



# Robotics: Final Project

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# Overview

- ▶ Motivation: practical experience with real hardware
- ▶ Team of two students
- ▶ Two options for the project
  - ▶ Cubes reorganization: pick-and-place with 6 DoF robot and vision
  - ▶ Drawing with a robot: draw with 4 DoF robot



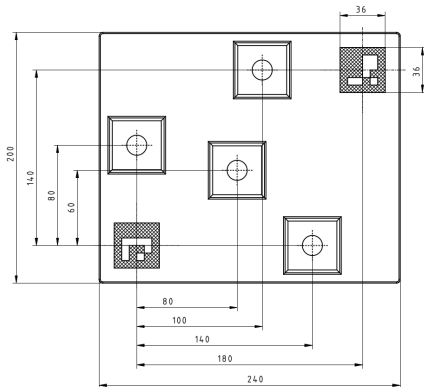
# Option #1: Cubes reorganization

- ▶ External camera, 2 robots (CRS97, CRS93)



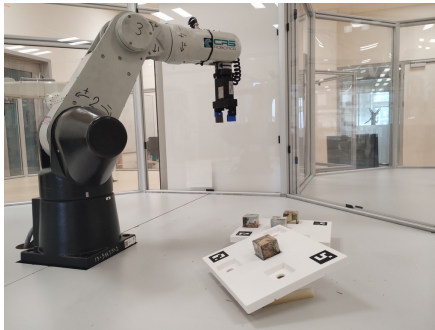
# Option #1: Cubes reorganization

- ▶ Desks with AruCo markers on the top (CSV provided)
- ▶ Goal: transfer all cubes between holders



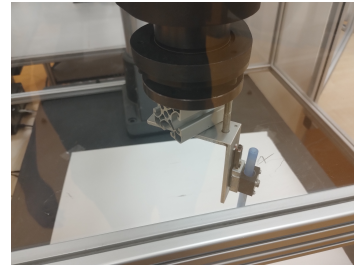
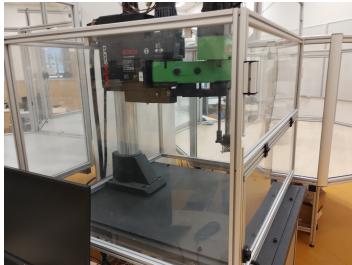
# Option #1: Cubes reorganization, variants

- ▶ Variant A: planar problem, one desk (7 points)
- ▶ Variant B: planar problem, cubes reorganization (10 points)
- ▶ Variant C: non-planar problem (15 points)
- ▶ Variant D: rotation by 7 or 15 degrees (20 points)



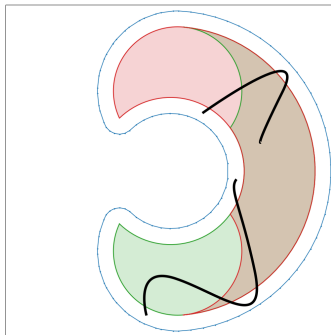
## Option #2: Draw with a robot

- ▶ Draw curves from the image template
- ▶ No camera needed
- ▶ Robot Bosch (SCARA)



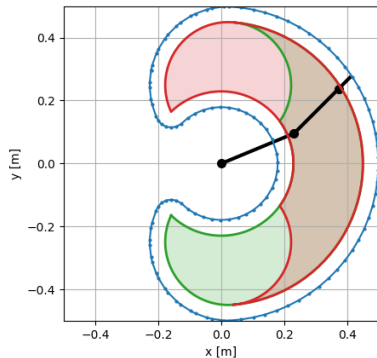
# Input

- ▶ Input is an image that contains a curve
- ▶ Dimension of a iamge is  $1000 \times 1000$  px
- ▶ 1 px corresponds to 1 mm



## Option #2: Draw with a robot, variants

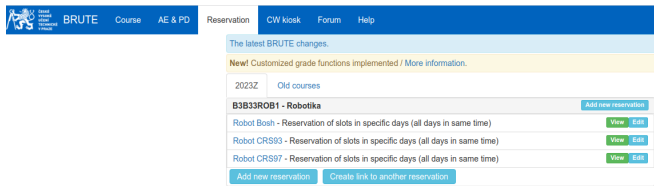
- ▶ Variant A-1: one curve in intersection of the red and green (4 points)
- ▶ Variant A-N: more curves (6 points)
- ▶ Variant B-1/N: one curve in either red or green (6/7 points)
- ▶ Variant C-1/N: one curve in union of red and green (8/10 points + 1 point for continuity)
- ▶ Variant D-1/N: one curve in robot workspace (blue) (14/15 points)





# Laboratories

- ▶ Sharing the resources: reservation system in BRUTE
- ▶ Consultations
  - ▶ During the labs: one of TAs (Krsek, Smutny) is prepared on a phone
  - ▶ Other timeslot: contact all TAs by email



The screenshot shows the BRUTE reservation system interface. The top navigation bar includes the university logo, 'BRUTE', and menu items for 'Course', 'AE & PD', 'Reservation', 'CW kiosk', 'Forum', and 'Help'. Below the navigation bar, there is a section for 'The latest BRUTE changes.' with a yellow highlight for 'New! Customized grade functions implemented / More information.' Below this, there are tabs for '2023Z' and 'Old courses'. The main content area displays a table of reservations for the course 'B3B33ROB1 - Robotika'. Each row includes the reservation name, a description, and 'View' and 'Edit' buttons. At the bottom of the table, there are buttons for 'Add new reservation' and 'Create link to another reservation'.

Course	Reservation Name	Description	View	Edit
B3B33ROB1 - Robotika	Robot Bosh	Reservation of slots in specific days (all days in same time)	View	Edit
B3B33ROB1 - Robotika	Robot CRS93	Reservation of slots in specific days (all days in same time)	View	Edit
B3B33ROB1 - Robotika	Robot CRS97	Reservation of slots in specific days (all days in same time)	View	Edit



# Delivering final project

- ▶ Technical report and demonstration
- ▶ Report needs to be uploaded in advance
- ▶ Reservation system for the last week of the semester and exam-period
- ▶ **Contact us if you want to deliver sooner**

