Distributed System/Advanced Embedded Systems Lab
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Documentation

Chaotic Workers

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Team members

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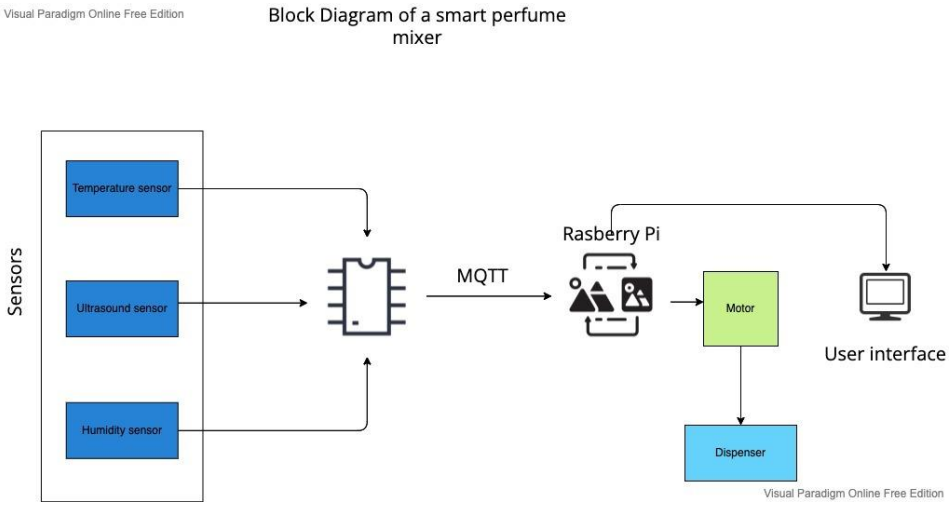
Introduction

The rise of the Internet of Things (IoT) has been attributed to the increasing number of devices and the global connectivity of the Internet. This has led to the development of new communication protocols that allow smart objects and machines to communicate with each other and with other people. Wireless Sensor Network is the most commonly used network for monitoring and controlling smart home devices. This document is focused on implementing a project using IoT and Wireless sensor network.
A communication protocol is a set of rules that enables two or more devices in a communication system to transmit and receive information. It set the rules, syntax, semantic and synchronization of communication and how an error can be handled.

Making a perfume involves lots of work and processes such as collecting ingredients, blending, extracting oils, aging and quality control. It involves lots of time and even calculation to create a well-blended perfume. The mixtures and methods have been modified and perfected over the years. The right blend of oils, alcohol and water will determine the quality and worth of a perfume. The ratio of alcohol to scent will determine the strength of the perfume. The right quantity and ratio are therefore very essential in perfume making.

Our smart perfume mixer will help to relieve stress, manage time, increase production, and help with measurement and accuracy when it comes to mixing ingredients for making perfume.

Concept description



The block diagram above shows the connection/relationship between the sensors, microcontrollers and other components used for the project.

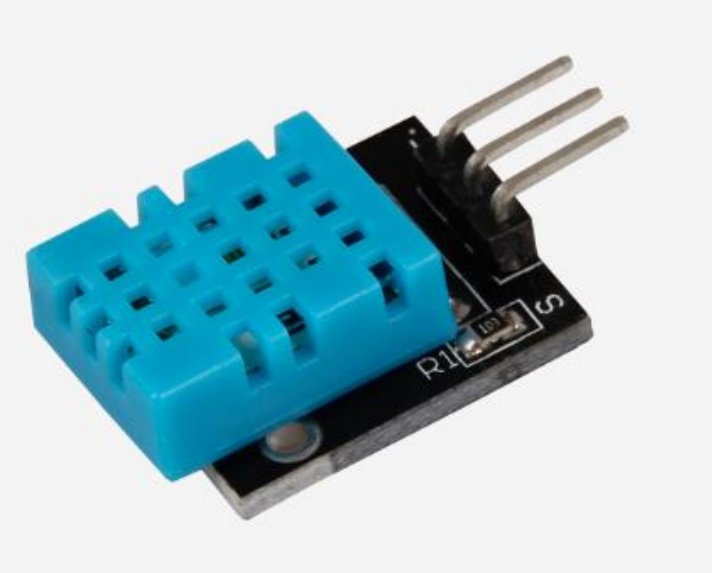
Focus of our application is to provide control and/or provide autonomous use of air freshener/Perfumery devices. The device can be controlled remotely through a smartphone app or it can be chosen to be autonomous using the data contracted from the inbuilt.

Memory card stores fragrance recipes provided by the user and provide power and digital information to function the electronic components. This activates selected scent capsules and creates a programmed combination of scents to give a programmed fragrance, using a microcontroller to control the precision. It was hoped that the working prototype would generate interest leading to funding of a response.

The concept developed from existing products on the market today that can recognize and replicate preprogrammed scents and ultimately it should lead to electronic scent detection and emission but the difference between our product is that it is manually controlled also and with the help of the Ultra sound detector it measure the depth for the room to provide data of how much fragrance would be required to intensify the scent in the room, it will help when taking costs and efficiency in to account.

Sensors

A **temperature sensor** as the name implies is used to measure temperature of either air, liquid or solid matter. Humidity is related to temperature in the sense that for a certain volume of gas, if the humidity is high, the temperature will be low and vice versa. We used DHT11 Temperature and Humidity Sensor for this project. This sensor measures both temperature and humidity. The sensor is suitable for long term measurements with a measuring range of 0°C to 50°C.

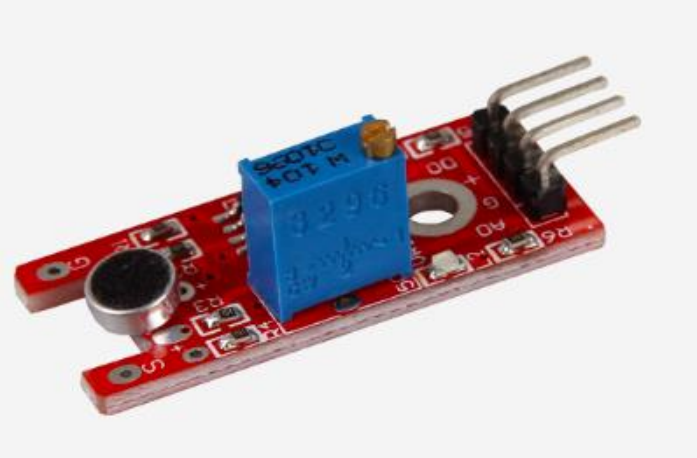


Temperature and Humidity Sensor

A **Distance Sensor** is used for measuring distance through ultrasound. The ultrasonic distance sensor used in our project can measure distance between 2cm to 300cm.

Ultrasonic Distance Sensor

A **Microphone sound sensor** is sensitive and emits signal if noise is detected by the microphone. The front sensor unit measures the environment physically and outputs it to the second unit which is the amplifier as an analog signal. This increases the signal based on the resistance set on the potentiometer and sends the signal it to the analog output.
The third unit represents a comparator, which switches the digital output and when the signal falls below a certain value, the unit which is a comparator switches the digital output and LED. This can be adjusted from the rotary potentiometer.



Microphone sound sensor

Project/Team management

A main factor that differentiates project management from ordinary management is that it has deadline and well-planned goals. This is a project that needs a wide range of skills and commitment. A project is a transient endeavour taken in order to achieve planned objective in terms of outputs or outcomes. If objectives are achieved, a project is referred to as a success. It is essential to meet deadlines set for each objective in a project for an overall success. The initiation, and planning of a range of tasks required to deliver this end project is done by and as a team. We use agile project management method because of its flexibility and to reduce project risks. We worked as a team and without hierarchy and with cooperation. We had regular meetings where we discuss about the project and tasks needed to be completed. We also assign tasks and discuss deadlines. We collaborated, communicate effectively, and manage time for the success of the project.

Technologies

Hardware list

- Temperature/humidity sensor(TH)
- Ultrasonic distance sensor(UD)
- Microphone sound sensor(MS)
- Raspberry Pi 3
- Micro SD card
- Arduino Uno
- Jumper cables
- Breadboard

We are using TH, UD, MS sensors as listed above to provide data from the surroundings. These sensors will provide us with the data we require to analyze weather the dispenser should dispense or not.

Implementation

For this project, we had to actually implement our product using the appropriate hardware, our first step after brainstorming, drafting the requirement and drawing a block diagram was to get the hardware required to implement our project. After finalizing the components for our project, we started the implementation process. We programmed the Arduino with the ArudinoIDE.

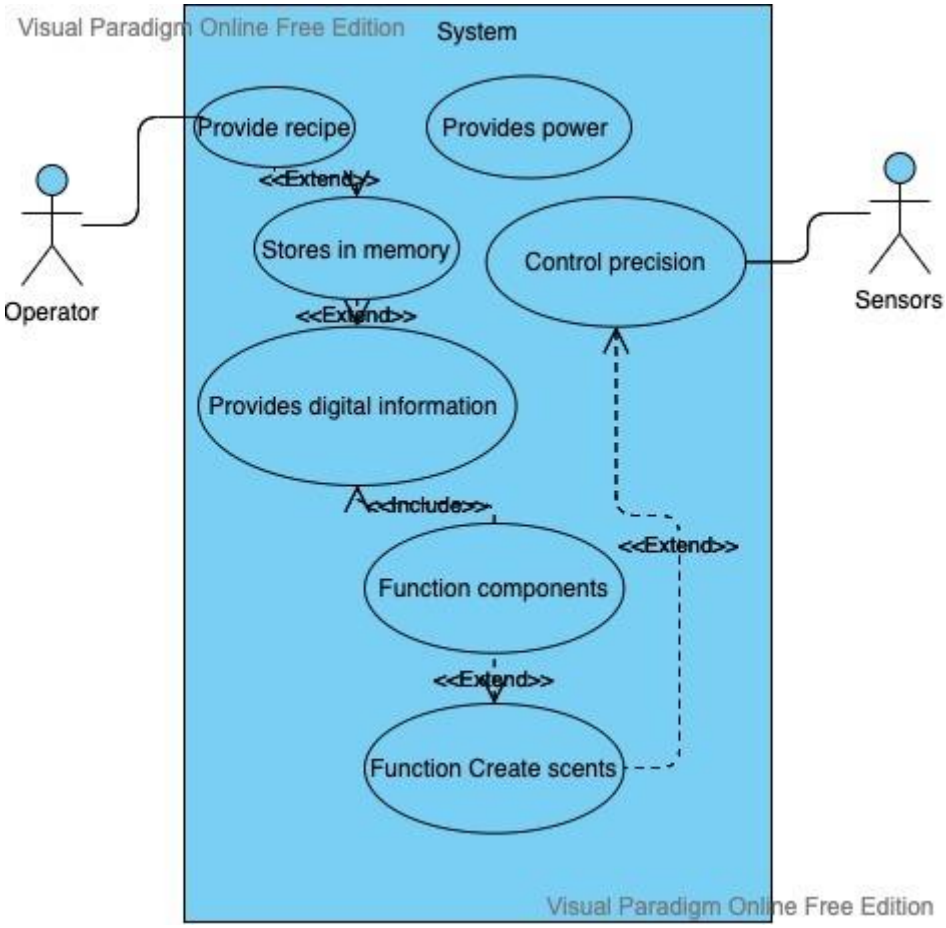
Implementations of this projects are that we can now have smart air fresheners controlled and with autonomous functions using sensor data. We can store data from sensors to decide the amount of chemicals and their intensity to dispense. Nor are we just controlling the air freshener we are also making it smarter. With the help of Mqtt connection the user can control its device remotely. The sensors used for example Temperature and humidity with decide if the chemicals need to be mixed more intensely for the scent to be distributed more evenly. The Ultra sound sensor measures the depth of room and objects in the room and also helps decide what kind intensity needs to be mixed with chemicals for it to be dispersed. Microphone sound sensor helps the device receive data of how much noise is inside the room determining how many people are in the room which also in return gives us data to make the device autonomous for the scent to remain intense.

Project Requirements

1. Our Smart perfume mixer must fulfill its primary function which is to mix the required chemicals to create certain intensity depending on the data received from the sensors used.
2. It should be able to mix perfumes based on the environment sensor readings
3. It should be able to receive certain commands from the user interface to change the fundamental program to the desire of user.
4. Using Mqtt protocol to achieve communication between all the clients. In our case we used Arduino Wi-Fi uno rev 2 as a client microcontroller which will send data to the broker (raspberry pi 2)

The static structure of our environment is the MQTT connection while the sensor readings and determination are both dynamic since the user can change both according to their desire.

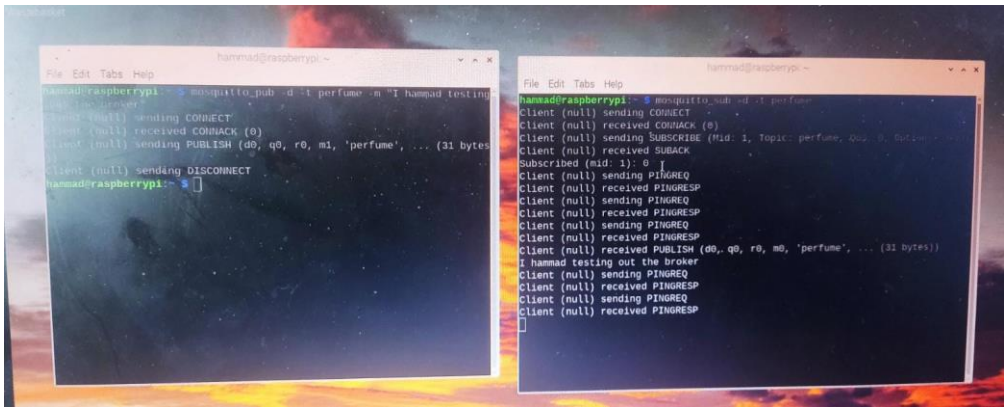
Use Case



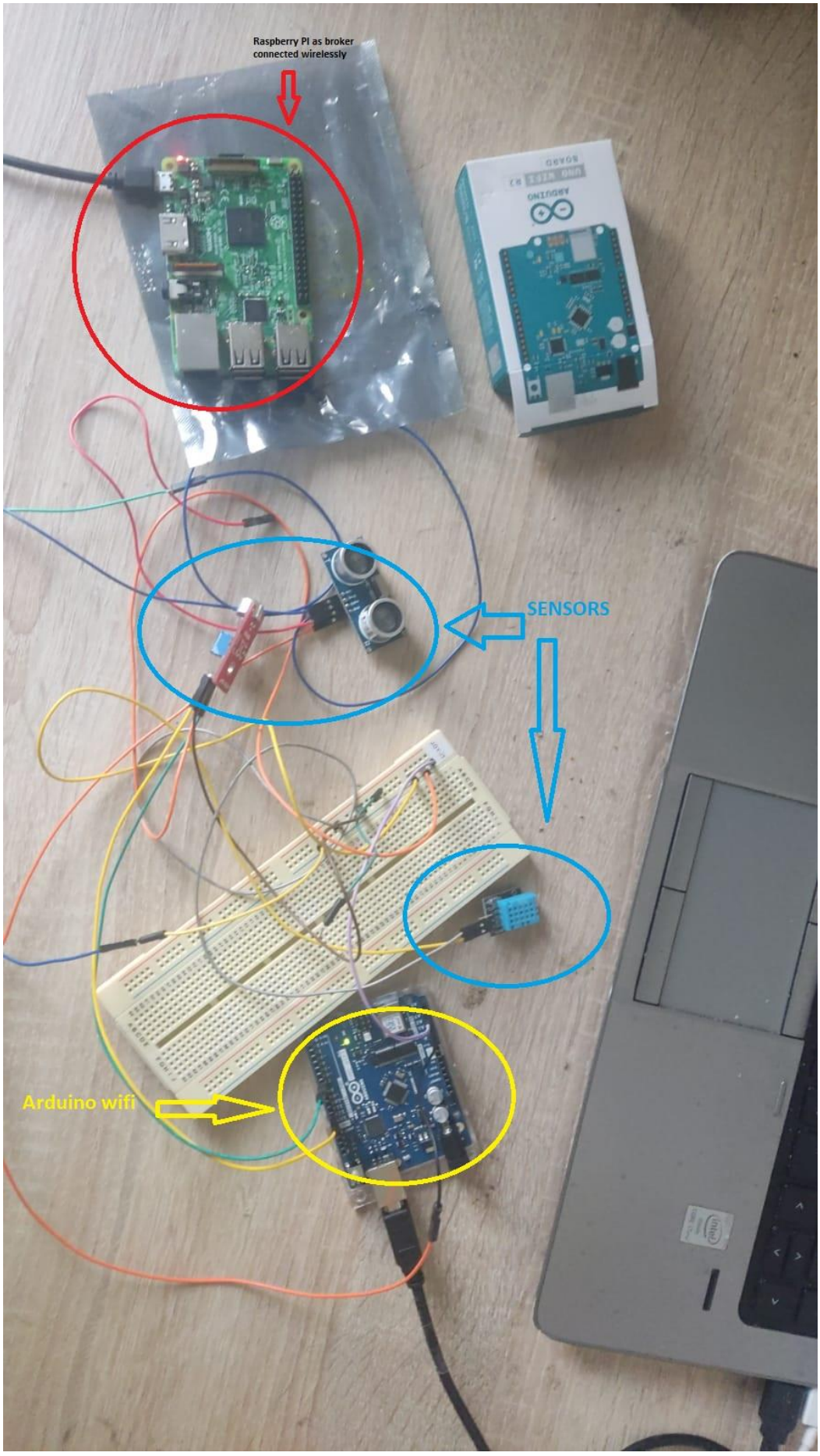
We used Raspberry Pi as a MQTT broker and Arduino as a publish and subscribing client. We receive data from Arduino to the broker and from broker to the user interface where the user can also manually adjust the temperature, distance and the noise setting to determine how and what time will the dispenser will dispense the scent.

We converted our raspberry as a broker using the mosquito broker. By installing mosquito in to the raspberry we were able to receive messages and send them to all the clients connected to different topics.

For this project there were two clients connected to one broker. First client was a web interface used as a user-friendly interface and second client was Arduino which provided us with data.



This picture represents our connection with the broker


Raspberry PI as broker
connected wirelessly
SENSORS
Arduino wifi

This is a picture of how we connected the Hardwares together

Sources/References

1. https://www.stackfield.com/project-management
2. https://sensorkit.joy-it.net/en/sensors/ky-015
3. https://sensorkit.joy-it.net/en/sensors/ky-050
4. https://sensorkit.joy-it.net/en/sensors/ky-038