Smart Home Elderly Assistance and Emergency Monitoring System

(Elderly Use Case – Intrusion Detection)

Problem Statement

Elderly individuals living alone face multiple safety and health risks due to limited mobility, cognitive decline, and environmental hazards. Key challenges include:

1. Air Quality Hazards: Poor ventilation, gas leaks, or chemical exposure can lead to respiratory problems, dizziness, or long-term health issues. Traditional homes lack automated systems to continuously monitor air quality and alert the elderly or caregivers.

2. Unauthorized Entry or Wandering Risks: Seniors may be vulnerable to intrusions, theft, or accidental wandering, especially during the night or when unsupervised. Traditional home security measures, such as locks or alarms, often do not provide real-time monitoring or personalized alerts.

3. Heat-Related Health Risks: Overheating in rooms or bathrooms can cause dehydration, fainting, or heat stroke. Conventional temperature controls (thermostats) do not actively alert the elderly or caregivers when temperatures reach dangerous levels.

Solution

This IoT monitoring system provides automated intrusion detection using sensors and LED indicators:

- Air Quality Monitoring (Gas Sensor):
  Detects poor air quality (gas leaks, chemical fumes). YELLOW LED turns on to warn caregivers.

- Intrusion Detection (Ultrasonic Sensor):
  An ultrasonic sensor is placed near doors, windows, or main entry points.
  If a person or object suddenly comes within 10 cm of the sensor — indicating an unauthorized entry — the RED LED turns on and the event is logged in the Serial Monitor.

- Heat Risk Monitoring (Temperature Sensor):
  If room temperature rises above 30°C, the GREEN LED turns on, indicating heat-related risk.

This system ensures real-time monitoring of both environmental and security risks in an elderly home.

II. Simulation Design Question

Design and simulate the Smart Home Elderly Assistance and Emergency Monitoring System using Tinkercad Circuits.

Your system must detect and respond to:

1. Poor Air Quality (Gas Sensor → Yellow LED)

2. Intrusion / Unauthorized Entry (Ultrasonic Sensor → Red LED)

3. High Temperature (Temperature Sensor → Green LED)

The Serial Monitor must display all readings and system status.**(10 marks)**

III. System Requirements & Component Functions

Component	Function	Trigger Value
Ultrasonic Sensor	Detects unauthorized entry near doors or windows	Distance < 10 cm → RED LED
Gas Sensor	Detects unsafe air	Gas Value > 650 → YELLOW LED
Temperature Sensor	Detects high temperature	Temp > 30°C → GREEN LED
LEDs (Red, Yellow, Green)	Visual alert indicators	Each LED shows one specific danger
Arduino Uno	Reads all sensors and controls LEDs	Main controller

IV. Student Documentation Section **(10 marks)**

1. Circuit Diagram Screenshot

(Paste your Tinkercad wiring screenshot here.)

B. Simulation Results Screenshots **(60 marks)**

Scenario	Expected LED Behavior	Screenshot
1. Safe Condition	All LEDs OFF	(Paste Screenshot)
2. Poor Air Quality	YELLOW LED ON	(Paste Screenshot)
3. Intrusion / Unauthorized Entry Detected	RED LED ON	(Paste Screenshot)
4. High Temperature Risk	GREEN LED ON	(Paste Screenshot)

V. Code **(20 marks)**

//(Paste you code here)