Jordan University of Science and Technology
Faculty of Computer and Information Technology
Department of Network Engineering and Security
Graduation Project 1 Report

Project Title
IoT (Internet of Things) Based Gas Leakage Detector

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Sunday, January 19, 2023

Introduction

Our project is a gas detecting system using IoT that detects gas leakage and has functionalities that as a result sends alerts where-ever the user is and has safety measures that work as it detects gas automatically.

Suffocation cases sadly increase every year, and our goal is to minimize them as much as possible so we can achieve our main goal of **saving people's lives**.

Background

A gas detecting system based on IoT, that can be used at home or in any closed area, our targeted group are people who use gas heaters or even gas sources in the kitchen.

Jordanian Civil defense shared that in 2019 we sadly lose 29 civilians because of suffocation just in winter season [1].

Our project gives the user the ability to monitor and control the system using a mobile application so we can achieve ease of use.

Our system is extremely sensitive to gas leakage so it responds quickly and having lights is important in case there is noise at home, or the user has someone deaf at home so it can alert, and as a precautionary step. It has ventilation fans that turn on automatically when gas is detected, which will speed up flushing out polluted air.

Design Requirements

In the presence of gas leaks, the human body loses power and may pass out. Gas leaks have been detected by our system. People are alerted to polluted air and fans are turned on to flush it out automatically.

Our system is designed to be placed behind any gas source, so it provides alerts as soon as possible, to do this we have:

1. A MQ5 gas sensor [2] can detect CO, Methane, Propane, Butane, and LPG so it is compatible with domestic gas use.

2. The ESP-32 DEV KIT V1 WIFI BLUETOOTH NETWORKING DEVELOPMENT BOARD [3]: will allow gas sensors and any other parts to be connected and accessed via Wi-Fi and Bluetooth.

3. Air suction systems will be used to remove all polluted air with fans: here we will use computer fans [4].

4. By using SIM800L [5], the system will send SMS and make calls to the users to alert them: used in case user is outside home and do not have any internet around, if the user is inside home, we will be using the Blynk app to send the alerts.

5. LED lights: alert the user with light in case there is noise, or someone is deaf in the house.

   All these parts will be gathered in a box that can be hung on the surface behind any gas source.

Engineering Standards

Regarding the system in general (HTTP (Hypertext Transfer Protocol), HTTPS (Hypertext Transfer Protocol Secure), TLS, SSL, MQTT for the Blynk app, IEEE 802.11, IEEE 802.3 for sending alerts inside home) [9][10][11].

Regarding SIM card: GSM, ISO/IEC 7810, ISO/IEC 7816, ETSI TS 102 221, 3GPP TS 31.102, 3GPP TS 51.011, 3GPP TS 51.014. In addition to being utilized in GSM technology, SIM cards are also employed in other mobile communication systems such as 3G and 4G. As a result, SIM cards may also comply with other standards, such as 3GPP TS 31.121, 3GPP TS 33.220, and 3GPP TS 51.014, among others [7][8][12].

Realistic Constrains

1. Economic: any safety product that helps in saving lives and assures people's safety has a lot of techniques and technologies that are used to deal with all cases that sometimes are expensive.

Our design is rich in functionalities and has ease of use done by using technological parts that have high efficiency and low in price makes it cheap so anyone can have it, but it will be achieved by using constant power supply not batteries because sensors are high power consuming and cannot be held in sleep mode.

2. Environmental: according to website [6] at least 430 people in the United States die of unintentional carbon monoxide poisoning every year. And 50,000 people visit the ER for accidental carbon monoxide poisoning annually. it happens to humans and any creature living in the house or around it so our design will decrease suffocation cases that may leads to death and let people have a better gas consuming rate without any harm.

3. Manufacturability and Sustainability: every safety product has a sheet of strict construction on how to handle with it and a complex design our product is made to help all people especially deaf people with including lights as alert that should be always plugged to a 5V power supply all elements are integrated to work and detect continuously.

Proposed System Model/Design
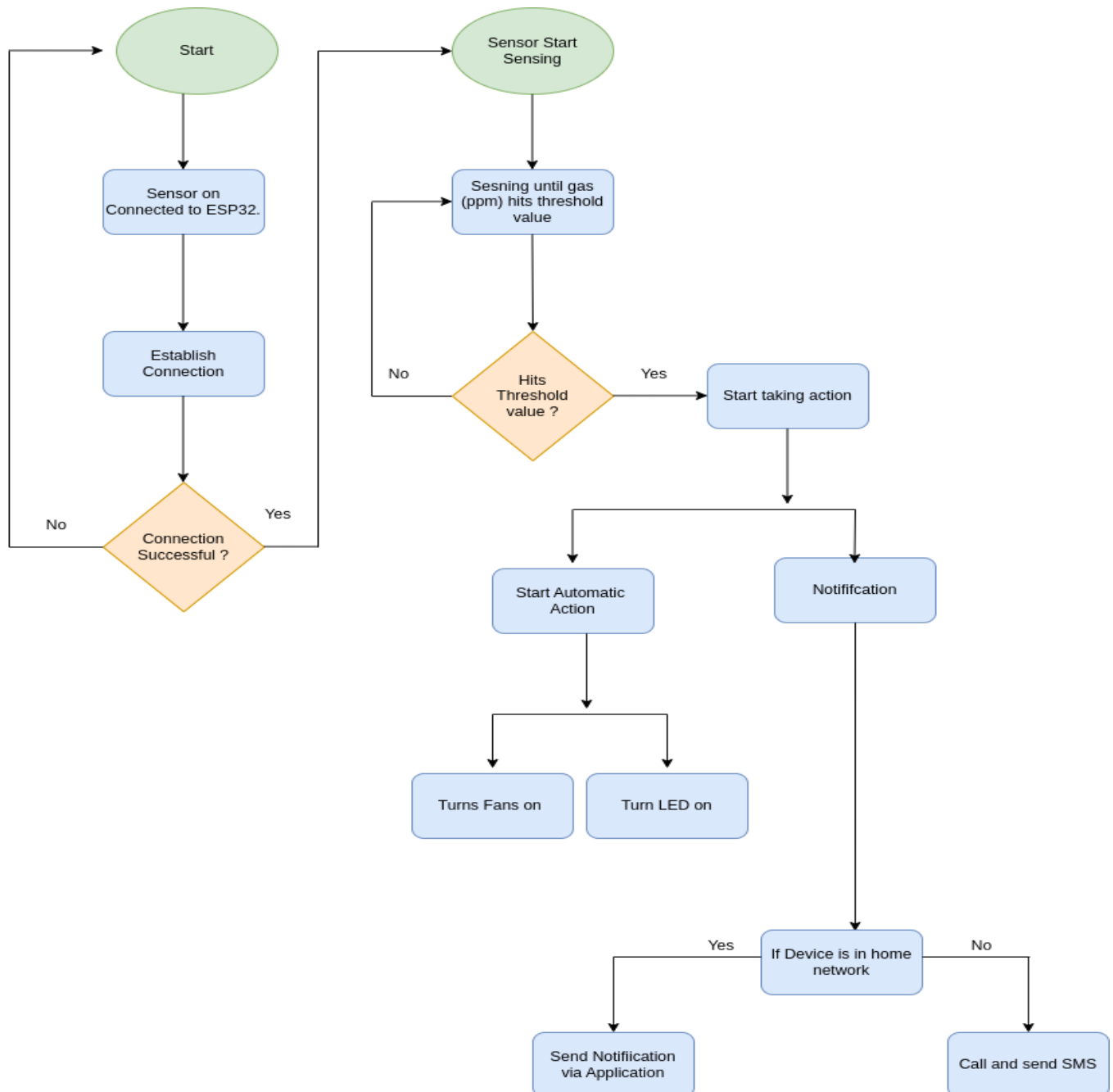
Completed Tasks

Our project consists of two parts: software and hardware. The hardware was fine. We have everything we need in Jordan. The software had some problems. There is a challenge when the application must notify the user outside the network. What should the application do? We solved it with two options either using SMS or phone call.

The devices we were looking for were found in Jordan as I mentioned above. Our project requires the following hardware: The ESP-32 DEV KIT V1 WIFI BLUETOOTH NETWORKING DEVELOPMENT BOARD, MQ5 gas sensor, SIM800L, BB400 Solderless Plug-in, and software requirements (for example, does the application require a database). (Yes, we need to store phone numbers for making calls or sending SMS messages) and know the programming language we will use to code the application)

References

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The Youtube Link of our Presentation Video:

https://www.youtube.com/watch?v=TWDAyV9pysk