
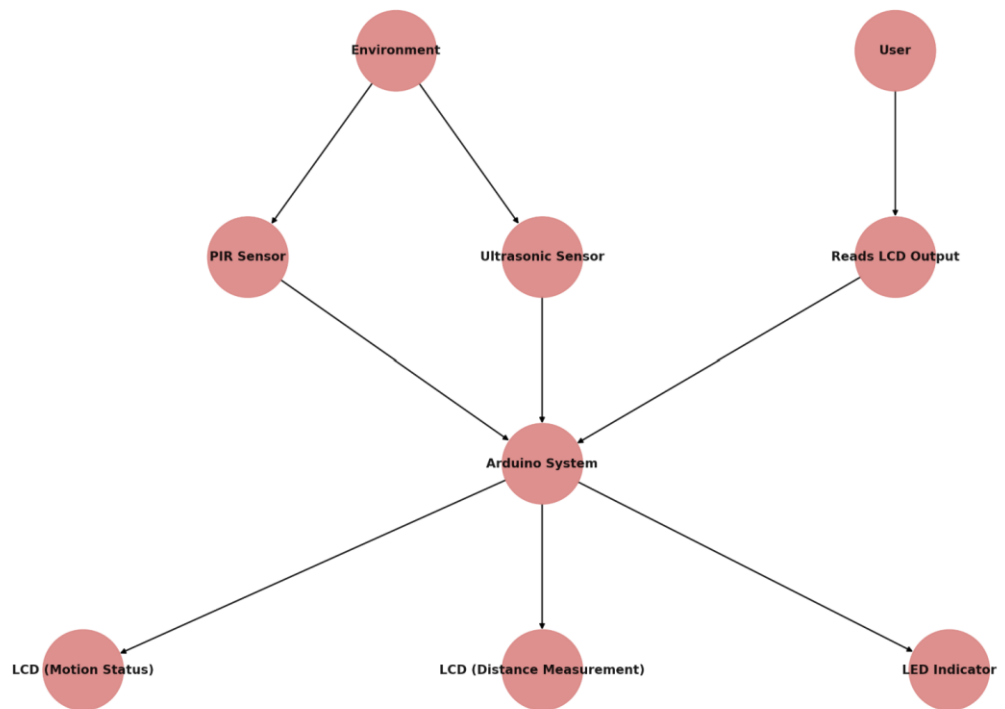


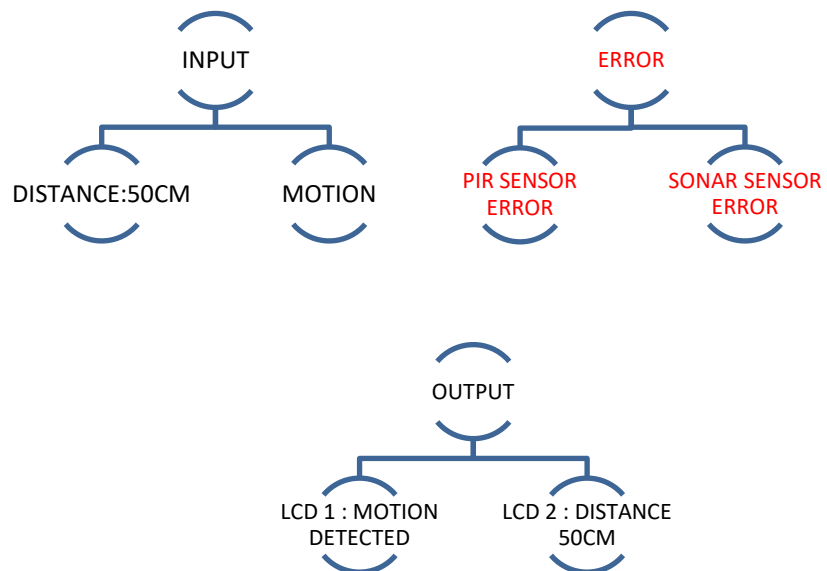
Project:	
Document:	Software Design Document
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Date:	21-11-2024
Version:	1

System Description	
System Description:	<p>The project is mainly of two parts:</p> <p>The first part of our project is a PIR sensor that lets us know when any kind of motion is detected around it is connected to a LCD, Jumper wires, male-to-female wires, Breadboard, and Arduino Uno R3.</p> <p>The other part of our project has a distance analyzer that consists of an ultrasonic sensor that helps to exactly measure the distance of an object from the sensor which will be placed on the breadboard with some wiring.</p>
Development Platform:	<p>Software:</p> <ul style="list-style-type: none"> • Arduino IDE <p>Hardware:</p> <ul style="list-style-type: none"> • Ultrasonic Sensor • PIR Sensor • Arduino • Jumper cables • Male-Female cable • LEDs [Light Emitting Diode] • LCDs [Liquid Crystal Display] • I2C Adapter
Execution Platform:	<div>  Arduino IDE </div> <p>Arduino IDE</p>

**Data Flow
Diagram:**

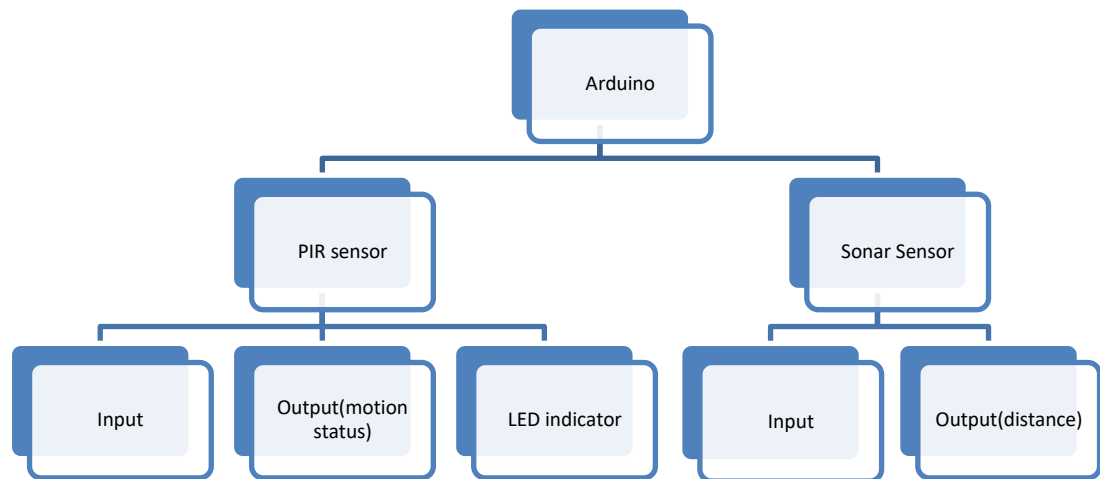


**System
Interfaces:**



Detailed Design

Hierarchy Diagram:



Modules (one for each block shown in the hierarchy diagram)

Module Name:	Arduino Uno R3 HC-SR501 PIR MOTION SENSOR HC-SR04 ULTRASONIC SENSOR
Purpose:	The PIR sensor module detects motion by sensing changes in infrared radiation within its field of view. The sonar sensor module is designed to measure the distance to an object using ultrasonic sound waves
Input:	Any type of motion , Trigger signal.
Output:	Digital signal which reports if motion is detected. Distance of the object from the sensor.
Algorithm:	<p>START</p> <ol style="list-style-type: none">1. Initialize components:<ul style="list-style-type: none">- Set up PIR Sensor, Ultrasonic Sensor, LCDs, and LED.- Configure thresholds for motion and distance.2. Loop forever:<ol style="list-style-type: none">a. Read PIR Sensor:<ul style="list-style-type: none">- If motion detected:<ul style="list-style-type: none">- Display "Motion Detected" on LCD 1.- Turn on LED.- Else:<ul style="list-style-type: none">- Display "No Motion Detected" on LCD 1.- Turn off LED.3. Read Ultrasonic Sensor:<ul style="list-style-type: none">- Measure distance to nearest object.- If distance \leq threshold:<ul style="list-style-type: none">- Display "Distance at X cm" on LCD 2.- Else:<ul style="list-style-type: none">- Display "Distance at 0 cm" on LCD 2.4. Error Handling:<ul style="list-style-type: none">- If any sensor fails:<ul style="list-style-type: none">- Display error message on respective LCD.<p>END</p>

Test Values

Reliability Test:	Input Type	Input Value	Expected Output
	PIR Sensor	Low (No motion)	"No Motion" displayed on LCD 1. LED OFF.
	PIR Sensor	High (Motion detected)	"Motion Detected" displayed on LCD 1. LED ON
	Ultrasonic Sensor	Low (10 cm)	"Distance= 10 cm" displayed on LCD 2.
	Ultrasonic Sensor	Mid (50 cm)	"Distance= 50 cm" displayed on LCD 2.
	Ultrasonic Sensor	High (300 cm, threshold	"Distance=0 cm" displayed on LCD 2.
Robustness Test:	Input Type	Invalid Input	Expected Error Message
	PIR Sensor	Signal error	"PIR Sensor Error!" displayed on LCD 1.
	PIR Sensor	Constant HIGH/LOW signal	"PIR Sensor Stuck!" displayed on LCD 1.
	Ultrasonic Sensor	Out-of-range values (>400 cm)	"Ultrasonic Sensor Timeout!" displayed.
	Ultrasonic Sensor	No response (sensor fails)	"Ultrasonic Sensor Error!" displayed.
Exceptions Test:	Exceptional Value	Cause	Handling
	PIR Sensor Disconnected	Loose connection or failure	Display "PIR Sensor Disconnected!" on LCD 1.
	Ultrasonic Sensor Failure	Wire disconnection or blockage	Retry the measurement, display "Error!" if persistent.
	LCD Communication Error	I2C adapter failure	Retry I2C connection, log error if it fails.
	Arduino Overload	Too many tasks or power issues	Restart the Arduino system automatically.