Experiment #3

Robot Management for PPDR Use Cases [Alisys]

Overview and Objectives

Alisys is a technology company specializing in cloud solutions, Artificial Intelligence (AI) and robotics. With over 20 years of experience, Alisys aims to drive digital transformation to organizations by providing innovative and personalized solutions. Alisys is headquartered in Madrid, Spain, but operates globally. Alisys has developed an advanced solution in collaboration with Ghost Robotics, centered around the V60 quadruped robot (see Figure 1 and Figure 2**Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**), also known as Vision 60. This partnership aims to leverage the robust capabilities of the V60 for various challenging applications, such as PPDR use cases.

The V60 is designed to navigate complex terrains, making it suitable for environments where traditional wheeled or tracked robots may struggle. The V60 integrates LiDAR technology, which enables it to create detailed 3D maps and point clouds. This feature is used in emergency situations to inspect and monitor environments accurately. Also, based on LiDAR, the robot can autonomously plan and execute scanning routes. Moreover, the V60 is responsible for feeding and carrying payloads. It connects via Ethernet to an internal PC, and this connection is used for all motion control and access to the internal cameras of the robot through ROS. On the other hand, the LiDAR is directly connected to the robot and integrated via ROS. For the PPDR use case, the V60 also incorporates a thermal camera and a 360º camera, connected via USB. Inside the internal PC, a container is deployed, which manages teleoperation commands via WebSocket and WebRTC, to stream the videos of the cameras integrated onto the robot.

Experiment Execution and Results

Alisys used the UMA testbed to test the integration of teleoperation in a 5G private network, to support remote control of the robot, allowing operators to manage the robot inside the 5G private network area of coverage, and without the usage of the centralized teleoperation services hosted on the Internet. This approach reduces the latency in the communications, and provides exclusive communications for PPDR usage.

During the integration tests we assessed different 5G routers, and identified the need to use more than one IP address per User Equipment. The needs of several IP addresses arise when exposing different services behind the same UE. We should add port redirections in the 5G router to the different services, but the full set of ports used for the solutions integrated into the robot was not available. Moreover, the existence of point to point connections in the internal PC hampered also the reachability of some features needed for the teleoperation. The first integration was done by using two different 5G routers. The second integration was done using one single router, adding the right RTP ports redirections used by the 3600 camera into the 5G router, and placing the teleoperation services in the edge servers available in the testbed.

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Figure 1: Alisys Robot

Figure 2: Nokia AGV

Overall evaluation

By conducting a thorough evaluation and addressing the identified issues, the Alisys solution has demonstrated improved connectivity. Moreover, the integration of edge cloud services and additional functionalities, like 3600 video cameras, has enhanced both the performance and the features exposed by the solution for PPDR use cases.