# VarastoRobo – UR5

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## Introduction

The aim of this project was to make an autonomous storage management system, in which multiple devices work in co-operation to transport ordered packages to a drop-off point. In addition a drone was to function as surveillance system for the premises.

## Objectives

Our part of VarastoRobo -project was to program an autonomous robot arm to pass on various objects for the GoPiGo robots to transfer them (FIGURE 1). The operating principle was that the master device would inform the UR5 robot on which package to select and where to move it.

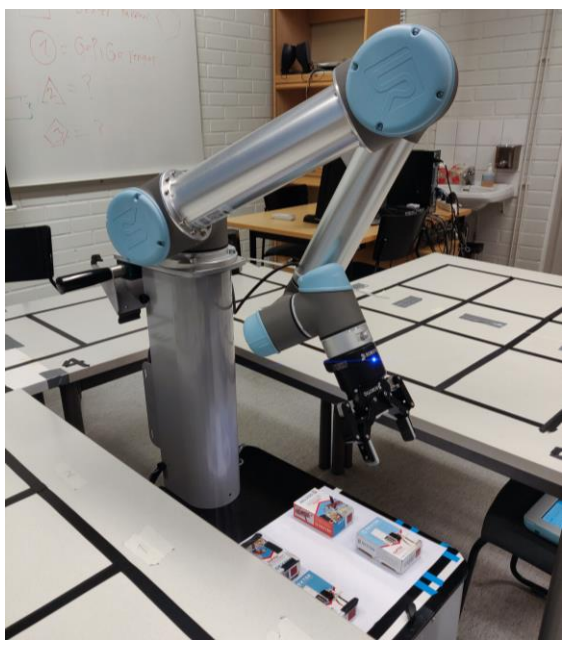

*FIGURE 1. UR5 –robot*

## Methods

The communication between the master device and the UR5 –robot required a gateway device, so a Raspberry Pi was added to convey the information about what package were to be delivered and where to. To achieve the desired goal the gateway device was programmed using Python and UR5 -robot with URScript. (FIGURE 2.)

For the UR5 robot to acknowledge a specific package, it would use a built-in object detection function. The robot would take a picture of the possible packages and then inform gateway and master device if packages are available and if transfer is possible to make.

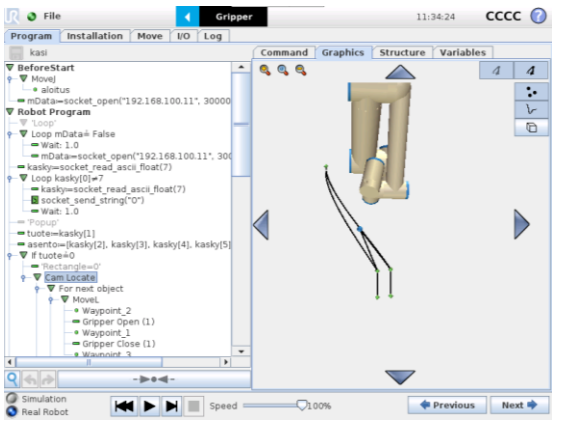


*FIGURE 2. Screenshot from UR5 UI*

In case of a failure, a simultaneous emergency stop was designed for the whole system. The master device would inform the gateway device to halt the UR5 program if a manually triggered stop occurred.

## Results

The implementation of the UR5-robot was successful. Robot moves the specified packages to predefined drop-of points as expected.

Emergency stop function made problems, but with an alternative solution the desired functionality was eventually reached, and the system could be shutdown simultaneously with other devices.

## Conclusions

Working with the UR5 robot was valuable experience. We got to know the capabilities and experiment with various functionalities the robot had. Project management worked very well considering we had clear sprint goals and continuous conversation between teams to ensure a reliable result.

## References

1. UR5 User manual https://www.usna.edu/Users/weaprcon/kutzer/_files/documents/User%20Manual,%20UR5.pdf
2. URScript Manual http://www.me.umn.edu/courses/me5286/robotlab/Resources/scriptManual-3.5.4.pdf
3. GitHub repository https://github.com/Jarno-Poikonen/VarastoRobo/

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