

# Home Security System

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# Introduction

- House security hazards
  - ◆ 360,000 structural fires/year
  - ◆ 7 million property crimes in 2020
  - ◆ 630,000 gas leaks/year
- Home Security Systems mitigate risk
- Safer households when user is absent

# Introduction

- Less present in lower income households
  - ◆ Vulnerable to break-ins
  - ◆ Less safety resources for fires and gas leaks
- Solution: Cheap and affordable ESP32-based design
  - ◆ Contact, motion, vibration, smoke/gas sensors

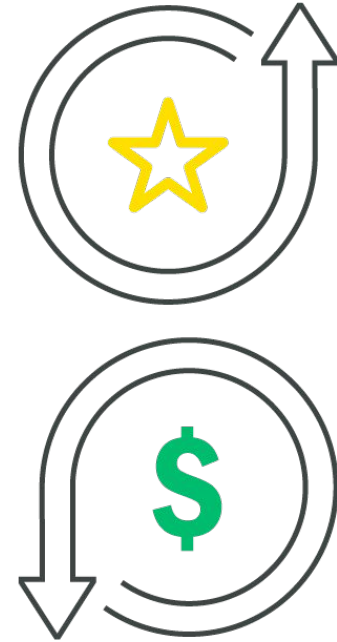
# Problem Description

Challenge: Lower cost without sacrificing quality



# Problem Description

- Motion detection
- Door monitoring
- Window monitoring
- Gas Leaks and Smoke
- Easy of Use



# Problem Description

→ Motion

◆ Microwave vs PIR

→ Door monitoring

◆ Reed switch issues a

◆ costly alternatives

→ Window monitoring

→ Gas Leaks and Smoke

→ Easy of Use

# Proposed Solution

## → Motion

- ◆ A motion sensor will be placed around the perimeter of the house.

## → Door and window sensors

- ◆ A magnetoresistive sensor will be placed on all exterior doors and fast vibration sensor switches will be located on all of the windows of the house.

# Proposed Solution

- Flame and gas leak detector
  - ◆ The gas/smoke sensor will be placed inside the house to detect methane, butane, petroleum and smoke.
- Website/app
  - ◆ The user will receive notifications about any breaches or disturbances detected through either an app or website.



# Demonstrated Features

- Motion
  - ◆ Alarm activated when motion sensor triggered
  - ◆ Motion sensor will instantly relay information to the website/app.
- Flame detection and Gas leaks
  - ◆ Alarm activated when the gas/smoke sensor is triggered
  - ◆ Gas/smoke sensor will instantly relay information to the website/app.

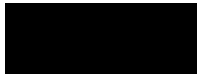
# Demonstrated Features

- Force Application
  - ◆ Alarm activated when contact/vibration sensor on the door/window is triggered
  - ◆ Both contact and vibration sensor relay information to the website/app
- Website/App
  - ◆ Provides notification to user
  - ◆ Details security issue: sensor triggered and area affected

# Available Technologies

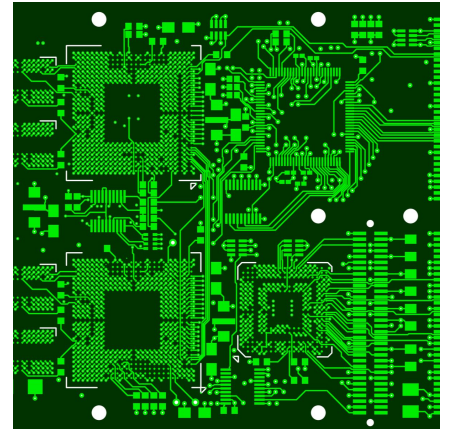
- Microcontroller Board: ESP32 DevKit
  - ◆ ESP32-WROOM-32
- Contact Sensor: MR Sensor
  - ◆ HCM1512-TR
- Motion Sensor: PIR Sensor
  - ◆ BS612
- Smoke/Gas Sensor: MQ-2 Sensor
  - ◆ MQ-2 Smoke/Gas Sensor
- Vibration Sensor: Fast Vibration Sensor
  - ◆ SW18010

# Engineering Content

- PCB Design
  - Board Manufacturing
  - CAD
  - Microcontroller Programming
  - User Interface
- 

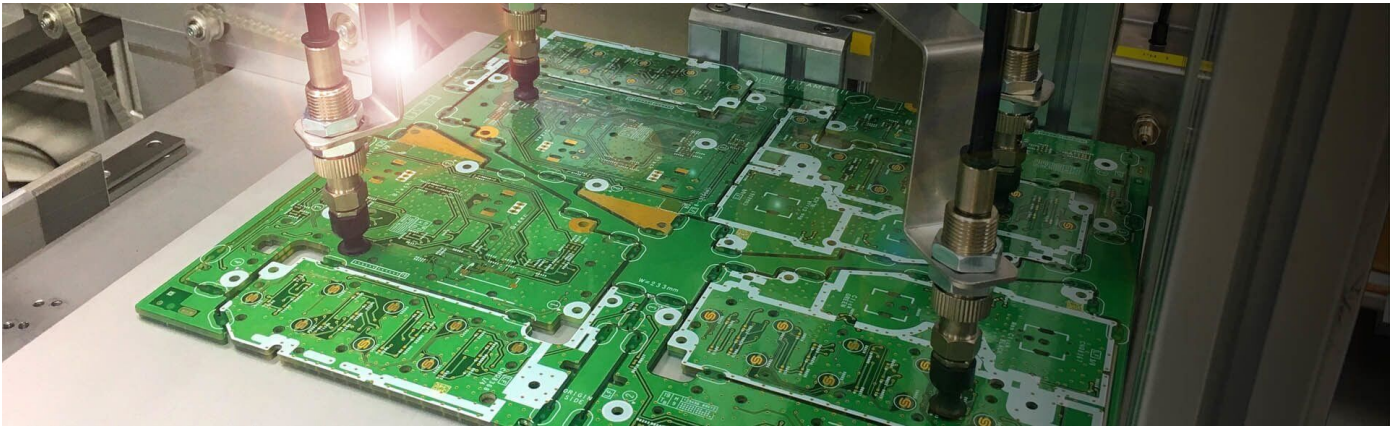
# Engineering Content - PCB Design

- PCB will connect the sensors and ESP32
  - ◆ Each sensor in a separate PCB
- Board must have space for through-hole soldering or surface mount assembly
- PCB will be designed on Eagle or KiCad

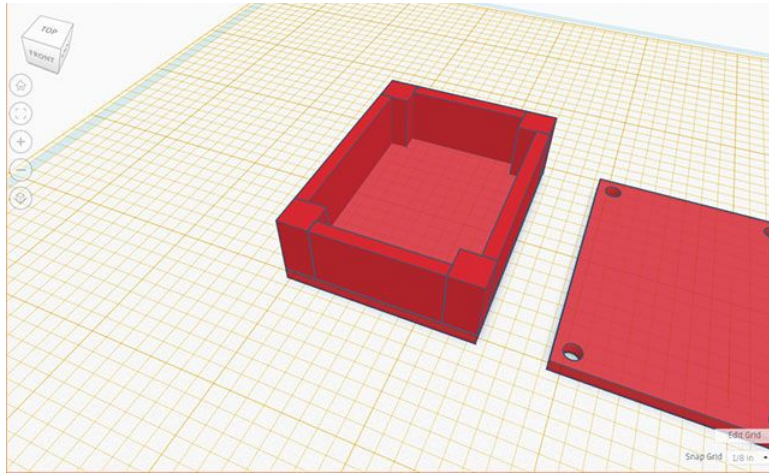


# Engineering Content - Board Manufacturing

- Hot air soldering leveling (HASL)
- Soldering
- Flux remover to clean up the board



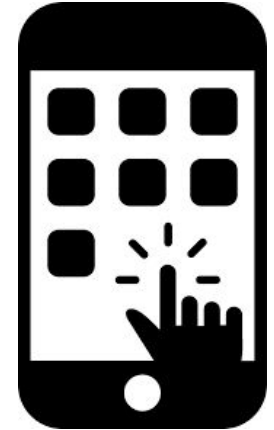
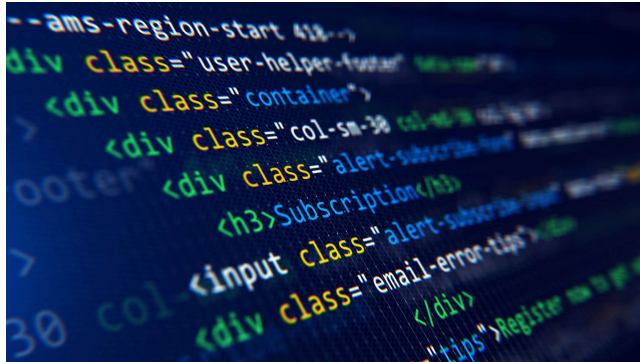
# Engineering Content - CAD



- Sensors must be mounted into strategic places at the house
- The mounting will be designed on CAD
  - ◆ SolidWorks or Tinkercad

# Engineering Content - User Interface

- Users will be notified of security breaches
- Data about previous breaches will be available for users
- Either website or app for user interface
  - ◆ HTML, JavaScript, CSS, and React





# Conclusion

- Inexpensive layer of safety
- Great variety in sensors
  - ◆ Contact, motion, vibration, smoke/gas
- Agile and interactive connection with client
  - ◆ 150 Mbps data rate
- Accessible and user-friendly
  - ◆ Low cost or maintenance