board. On the front, there is a 2004A (read this as two O O four A) LCD screen, it can be used to show the data of the sensors and help the user to check if it is allowed to communicate using different methods. We would introduce this later. By looking at the side, we could see that there is the Arduino Uno board as the processing centre of the system and a ethernet shield for Arduino Uno to get access to the internet. And by looking at the back, you could see the 2 sensors same as those on the charsiu board and the potentiometer for testing.

[Communication]

There are 3 outputs for the system using Arduino board. Firstly, it can show the data directly on the LCD display as shown. Secondly, it can transfer the data to the app on your smart phone using Bluetooth, but the process is a bit slow. As an alternative, the Arduino can also send the data to an IP address as a webpage, but it is limited to local transfer only.

[compare]

This is a diagram comparing the two systems. On the left hand side, we could see that the Arduino system could show data immediately on the LCD display and could check the real time data on a smartphone. Also, the Arduino board is a open-sourced device so everyone could build up the same system easily and cheaply. However, on the charsi board side, it could send warning over the internet, so that if the user is not at home, they can still know this incident. In the middle, we could see that both of the systems could give out warnings to the people around it and they could evacuate in time.

[security]

So why don't we also implement internet connection for the Arduino Board system? The main reason is that there is a security issues. Firstly, it is difficult to implement an authentication system for the Arduino board, so it is easy to let others to get access to the data collected. Also, as Arduino Board is a microcontroller board, it is vulnerable to hacks. Hackers can hack the Arduino board easily and then he can hack the computer at the same network easily. These cause serious security issues.

[extension]

What else can we do with our STEM project. Firstly, we could implement the system to a fume cupboard. When some toxic gas is detected, it will start up to take away those toxic gases. Also, we could use the system to detect the presence of certain gases during the experiment.

[ending]

If you want to know more about how the system works, you may refer to this document. If you want to understand how the gas sensors detect the gases, you may visit this website for details. Thank you.