CSE3063 LAB

Name: Preyash
Registration Number: 20BPS1022

Black Box Testing

Use case: Rover Navigation Control

1) **Steering Commands:**
   a) Test Input: Send various steering commands (e.g., left, right, forward, backward).
   b) Expected Output: Rover moves in the specified direction accurately.

2) **Waypoint Setting:**
   a) Test Input: Set waypoints at different coordinates on the planetary surface.
   b) Expected Output: Rover navigates to the specified waypoints correctly.

3) **Monitoring Movement:**
   a) Test Input: Monitor rover's movement in real-time.
   b) Expected Output: Receive accurate and continuous updates about rover's position and status.

4) **Invalid Commands:**
   a) Test Input: Provide invalid or unsupported commands (e.g., nonsensical directions).
   b) Expected Output: System handles invalid inputs gracefully, perhaps by providing an error message.

5) **Load Testing:**
   a) Test Input: Simulate a large number of navigation commands in a short time.
   b) Expected Output: The system should handle the load and process commands within an acceptable timeframe.

6) **Interrupt Testing:**
   a) Test Input: Interrupt navigation with emergency stop commands.
   b) Expected Output: Rover should immediately stop all movement and respond to emergency commands effectively.

7) **Power Loss Simulation:**
   a) Test Input: Simulate a power loss during navigation.
   b) Expected Output: The system should have mechanisms in place to resume operation or enter a safe state when power is restored.

8) **Localization Accuracy:**
   a) Test Input: Test the rover's ability to accurately determine its position.

b) Expected Output: The rover should accurately determine its location using sensors and GPS data.

9) Network Disconnection:

a) Test Input: Disconnect the communication link between the control center and the rover.
b) Expected Output: The system should handle communication loss gracefully, perhaps by attempting reconnection or entering a safe mode.

10) Sensor Failures:

a) Test Input: Simulate failures in sensors (e.g., camera, distance sensors).
b) Expected Output: The system should handle sensor failures and continue navigation using available sensor data or enter a safe mode.

Use case: Rover Obstacle Detection and Avoidance

Obstacle Detection:

- Test Input: Place obstacles of various sizes and shapes in the rover's path.
- Expected Output: The Rover's sensors should detect obstacles and the rover should navigate around them without colliding.

Hazard Detection:

- Test Input: Simulate hazardous terrain (e.g., steep slopes, loose soil).
- Expected Output: Rover should identify hazardous conditions and adjust its path to avoid these areas.

Dynamic Obstacle Avoidance:

- Test Input: Introduce moving obstacles in the rover's path.
- Expected Output: Rover should dynamically adjust its path in real-time to avoid moving obstacles.

Testing Sensor Range:

- Test Input: Place obstacles at the maximum and minimum detection range of the rover's sensors.
- Expected Output: Rover should detect obstacles within its specified sensor range and navigate around them accordingly.

Edge Cases Testing:

- Test Input: Test scenarios where obstacles are placed near cliffs or other dangerous terrains.
- Expected Output: Rover should recognize the danger and avoid approaching edges to prevent falling.

Simulated Weather Conditions:

- Test Input: Simulate adverse weather conditions (e.g., dust storms, low visibility).
- Expected Output: Rover's sensors and algorithms should adapt to the reduced visibility and still avoid obstacles effectively.

Sensor Redundancy Testing:

- Test Input: Simulate failure in one of the obstacle detection sensors.

- Expected Output: Rover should compensate for the sensor failure by relying on other sensors and still avoid obstacles successfully.

Testing Response Time:
- Test Input: Introduce sudden obstacles in the rover's path.
- Expected Output: Rover should detect the obstacle quickly and change its path promptly to avoid collision.

Use case: Rover Sample Collection and Analysis

Targeted Sample Collection:
- Test Input: Specify various target locations for sample collection.
- Expected Output: Rover should accurately navigate to the specified target locations and collect samples from those locations.

Random Sample Collection:
- Test Input: Instruct the rover to collect samples from random locations.
- Expected Output: Rover should autonomously select random locations, collect samples, and store them for analysis.

Sample Identification:
- Test Input: Collect samples of different materials (e.g., rock, soil) and unknown substances.
- Expected Output: Rover's analysis tools should identify and categorize the collected samples correctly.

Sample Preservation:
- Test Input: Collect organic or delicate samples that require special preservation methods.
- Expected Output: Rover should handle and preserve delicate samples properly, ensuring their integrity during transport and analysis.

Sample Volume Measurement:
- Test Input: Collect samples of varying sizes and volumes.
- Expected Output: Rover's tools should measure the volume of collected samples accurately.

Real-time Analysis:
- Test Input: Perform real-time analysis of collected samples on-site.
- Expected Output: Rover's analysis tools should provide immediate data and insights about the composition of the collected samples.

Sample Contamination Prevention:
- Test Input: Implement protocols to prevent sample contamination during collection and analysis.
- Expected Output: Rover should follow contamination prevention procedures and ensure that collected samples remain pure and uncontaminated.

Sample Retrieval Confirmation:

- Test Input: Request the rover to confirm successful sample retrieval.
- Expected Output: Rover should provide confirmation signals or messages when samples are successfully collected and stored.

Multiple Sample Collection:

- Test Input: Instruct the rover to collect samples from multiple locations in a sequence.
- Expected Output: Rover should navigate to each specified location, collect samples, and store them without confusion or mix-up.