

Acceptance Test Plan
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ENEL 400: Electrical Engineering Design and Technical
Communications
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Group 2

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1 Introduction

To ensure the reliability and accuracy of our design we have compiled this document of tests. Each test is to make sure that we are meeting our intended specifications, finding unexpected outcomes, and ensure that things are working.

This document is structured to provide a clear overview of the tests planned, their respective objectives, criteria for passing, and references to associated requirements. Our commitment to excellence drives us to execute these tests rigorously, contributing to the refinement and validation of our design.

2 Tests

2.1 Smart Glove Testing

2.1.1 Range of Motion

Description: Have user wear the glove and perform a series of predetermined finger movements, including flexing, extending and lateral finger movements.

Pass criteria: Predetermined expected finger flexing angles match the captured motion of each finger.

Requirement reference: 3.1.4

2.1.2 Speed Test.

Description: User will open and close hand at varying frequencies to calculate the response time for detecting finger flexes.

Pass criteria: Calculates the average response time for detecting finger movements. Ensure that the average response time meets or falls below a predefined threshold. Response delay under 2 milliseconds.

Requirement reference: 3.1.1

2.1.3 Durability Test.

Description: Subject the glove to repeated bending and flexing cycles and monitor the functionality of the glove before, during, and after the bending cycles.

Pass criteria: Ensure that the glove maintains functionality without significant damage.

Requirement reference: 3.4.1

2.1.4 Calibration Test

Description: Establish a set of reference points corresponding to known finger positions. Compare the recorded finger positions with the known reference points.

Pass criteria: Evaluate the accuracy of calibration by calculating the deviation between recorded finger positions and the corresponding reference points. Ensure that the deviation falls within an acceptable range.

Requirement reference: 3.3.4

2.1.5 Battery Life Test.

Description: Fully charge the glove and operate under normal usage. Record the time it takes to deplete. Indicator of low battery is shown.

Pass criteria: Battery lasts longer than desired and expected time. Can be charged after drained. Low battery LED turns on.

Requirement reference: 3.1.3, 3.1.6, 3.3.5

2.1.6 Environmental Test.

Description: *Expose and monitor the gloves performance under controlled environmental conditions. Such as moisture from sweat and potential static discharge and falling.*

Pass criteria: *Ensure that the glove maintains consistent performance within specified environmental tolerances.*

Requirement reference: 3.1.5, 3.4.1, 3.4.4

2.1.7 Compatibility Test.

Description: *Connecting glove to software interface and RC car hardware.*

Pass criteria: *Ensure that the glove successfully connects to and operates with RC car and software platform without compatibility issues or communication errors.*

Requirement reference: 3.1.2, 3.1.7, 3.3.2

2.1.8 State Transition Test.

Description: *The gloves programming states can all be reached.*

Pass criteria: *Glove transitions to the correct states promptly from ON to calibration to interfacing device and back to calibration mode interrupt for low battery. Proper outputs are shown for each state.*

Requirement reference: 3.3.1, 3.3.3, 3.3.4, 3.3.5

2.1.9 Comfortability Testing.

Description: *Glove is comfortable enough to wear for extended periods of time*

Pass criteria: *Size of casing is less than 200 centimetres squared, flush with arm and properly ventilated.*

Requirement reference: 3.4.2, 3.4.3, 3.4.4

2.2 RC Car Testing

2.2.1 Speed Test

Description: *This test evaluates the maximum speed capabilities of the RC car on a straight track. The car will be driven at full throttle between two points, and its speed will be measured using a stopwatch.*

Pass criteria: *The RC car must achieve a speed of at least 5 m/s. Around twice the speed of walking.*

Requirement reference: 3.2.1

2.2.2 Battery Life Test

Description: *This test measures the endurance of the RC car's battery by continuously running the car at a moderate speed until the battery is depleted.*

Pass criteria: RC car must be able to operate continuously for at least 1 hour on a single battery charge.

Requirement reference: 3.2.3

2.2.3 Movement Test

Description: *The RC car will be tested to ensure it can move forward, backward, left, and right.*

Pass criteria: *The RC car successfully moves in all directions without any mechanical issues or limitations.*

Requirement reference: 3.2.1

2.2.4 Control Range Test

Description: *This test evaluates the range of the RC car's remote-control system (Smart Glove) by driving the car away from the controller until the signal is lost or becomes unreliable.*

Pass criteria: *The RC car must maintain a reliable connection with the controller at a distance of at least 100 meters to pass the test.*

Requirement reference: 3.2.7, 3.2.4

2.2.5 Load Limit Test

Description: *The RC car should weigh less than 500 grams.*

Pass criteria: *The RC car's weight is confirmed to be less than 500 grams, optimizing motor and battery performance as per design specifications.*

Requirement reference: 3.2.6

2.2.6 Rotation Test

Description: *The RC car will be tested to ensure it can rotate 360 degrees on the spot without moving forward or backward.*

Pass criteria: *The RC car completes a full 360-degree rotation within a specified area without any mechanical issues or limitations.*

Requirement reference: 3.2.2

2.2.7 Arduino Programming Test

Description: *The RC car will be programmed using Arduino to execute specific movements and behaviors.*

Pass criteria: *The RC car accurately executes the programmed movements and behaviors as instructed without errors or deviations.*

Requirement reference: 3.2.5

3 Traceability Matrix

| Requirement Constraint | Test | Requirement Constraint | Test | Requirement Constraint | Test |
|---------------------------|--------------|---------------------------|-------|---------------------------|--------------|
| 3.1.1 | 2.1.2 | 3.2.2 | 2.2.6 | 3.3.3 | 2.1.8 |
| 3.1.2 | 2.1.7 | 3.2.3 | 2.2.2 | 3.3.4 | 2.1.4, 2.1.8 |
| 3.1.3 | 2.1.5 | 3.2.4 | 2.2.4 | 3.3.5 | 2.1.5, 2.1.8 |
| 3.1.4 | 2.1.1 | 3.2.5 | 2.2.7 | 3.4.1 | 2.1.3, 2.1.6 |
| 3.1.5 | 2.1.6 | 3.2.6 | 2.2.5 | 3.4.2 | 2.1.9 |
| 3.1.6 | 2.1.5 | 3.2.7 | 2.2.4 | 3.4.3 | 2.1.9 |
| 3.1.7 | 2.1.7 | 3.3.1 | 2.1.8 | 3.4.4 | 2.1.6, 2.1.9 |
| 3.2.1 | 2.2.1, 2.2.3 | 3.3.2 | 2.1.7 | | |

4 References

ENEL 400 Group 2, Requirements Specification for Smart Gloce, Calgary: 2023, pp. 4, 5.