Guide for Launching the Aerial Delivery Robot

Launch Steps

T#	Purpose	Computer	Command
T1	Livox Driver	Lattepanda	roslaunch livox_ros_driver2 msg_MID360.launch
T2	Localization	Lattepanda	roslaunch fast_lio_localization localization_mid360.launch map:=/home/grvc/catkin_ws/src/FAST_LIO/PCD/scans.pcd
T3	Initialization	Lattepanda	rosrun fast_lio_localization publish_initial_pose.py 0 0 0 0 0 0 sudo chmod 666 /dev/ttyUSB0 roslaunch mavros apm3.launch
T4	Target Point Publisher	Local	export ROS_MASTER_URI=http://192.168.0.234:11311 export ROS_IP=192.168.0.171 roslaunch target_point_publisher run.launch
T5	LiCAS euROBIN Configuration	RPi4	sudo nano /sys/bus/serial/.../ttyUSB0/latency_timer sudo nano /sys/bus/serial/.../ttyUSB1/latency_timer sudo ./LiCAS_A1 /dev/usart_LiCAS_A1_euROBIN_Left /dev/usart_LiCAS_A1_euROBIN_Right
T6	ArUco Parcel Detection	RPi4	./Aruco_Parcel_Marker 4 3 1
T7	ADROM Navigation	Local	cd ~/Documents/euROBIN/ADROM/build/Main ./ADROM
T8	Ground Control Station	Local	./gcs 192.168.0.166 22000
T9	Image Display	Local	./VisualFeedback_Display 28001
T10	MAVROS Setpoint Monitoring	Local	export ROS_MASTER_URI=http://192.168.0.234:11311 export ROS_IP=192.168.0.171 rostopic echo /mavros/setpoint_position/local
T11	Global Pose Monitoring	Local	export ROS_MASTER_URI=http://192.168.0.234:11311 export ROS_IP=192.168.0.171 rostopic echo /global_pose

INSTALLATION AND DESCRIPTION:

Clone repository to get all the required software:

```
cd ~
git clone https://github.com/JorgePogue37/eurobin_grvc_software.git
```

T1: Livox Driver

Purpose: Enables communication between ROS and Livox LiDAR devices using Livox SDKs.

Installation

1. **Install Livox SDK from the Official Repository**:

   ```
   cd ~
   git clone https://github.com/Livox-SDK/Livox-SDK.git
   cd Livox-SDK
   mkdir build && cd build
   cmake .. && make -j
   sudo make install
   ```

2. **Install Livox SDK2 from the Official Repository**:

   ```
   cd ~
   git clone https://github.com/Livox-SDK/Livox-SDK2.git
   cd Livox-SDK2
   mkdir build && cd build
   cmake .. && make -j
   sudo make install
   ```

3. Copy the Livox ROS Drivers to your ROS workspace:

   ```
   cp -r ~/eurobin_grvc_software/On\ Board\ Lattepanda/Livox_ROS_Driver ~/catkin_ws/src
   cp -r ~/eurobin_grvc_software/On\ Board\ Lattepanda/Livox_ROS_Driver2 ~/catkin_ws/src
   ```

4. Build the workspace:

   ```
   cd ~/catkin_ws
   catkin_make
   ```

5. Configure MID360_config.json in Livox ROS Driver2 with the appropriate rotation values for your setup.

Usage

Launch the Livox Driver:

```
roslaunch livox_ros_driver2 msg_MID360.launch
```

T2: FAST-LIO Localization

Purpose: Runs the FAST-LIO Localization node to estimate the robot's position using a pre-generated map.

Prerequisites: Generating the Map

1. Copy FAST-LIO from the repository:

   ```
   cp -r ~/eurobin_grvc_software/On\ Board\ Lattepanda/FAST_LIO ~/catkin_ws/src
   ```

2. Build FAST-LIO:

   ```
   cd ~/catkin_ws
   catkin_make
   ```

3. Generate the map:
   - Launch the Livox Driver:

     ```
     roslaunch livox_ros_driver2 msg_MID360.launch
     ```

   - Run the FAST-LIO mapping node:

     ```
     roslaunch fast_lio mapping_mid360.launch
     ```

   - Transfer the map and generate a 2D map for the path generator:

     ```
     scp grvc@192.168.0.234:~/catkin_ws/src/FAST_LIO/PCD/scans.pcd ~/eurobin_grvc_software/GCS/Not\ ROS/Generate2dmap/files
     cd ~/eurobin_grvc_software/GCS/Not\ ROS/Generate2dmap/
     ./generatemap2d.sh
     ```

Installation

1. Copy FAST-LIO_LOCALIZATION from the repository:

   ```
   cp -r ~/eurobin_grvc_software/On\ Board\ Lattepanda/FAST_LIO_LOCALIZATION ~/catkin_ws/src
   ```

2. Copy pose_publisher from the repository:

   ```
   cp -r ~/eurobin_grvc_software/On\ Board\ Lattepanda/pose_publisher ~/catkin_ws/src
   ```

3. Build the workspace:

   ```
   cd ~/catkin_ws
   catkin_make
   ```

NOTE:

- **Do not modify the mid360.yaml in this package (It has to be modified in FAST_LIO but not in FAST_LIO_LOCALIZATION); altering it will cause positioning errors to accumulate over time.**
- **The localization output will be rotated based on the LiDAR's orientation. This can be corrected in the pose_publisher package by modifying its source code to apply the counter-rotation needed to align the output correctly.**

Usage

1. Source the workspace:

   ```
   source ~/catkin_ws/devel/setup.sh
   ```

2. Launch localization:

   ```
   roslaunch fast_lio_localization localization_mid360.launch map:=/home/grvc/catkin_ws/src/FAST_LIO/PCD/scans.pcd
   ```

3. Publish the initial pose:

   ```
   rosrun fast_lio_localization publish_initial_pose.py 0 0 0 0 0 0
   ```

T3: MAVROS

Purpose: Starts MAVROS for flight control.

Installation:

1. Install the mavros package:

   ```
   sudo apt install ros-$ROS_DISTRO-mavros ros-$ROS_DISTRO-mavros-extras
   sudo cp ~/eurobin_grvc_software/MAVROS_launcher/apm3.launch /opt/ros/$ROS_DISTRO/share/mavros/launch/
   ```

Usage:

1. Update serial port permissions:

   ```
   sudo chmod 666 /dev/ttyUSB0
   ```

2. Launch MAVROS:

   ```
   roslaunch mavros apm3.launch
   ```

T4: Target Point Publisher

Purpose: Publishes target points for the robot to navigate to.

Installation

1. Copy the Target Point Publisher from the repository:

   ```
   cp -r ~/eurobin_grvc_software/GCS/targetpoint_publisher ~/catkin_ws/src
   ```

2. Copy pcd_map_viewer from the repository:

   ```
   cp -r ~/eurobin_grvc_software/GCS/ROS/pcd_map_viewer ~/catkin_ws/src
   ```

3. Build the workspace:

   ```
   cd ~/catkin_ws
   catkin_make
   ```

Usage

1. Set ROS environment variables for the Ground Control Station (GCS):

   ```
   export ROS_MASTER_URI=http://192.168.0.234:11311
   export ROS_IP=192.168.0.171
   ```

2. Launch the publisher:

   ```
   roslaunch target_point_publisher run.launch
   ```

T5: LiCAS euROBIN Configuration

Purpose: Configures and launches the LiCAS arms system.

Installation:

1. Build the LiCAS program

   ```
   git clone https://github.com/JorgePogue37/eurobin_grvc_software.git
   cd ~/eurobin_grvc_software/On\ Board\ Raspberry/LiCAS_A1_euROBIN
   mkdir build
   cd build
   make
   ```

2. Apply rules for the usbs of the LiCAS system

   ```
   sudo cp ~/eurobin_grvc_software/On\ Board\ Raspberry/99-usb-serial.rules /etc/udev/rules.d/
   ```

Usage:

1. Configure latency timers (**change the values from 16 to 1**):

   ```
   sudo nano /sys/bus/serial/.../ttyUSB0/latency_timer
   sudo nano /sys/bus/serial/.../ttyUSB1/latency_timer
   ```

2. Start the LiCAS system:

   ```
   cd ~/eurobin_grvc_software/On\ Board\ Raspberry/LiCAS_A1_euROBIN
   sudo ./LiCAS_A1 /dev/usart_LiCAS_A1_euROBIN_Left /dev/usart_LiCAS_A1_euROBIN_Right
   ```

T6: ArUco Parcel Detection

Purpose: Detects parcels using ArUco markers.

Installation

1. Clone your repository if not already done:

   ```
   cd ~
   git clone https://github.com/JorgePogue37/eurobin_grvc_software.git
   ```

2. Navigate to the **Aruco Parcel Detection** program:

   ```
   cd ~/eurobin_grvc_software/On\ Board\ Raspberry/Aruco_Parcel_Detection
   mkdir build
   cd build
   cmake ..
   make
   ```

Usage

1. Launch the program from the build folder:

   ```
   cd ~/eurobin_grvc_software/On\ Board\ Raspberry/Aruco_Parcel_Detection/build/Main
   ./Aruco_Parcel_Detection 4 3 1
   ```

T7: ADROM Navigation

Purpose: Provides advanced navigation and path planning.

Installation

1. Navigate to the **ADROM Navigation** folder:

```
cd ~/eurobin_grvc_software/GCS/Not\ ROS/ADROM
mkdir build
cd build
cmake ..
make
```

2. Install whisper cpp for voice recognition:

```
cd ~
git clone https://github.com/ggerganov/whisper.cpp.git
cd whisper.cpp
mkdir build
cd build
cmake ..
make
```

Usage

1. Launch the program from the build folder:

```
cd ~/eurobin_grvc_software/GCS/Not\ ROS/ADROM/build/Main
./ADROM
```

T8: LiCAS Ground Control Station (GCS)

Purpose: Control station for managing robot operations.

Installation

1. Navigate to the **GCS program** folder:

```
cd ~/eurobin_grvc_software/LiCAS_GCS/Not\ ROS/GCS
mkdir build
cd build
cmake ..
make
```

Usage

1. Launch the program from the build folder, specifying the IP and port:

```
cd ~/eurobin_grvc_software/LiCAS_GCS/Not\ ROS/GCS
./gcs 192.168.0.166 22000
```

T9: Image Display

Purpose: Displays visual feedback from the robot.

Installation

1. Navigate to the **Image Display** folder:

```
cd ~/eurobin_grvc_software/GCS/Not\ ROS/VisualFeedback_Display
mkdir build
cd build
cmake ..
make
```

Usage

1. Launch the program from the build folder, specifying the port:

```
cd ~/eurobin_grvc_software/GCS/Not\ ROS/VisualFeedback_Display/build
./VisualFeedback_Display 28001
```