DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
College of Engineering

UNT

Power Termination, Diversion, and Notification Using "COSMIC"

Digital Eagles

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COSMIC™ BREAKER

Purpose and Background

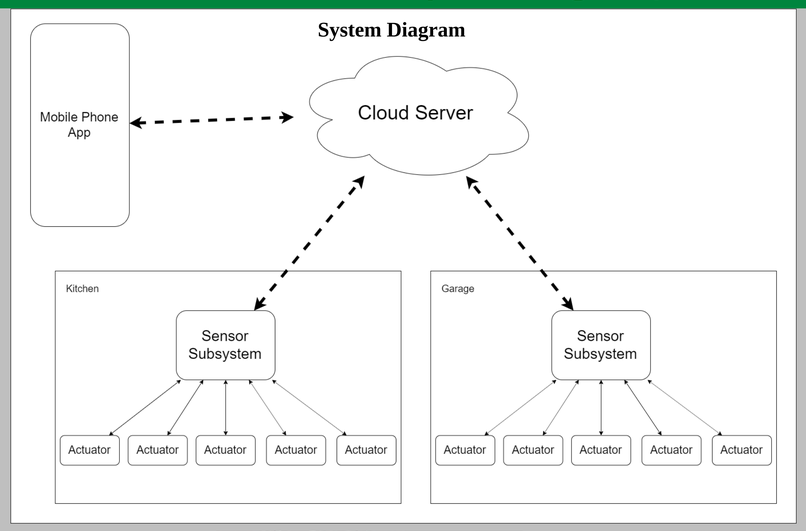
- Insufficient monitoring systems in most houses cause thousands of preventable gas-related deaths each year
- Even when monitoring systems are present, no functionality exists to prevent these deaths beyond alarms
- Additionally, alarms often trigger too late for residents to react.

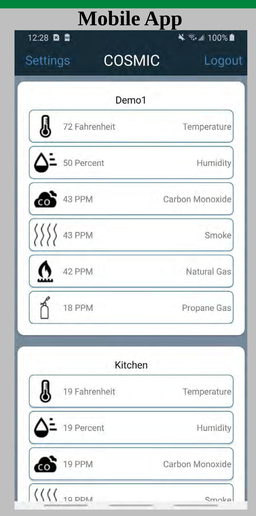
While existing devices and sensors within the home can provide immediate warning in case of a life-threatening situation, they are not capable of providing early warning countermeasures to mitigate the potential for lost life.

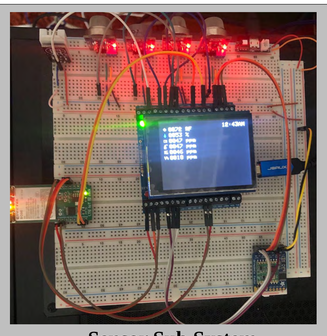
Solution

- Create a system that can monitor many gasses more accurately
- Earlier warning to residents, can monitor more than one gas
- Send alerts to a user's phone through SMS, not relying on an audible alarm that may not be heard
- Take steps to prevent a more serious emergency
- Pair with a set of actuators to turn on or off devices such as ventilation systems, stoves/ovens, and water heaters
- Shut down devices to halt any possible gas emissions and turn on fans to vent any harmful gasses

System Diagram / Photos







Sensor Sub System

Actuator Sub System

Results

Our final system allows

- Sensor Sub System to detect the gas levels of Temperature, Humidity, Carbon Monoxide, Propane, Smoke, and Natural Gas
- Sensor Sub System to send sensor values/alerts to the Cloud and receive threshold updates/Actuator ID's from the Cloud
- Sensor Sub System to constantly compare sensor values to set thresholds and when threshold reached trip connected Actuators and send alert to Cloud
- Actuator Sub System to receive RF signals from Sensor Sub System and flip relay on connected appliance
- Cloud Sub System to send SMS text messages to user when alert received from Sensor Sub System
- Mobile App to add/remove Actuator/Sensor Sub Systems along with view current and past sensor readings and update thresholds

Implementation

- **Mobile App Sub System**
  - Designed in the cross-platform Xamarin Studio
  - XAML-UI, C#-Code Logic
- **Cloud Sub System**
  - Amazon Web Services
    - Lambda, S3, DynamoDB, SNS
- **Sensor Sub System**
  - Main controller: Arduino Wi-Fi Rev. 2
  - Peripherals: RFM69HCW radio, LTE IoT 2 Click, MQ series sensors, DHT-22 temperature and humidity sensor
  - Wi-Fi with backup LTE for communications with the cloud
  - Wi-Fi access point mode for setup with the mobile app
  - RF signals for turning actuators on and off
- **Actuator Sub System**
  - Controlled by RF 433Hz Feather32u4
  - Switches 2 relays for phase and live wire

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