Robot Operating System (ROS2) for Khepera IV Robots

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The Robot Operating System 2 (ROS2) is a set of tools and software libraries, for building efficient robot applications, that is meant to replace ROS1 in the future. Therefore, to take advantage of ROS2, this project aimed at interfacing a ROS2 library with the Khepera IV robot from K-Team Corporation, shown in Figure 1. In other words, the goal was to find and test several approaches to integrate ROS2 within Khepera IV's Yocto embedded Linux Operating System (OS) distribution. The main difficulty was found in the fact that the Yocto 1.8 Fido release from 2015, used to build the Linux embedded OS currently running on the Khepera IV, does not provide any support to directly integrate ROS2 in it.

Figure 1: Khepera IV robot

In the scope of this project, two main approaches were implemented. The first one used a Yocto 1.8 Fido release from 2015, with Docker to run ROS2 in another Linux distribution, thanks to the meta-virtualization layer. The second one used a Yocto 3.1 Dunfell release from 2020, which can directly integrate ROS2 thanks to the meta-ros layer.

Unfortunately, despite numerous attempts to integrate ROS2 inside the robot, none of these approaches turned out to be successful. The failures were caused by old unsupported code from 2016, and by incompatibilities between the meta-khepera4 layer implemented by K-Team and the latest Yocto releases, respectively.

However, even though the final goal has not been reached, other important milestones, such as the ability to rebuild the original image of the Khepera IV, were met.

It is further worth noting that the lack of success in this project does not mean that it is impossible to embed ROS2 within the Khepera IV. On the contrary, several promising alternatives involving the collaboration of K-Team could solve this problem. More concretely, a hardware upgrade with a new implementation of the Khepera IV library or/and adapt the meta-khepera4 layer to obtain compatibility with Yocto 3.1 Dunfell, appear to be the most promising future directions of this semester project.