RoverMapper-Autonomous Terrain Mapping using Wheel-Based Rovers

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Problem Statement

There are indoor localization system but they can often be unreliable and irrelevant

- Manual methods
  - Manual checks
  - Record keeping
- Automated methods
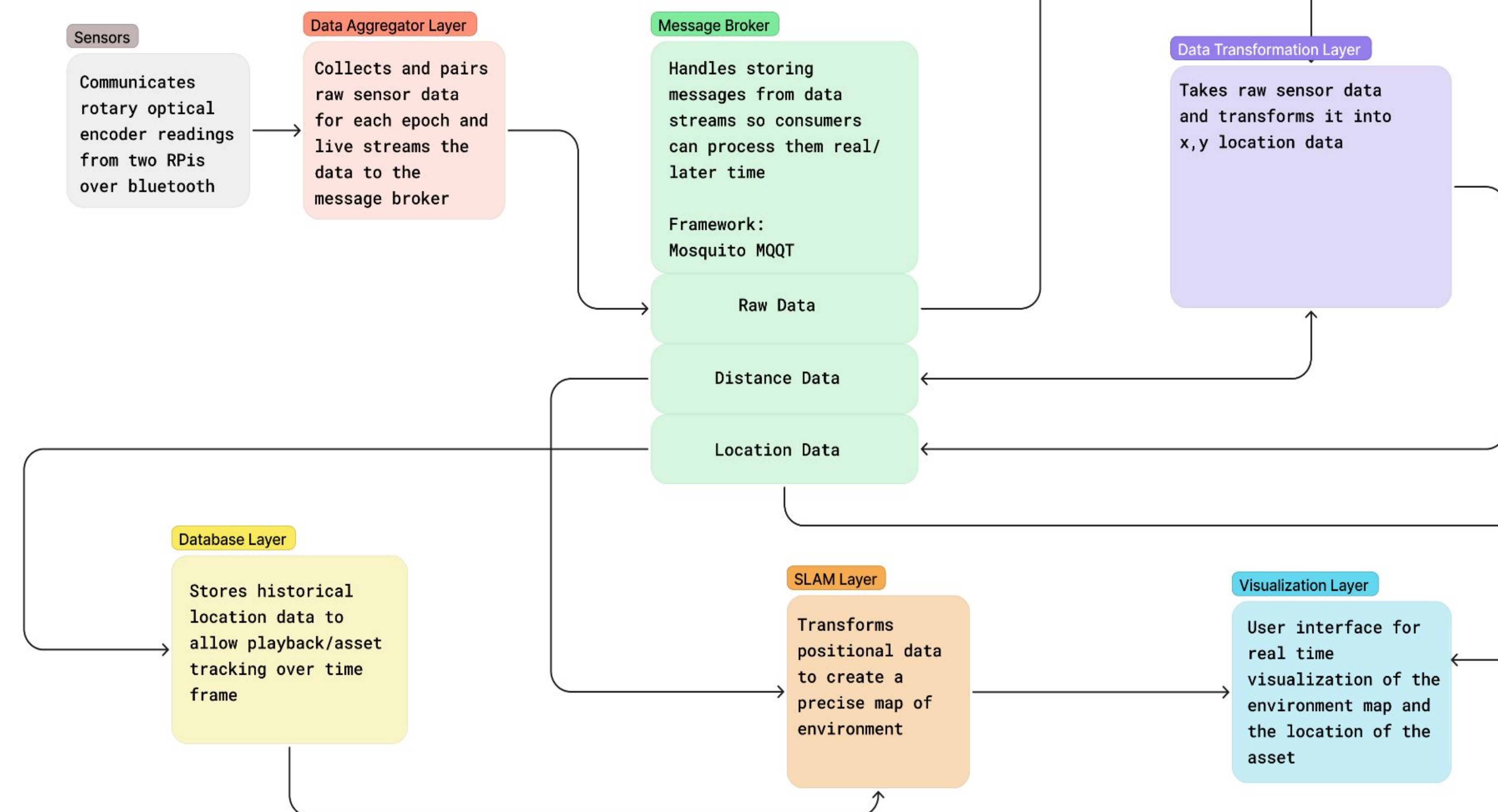 - Expensive RTLS systems (RFID tags, GPS)
  - CMMS

Our Solution

- Using a Rotary Optical Encoder Sensor for more accurate readings
  - Have two sensors in mind to test which works better
  - Anticipate to have less drift
  - Anticipate to have more accurate readings
- Implementing an autonomous mapping
  - Plan to use a SLAM algorithm
- Implementing a database
  - Will be useful for storing historical information of the mapping
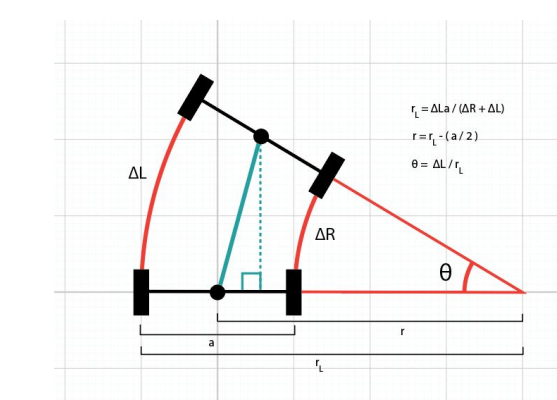
Our Design

We have 5 layers to our deign

- Data Aggregation Layer
- Data Transformation Layer
- Visualization Layer
- Database Layer
- SLAM Layer

Theory

You can get the rotational motion from two wheels by using these formulas

Sensors
Communicates rotary optical encoder readings from two RPis over bluetooth

Data Aggregator Layer
Collects and pairs raw sensor data for each epoch and live streams the data to the message broker

Message Broker
Handles storing messages from data streams so consumers can process them real/ later time

Framework:
Mosquito MQQT

Raw Data

Distance Data

Location Data

Data Transformation Layer
Takes raw sensor data and transforms it into x,y location data

Database Layer
Stores historical location data to allow playback/asset tracking over time frame

SLAM Layer
Transforms positional data to create a precise map of environment

Visualization Layer
User interface for real time visualization of the environment map and the location of the asset

Milestones

- Understanding the previous system
- Researching for compatible Rotary Optical Encoder sensors
- Researching the drift of IMU and Rotary Optical Encoder sensors
- Design for sensor attachment to wheel based systems
- Implement new sensor into application
- Research SLAM algorithms
- Implement SLAM algorithms with LIDAR sensors and cameras
- Design and Implement Database schemas
- Additional UI enhancements

Values

The social benefit would be crucial

- Health care
- Warehouses
- Motor Vehicle Industry
- Transportation Industry
- Asset Management Insutry