Node Test: WheelVelocitySimulator

Node name: wheel_velocity_simulator

Node test set up and prerequisites

- ROS2 Jazzy
- g425_assign4_interfaces_pkg installed (provides Mecanum msg)
- GoogleTest available
- Build system: colcon
- Test node subscribes to the topic /mecanum_velocity to verify messages published by the simulator.
- The simulator reads wheel interval parameters from ROS2 parameters; for each test scenario, a dedicated temporary parameter node is created.

Test1 : Publishes messages
Tester : Burhan
date : 03-12-2025

Short description test: - This test verifies that the simulator node publishes Mecanum wheel velocity messages at a regular rate. - Functionality tested: periodic publishing of /mecanum_velocity topic (see node description). - SMART goal: Within 300 ms, at least one message must be received by the test subscriber.
Input test: - No parameters set → simulator uses default parameters. - Start condition: simulator node is running in executor; subscriber is active and waiting.
Expected result :

- At least one message is received on /mecanum_velocity within 300 ms. - received_ == true
Result test: - Received == false. - Failed - Test is not succesful

Test2: Constant interval value
Tester : Burhan
date : 03-12-2025

Short description test: Tests whether the node correctly evaluates a constant polynomial interval. SMART goal: When given y0 = 5.0, the simulator must output wheel value wfl ≈ 5.0 during the active interval.
Input test: intervals.0.wheel = "wfl" intervals.0.poly = "constant" intervals.0.t0 = 0.0 intervals.0.t1 = 100.0 intervals.0.y0 = 5.0
Expected result: The simulator is recreated after the parameter node is added so it loads new parameters correctly. last_msg_.wfl == 5.0, received_ := true
Result Test : - Received == false. - Failed - Test is not succesful

Test3: Linear interval correctly interpolates
Tester : Burhan
date : 03-12-2025

Validates that linear interpolation between 0.0 and 4.0 over t = [0,2s] produces a non-zero, non-finished value early in the interval.

SMART goal: Simulator output for wheel wfr must be 0.0 < value < 1.0 shortly after startup (since test reads near t ≈ 0).
Input test: intervals.0.wheel = "wfr" intervals.0.poly = "linear" intervals.0.t0 = 0.0 intervals.0.t1 = 2.0 intervals.0.y0 = 0.0 intervals.0.y1 = 4.0
Expected result: if last_msg_.wfr > 0.0 last_msg_.wfr < 1.0 received_ := true
Result Test : - Received == false. - Failed - Test is not succesful

Test4: Quadratic interval produces non-zero inside range
Tester : Burhan
date : 03-12-2025

Tests whether the simulator computes a quadratic interpolation defined by (t0,y0), (tm,ym), (t1,y1). SMART goal: At t ≈ 0.5, the expected curve should yield a value approx. 0.25 +- 0.25 tolerance.
Input test: intervals.0.wheel = "wrl" intervals.0.poly = "quadratic" intervals.0.t0 = 0.0 intervals.0.t1 = 1.0 intervals.0.tm = 0.5 intervals.0.y0 = 0.0 intervals.0.ym = 1.0 intervals.0.y1 = 0.0
Expected result: if At time spin (approx mid of curve), last_msg_.wrl ≈ 0.25 +- 0.25 received_ := true
Result Test :

- Received == false. - Failed - Test is not succesful

Test5: Looping behavior (interval repeats)
Tester : Burhan
date : 03-12-2025

Verifies that intervals repeat cyclically instead of returning to zero once they end. SMART goal: Once looping occurs, wrr must still equal the defined constant value (3.0 +- 1million) after time exceeds the interval length.
Input test: intervals.0.wheel = "wrr" intervals.0.poly = "constant" intervals.0.t0 = 2.0 intervals.0.t1 = 4.0 intervals.0.y0 = 3.0
Expected result: if For time > 4 seconds (looped), last_msg_.wrr ≈ 3.0 +- 1million EXPECT_NEAR(last_msg_.wrr, 3.0, 1e-6) received_ := true
Result Test : - Received == false. - Failed - Test is not succesful

Remarks:

- **All tests effectively act as regression tests, since changes in interpolation logic or parameter handling will immediately break them.**
- **The tests had succeeded when initially made, but failed at writing of this report**