Node: SimBroadcaster

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Team: Groep 4 RMB

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name	date	Short description
SimBroadcaster	28.11.2025	This node subscribes to Mecanum odometry and IMU simulated position topics and broadcasts their transforms using tf2, enabling visualization and frame alignment in RViz and other ROS2 components.

Node description

The SimBroadcaster node receives PositionData messages from two sources:

- Calculated mecanum wheel odometry
- Calculated IMU odometry

It converts each received position into a geometry_msgs::msg::TransformStamped and broadcasts TF frames (mecanum_base_link and imu_base_link) relative to the map frame. This ensures that robot and IMU positions/orientations are visible and synchronized in the ROS2 tf2 tree.

The node uses ROS2 parameters to allow custom topic names at runtime.

Node sub-objects and functions (communication objects):

(timer, publisher, subscriber, service server, action server, service client, action client

TransformBroadcaster : mecanum_broadcaster_ Broadcasts the Transform msg with all the data (x,y,z, rx,ry,rz and the frame_id)
Publisher function: sendTransform Sends all the transform data.

TransformBroadcaster : imu_broadcaster_ Broadcasts the Transform msg with all the data (x,y,z, rx,ry,rz and the frame_id)
Publisher function: sendTransform Sends all the transform data.

subscriber : mecanum_sub_pos_ Receives mecanum-computed position data (x, y, yaw_z).
Callback function: broadcast_mecanum Converts mecanum pose to TF and broadcasts frame mecanum_base_link

subscriber : imu_sim_sub_pos_ Receives imu-computed position data (x, y, yaw_z).
Callback function: broadcast_imu Converts IMU pose to TF and broadcasts frame imu_base_link.

Node actions, messages and services:

Messages:

- Subscribed Message Type: g425_assign4_interfaces_pkg::msg::PositionData
- TransformBroadcaster Message Type: geometry_msgs::msg::TransformStamped

Topics:

- mecanum_position: Calculated position data for storage
- imu_sim_position: Calculated position data for storage

TF frames broadcasted:

- mecanum_base_link: frame for visualizing mecanum position data.
- imu_base_link: frame for visualizing imu position data.

Custom Node functions :

Custom function: declare_parameters() Declares ROS2 parameters for all subscribed topic names and loads their values into class variables.

Custom function: broadcast_mecanum()

Converts Mecanum odometry data into a TF transform and broadcasts mecanum_base_link.

Custom function: broadcast_imu() Converts IMU simulation position data to a TF transform and broadcasts imu_base_link.

Node implementation (main):

This node follows a standard single-threaded ROS2 node implementation.

No timers, services, multithreading, or action servers are used.

Standard implementation:

```
int main(int argc, char **argv)
{
  rclcpp::init(argc, argv);
  auto node = std::make_shared<SimBroadcaster>();
  rclcpp::spin(node);
  rclcpp::shutdown();
  return 0;
}
```

Node dependencies :

g425_assign4_interfaces_pkg/msg/position_data.hpp: Custom message used to receive position data to be converted to a transform msg.

tf2_ros/transform_broadcaster.h: Used as a broadcaster for transforms for visualization.

geometry_msgs/msg/transform_stamped.hpp: Msg used to get converted to from the custom position_data msg and broadcasted by transform_broadcaster.

rclcpp: Standard ROS2 C++ client library for node, subscription, and publisher functionality.