**Project Title: “Open Day Kiosk”**

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**Introduction:**

The purpose of the security testing is to evaluate the project’s robustness and error handling. This testing is performed within the limitations of the Tinkercad simulation environment.

**Ultrasonic Distance Sensor Testing:**

The distance sensor was evaluated to see how it behaved under different conditions, particularly with close and very far distances, and with rapid changes in distance.

**Extreme Value Testing:** We evaluated the sensor at its closest and farthest simulated distances.

**Fluctuation Testing:** We rapidly changed the simulated distance to see if the sensor’s readings were stable.

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Here are the results of distance sensor testing:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Serial No.** | **Test Scenario** | **Simulated Distance (cm)** | **Expected Behaviour** | **Actual Behaviour** | **Test Result Pass/Fail** | **Observations** |
| 1 | Minimum Distance | 2.73 | Display “Schedule”  message | Display “Schedule”  message | Pass | Sensor reading was stable |
| 2 | Maximum Distance | 331.22 | Display “Name of University” | Display “Name of University” | Pass | Sensor reading was stable |
| 3 | Rapid Fluctuations | Changing between 20 - 80 | Message changes smoothly | Message changes smoothly | Pass | LCD message changed without flickering |
| 4 | Out of range value | 2.32 | Display default message | Display default message | Pass | Serial monitor provided out of range value |
| 5 | Out of range value | 332 | Display default message | Display default message | Pass | Serial monitor provided out of range value |

**LCD (16 x 2) Display Testing:**

The LCD display was tested to ensure it could handle various types of messages, including long text and special characters. The tests aimed to check if the display showed information correctly and if the code prevented any errors.

**Long Message Testing:** Messages longer than the LCD’s display width were sent to the LCD to see how it handled them.

**Special Character Testing:** Attempts were made to display symbols and characters that might not be standard on the LCD.

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|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Serial No.** | **Test Scenario** | **Message Sent** | **Expected Display** | **Actual Display** | **Test Result Pass/Fail** | **Observations** |
| 1 | Long Message | “Welcome to the University Open Day! We have a very long schedule for you.” | “Welcome to the Uni…” (scrolling or truncation) | “Welcome to the Uni…” (truncated) | Pass | Display truncated the message |
| 2 | Special Character | “Temperature: 25oC” | “Temperature: 25oC” | “Temperature: 25?C” | Fail | Degree symbol not displayed correctly |
| 3 | Standard Message | “Campus Tour” | “Campus Tour” | “Campus Tour” | Pass | Message displayed correctly |

**Discussion of Issues:**

The LCD handled long messages by truncating them, meaning it cut of the extra text. This is expected behaviour for a standard LCD. To display the whole message, scrolling would need to be implemented in the code.

The LCD did not display the degree symbol (o). This indicates that the LCD’s character set does not include the specific symbol, or that the code was not using the correct character code. If special characters are critical, a LCD that supports them would be used, or a custom character would need to be created.

All normal messages are displayed as expected.

**Temperature Sensor (TMP36) Testing:**

“The temperature sensor was tested to evaluate its performance under extreme conditions and potential failure scenarios. Tests were conducted to verify the sensor’s accuracy and the code’s ability to handle unexpected readings.

**Extreme Value Testing:** The simulated temperature was set to minimum and maximum values allowed within Tinkercad’s simulation range.

**No Value Testing:** The sensor was, in the code, virtually disconnected, by setting the sensor reading variable to a null value, to simulate a sensor failure.

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The results of the temperature sensor testing are summarized in the following table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Serial No.** | **Test Scenario** | **Simulated Temperature (o C)** | **Serial Monitor Reading (o C)** | **Expected Behaviour** | **Actual Behaviour** | **Test Result Pass/Fail** | **Observations** |
| 1 | Minimum Value | -40.86 | -40.86 | Display correct minimum value | Display correct minimum value | Pass |  |
| 2 | Maximum Value | 113.62 | 113.62 | Display correct maximum value | Display correct maximum value | Pass |  |
| 3 | Rapid Fluctuations |  |  | Responsive | Responsive | Pass |  |

**Conclusion:**

The security testing performed within the Tinkercad simulation environment demonstrated the project’s overall robustness in handling various input scenarios. The distance sensor, LCD display, temperature sensor, and potentiometer all functioned as expected under tested conditions, including extreme and fluctuating values.

It is important to acknowledge the inherent limitations of the Tinkercad simulation. Real-world deployments may encounter more complex scenarios such as physical tampering, or unexpected environmental conditions.

Potential real-world security concerns include:

Sensor Failure: Malicious actors could potentially interfere with sensor readings, or the sensor could fail, implementing redundant sensors or incorporating data validation checks could mitigate the this risk.

Physical Tampering: The physical kiosk could be tampered with, potentially damaging components or altering the system’s behaviour. Securing the device in a protected enclosure and implementing physical security measures would be essential.

Power Supply Issues: Inconsistent or interrupted power could lead to instability. Implementing a backup power supply or ensuring a stable power source would address this concern.

Environmental Factors: Extreme temperatures, humidity, or dust could impact the system’s performance. Designing the kiosk with appropriate environmental protection and testing under various conditions would be necessary.

While the simulation provided valuable insights into the project’s behaviour, a thorough rea-world security assessment would be necessary prior to actual deployment to fully address these and other potential vulnerabilities.”