

# Multi-Robot Allocation for logistic applications

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# Industrial Logistics

The **industrial logistics** is the process of **planning**, **organization** and **control** of all the activities of handling and **storage** of goods, which, starting from the suppliers and reaching up to the end user, guarantee an adequate level of **service** to the customer consistent with the **costs** to it associated



# Multi-Robot Systems for logistic applications



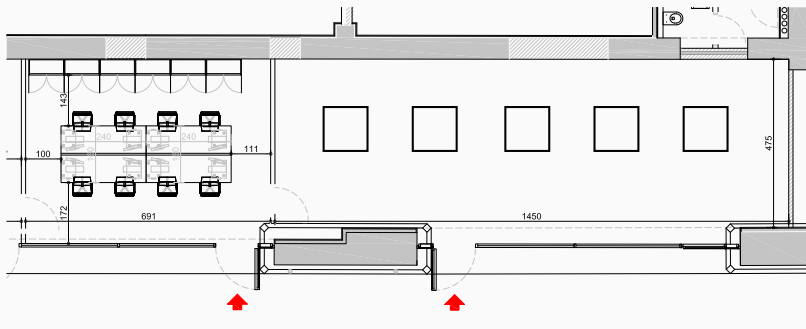
Kiva warehouse-management system

The contribution of this thesis:

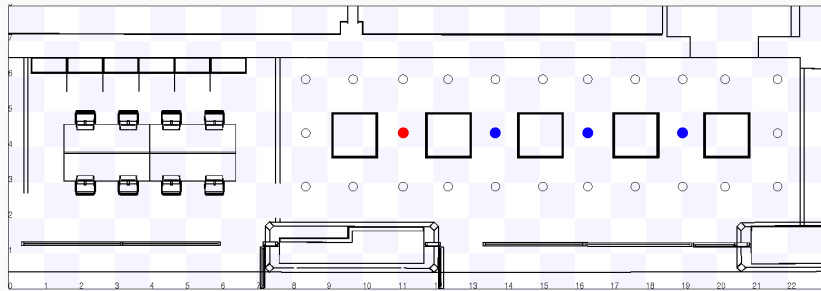
- extension of ROS package
- proposing three technique:
  1. Single robot : Single task (SR:ST)
  2. Set Partition Strategy - Single robot : Multiple task (SPS1:N)
  3. Greedy Set Partition Strategy - Single robot : Multiple task (GSP1:N)
- real scenario: Computer Engineering for Industry 4.0 Laboratory (ICE Lab)

ROS





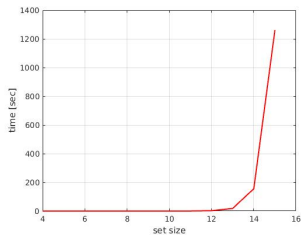
# ICE Laboratory for logistic application



- Loading bay
- Unloading bays
- Vertices

# Set Partition Strategy - Single robot : Multiple task (SPS1:N)

iteration	partition size	partition
1	1	$\{\{a, b, c, d\}\}$
2	2	$\{\{a, b, c\}, \{d\}\}$
3	2	$\{\{a, b, d\}, \{c\}\}$
4	2	$\{\{a, b\}, \{c, d\}\}$
5	3	$\{\{a, b\}, \{c\}, \{d\}\}$
6	2	$\{\{a, c, d\}, \{b\}\}$
7	2	$\{\{a, c\}, \{b, d\}\}$
8	3	$\{\{a, c\}, \{b\}, \{d\}\}$
9	2	$\{\{a, d\}, \{b, c\}\}$
10	2	$\{\{a\}, \{b, c, d\}\}$
11	3	$\{\{a\}, \{b, c\}, \{d\}\}$
12	3	$\{\{a, d\}, \{b\}, \{c\}\}$
13	3	$\{\{a\}, \{b, d\}, \{c\}\}$
14	3	$\{\{a\}, \{b\}, \{c, d\}\}$
15	4	$\{\{a\}, \{b\}, \{c\}, \{d\}\}$



# Greedy Set Partition Strategy - Single robot : Multiple task (GSP1:N)



# ROS package Logistic\_sim

