Towards developing an Autonomous dumper

Computer vision and deep learning to automate the loading process.

Construction sites are characterized by a high proportion of manual work, rapid variability, and harsh working conditions. As a result, the degree of digitalization, automation, and productivity is very low. Digitalization and the development of autonomous construction vehicles could lighten this problem. Therefore, this thesis aims to implement an autonomous loading functionality to equip a track dumper with self-sufficient performance.

This project aims to develop an autonomous loading process in a tracked dumper. The different behaviors will be triggered by an object detection algorithm that can recognize different states of the process:

- Shovel empty - Shovel full - Bucket empty - Bucket full - Gravel

For example:

Detect a pile of bulk material (gravel) so the robot can drive toward it, detect when the shovel is full so it can be empty in the bucket, and when the bucket is full, so the operation is finished. Considering this, the goal is to implement a state machine or behavior tree to automate the loading process using the information triggered by the object detector algorithm.

Tasks:

1. Get familiar with the different libraries and packages in ROS2 to work with state machines and behavior trees.
2. Implement state machine architecture.
3. Integrate object detection model to trigger and transition between different states.
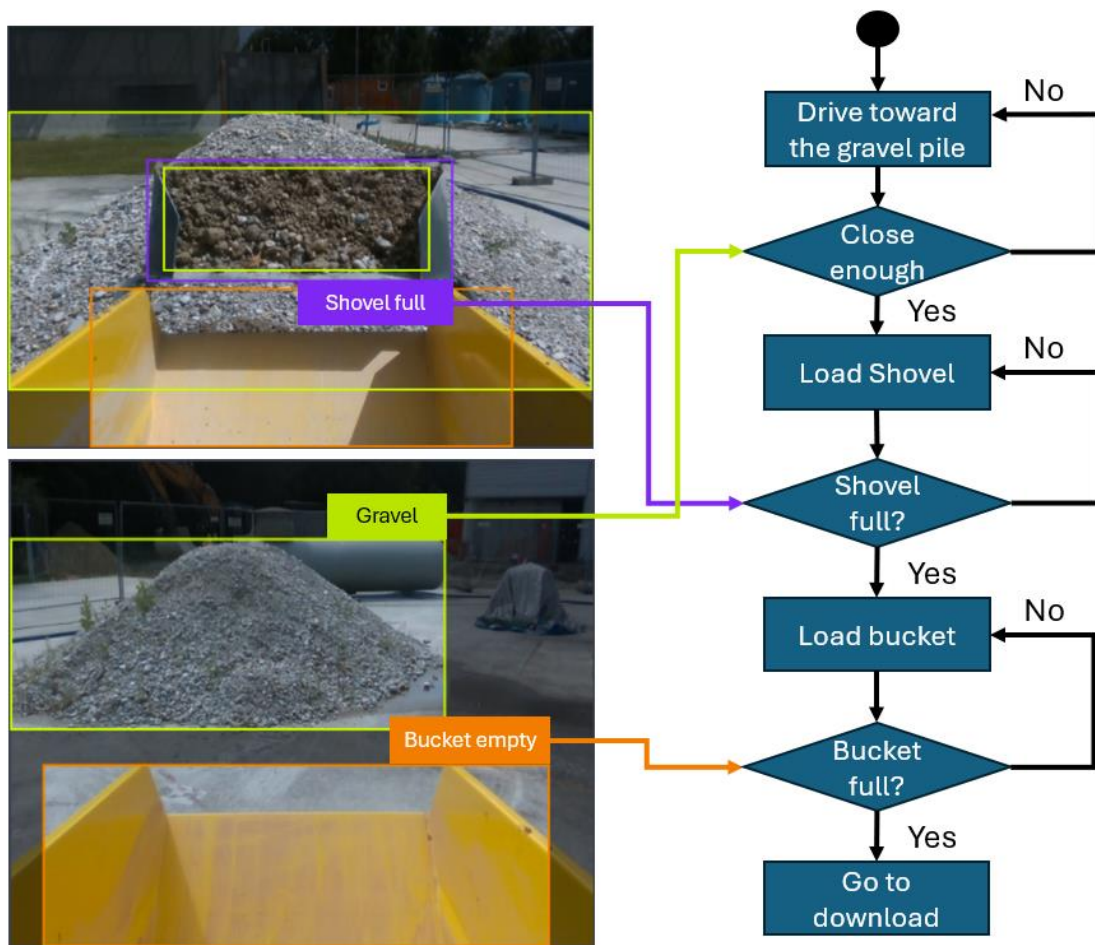4. Implement states functionalities to allow autonomous loading.
5. Test implementation in fml autonomous dumper.

Figure 1: State machine diagram