Music Bot

Testing Procedures

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1 Testing Procedures (TPs)

1.1 Testing Procedure 1: Size, Weight, and Cost Validation

This procedure ensures the music robot meets the specified size, weight, and cost constraints. Size dimensions will be verified against the limits of 2 feet width and 6 feet height, weight must be under 50 pounds, and all expenses tracked to keep the cost below $1,000. This test confirms compliance with ES related to size, weight, and affordability, and is scheduled before assembly and throughout the build process for budget tracking.

1.1.1 Testing Procedure 1: Objective

Verify that the robot dimensions do not exceed 2 feet in width and 6 feet in height, the weight is under 50 pounds, and the cost is below $1,000.

1.1.2 Testing Procedure 1: Resources Required

Tape measure, scale, budget spreadsheet.

1.1.3 Testing Procedure 1: Schedule

To be completed before the initial assembly, and budget monitored throughout the project.

1.2 Testing Procedure 2: Sound Projection

The purpose of this test is to confirm the robot's sound output meets the minimum 60dB specification. Using a decibel meter and an appropriate amp speaker, the robot's acoustic performance will be measured to satisfy the ES for sound projection. The testing is slated for after the robot's assembly and before the final product review.

1.2.1 Testing Procedure 2: Objective

Ensure the robot outputs sound at a minimum of 60dB, using a guitar amp speaker.

1.2.2 Testing Procedure 2: Resources Required

Decibel meter, guitar amp speaker capable of at least 60dB.

1.2.3 Testing Procedure 2: Schedule

Conducted post-assembly, before final product review.

1.3 Testing Procedure 3: Aesthetic Appeal

This test involves a subjective assessment of the robot's aesthetic appeal by the engineering team. It proves the ES concerning the robot's design and visual appeal, with a team vote post-painting and assembly determining the outcome. The evaluation is planned for after the robot has been fully assembled and painted.

1.3.1 Testing Procedure 3: Objective

Evaluate the aesthetic appeal based on the engineering team’s consensus.

1.3.2 Testing Procedure 3: Resources Required

The assembled robot and the project team for visual inspection.

1.3.3 Testing Procedure 3: Schedule

Conducted after painting and final assembly.

1.4 Testing Procedure 4: Robustness Test

The robot's robustness will be assessed by a gentle lift-and-place test, performed five times to simulate handling during use. This demonstrates the ES of durability and is to be executed after the robot's full assembly to ensure structural integrity and functional robustness.

1.4.1 Testing Procedure 4: Objective

Assess the robot's durability by gently lifting and placing it down 5 times.

1.4.2 Testing Procedure 4: Resources Required

The fully assembled robot.

1.4.3 Testing Procedure 4: Schedule

Conducted after the robot is fully assembled and functional.

1.5 Testing Procedure 5: MIDI Functionality Test

By running a testing file through the range of notes at various tempos, this procedure will validate the MIDI functionality of the robot, confirming the ES related to electronic performance and responsiveness. Scheduled during the electronic setup phase and again after assembly, this ensures the robot functions correctly as a MIDI device.

1.5.1 Testing Procedure 5: Objective

Validate the MIDI implementation with a range of notes and tempos using a testing file.

1.5.2 Testing Procedure 5: Resources Required

Laptop, MuseScore software, testing MIDI file.

1.5.3 Testing Procedure 5: Schedule

Conducted during initial electronic setup and again after the final assembly.

1.6 Testing Procedure 6: Power Requirement and Electrical Safety

The focus of this test is on the robot's power supply safety, using a heavy-duty power strip and surge protector to avoid electrical hazards, directly relating to the ES of running on wall power. The assessment is scheduled before the robot is initially powered and following the final assembly.

1.6.1 Testing Procedure 6: Objective

Ensure electrical safety using a heavy-duty power strip and surge protector.

1.6.2 Testing Procedure 6: Resources Required

Heavy-duty power strip, surge protector, voltage tester.

1.6.3 Testing Procedure 6: Schedule

Performed before initial power-up and post-assembly.

1.7 Testing Procedure 7: Visual Safety Inspection

A thorough visual inspection will be conducted to ensure there are no sharp edges, in accordance with safety ES. This procedure is a post-assembly requirement, aimed at preventing any harm to users during interaction with the robot.

1.7.1 Testing Procedure 7: Objective

Verify there are no sharp edges after assembly to meet safety compliance.

1.7.2 Testing Procedure 7: Resources Required

Assembled robot, inspection checklist.

1.7.3 Testing Procedure 7: Schedule

Post-assembly, before any in-person interactions.

1.8 Testing Procedure 8: Branding Application

This procedure verifies that the robot's branding aligns with OSU colors, satisfying the ES for school representation. The test involves applying and inspecting the paint job to ensure it meets branding guidelines, scheduled towards the end of the assembly process.

1.8.1 Testing Procedure 8: Objective

Apply OSU branding colors using orange and black paint, in line with university branding guidelines.

1.8.2 Testing Procedure 8: Resources Required

Orange and black paint, painting supplies.

1.8.3 Testing Procedure 8: Schedule

During the final stages of the assembly.

1.9 Testing Procedure 9: User Interface Test

Testing the simplicity of the user interface involves ensuring the robot can be activated to play music with a single button press. This test satisfies the ES for minimal human interaction and is planned after the final assembly, before the robot is used in demonstrations or interactions.

1.9.1 Testing Procedure 9: Objective

Confirm that activation of the robot through a simple interface requires only a single button press.

1.9.2 Testing Procedure 9: Resources Required

Assembled robot, interface documentation.

1.9.3 Testing Procedure 9: Schedule

Post-assembly, before user trials.

2 Safety Plan

The safety of team members and end-users is paramount throughout the fabrication and testing of our music robot. The project does involve the construction of a physical system, which presents several potential safety issues that must be addressed:

1. **Electrical Safety:** As the robot operates on wall power, there is a risk of electric shock during assembly and testing. This will be mitigated by:
    - Ensuring all team members handle electrical components with dry hands and on a non-conductive surface.
    - Using a heavy-duty power strip and surge protector to prevent power surges.
    - Implementing a strict protocol to disconnect the power supply before making any adjustments or conducting maintenance on the robot.
2. **Sharp Edges:** The fabrication process may leave sharp edges on the robot's stand or frame, posing cut risks. This will be mitigated by:
    - Deburring and smoothing all edges during the manufacturing process.
    - Conducting a thorough visual inspection post-assembly to identify and eliminate sharp edges.
    - Wearing protective gloves during assembly and initial testing phases.
3. **Chemical Safety:** The use of paint for branding involves exposure to potentially harmful fumes. To address this:
    - Painting will be done in a well-ventilated area or outside.
    - Team members involved in painting will wear appropriate respirators or masks.
    - Paints chosen will be non-toxic and comply with safety standards.
4. **Lifting and Handling:** Given the robot's size and weight, improper lifting and moving could lead to musculoskeletal injuries. Mitigation includes:
    - Training all team members in proper lifting techniques.
    - Using team lifts for any components weighing more than 25 pounds.
    - Ensuring the workspace is organized to minimize the need for lifting or moving the robot excessively.

By implementing these safety measures, we aim to create a secure environment for the fabrication and testing of our music robot, ensuring the well-being of all involved. Continuous monitoring and adherence to these practices will be maintained throughout the project's lifecycle.