

Carnegie Mellon University Africa

18-799 Cognitive Robotics

Assignment 5 Vision-based Brick Stacking

Deadline: 18:00 Tuesday 20th April 2021

Problem Definition

Write a robot control program for the LynxMotion AL5D robot arm simulator to pick up three small coloured bricks – one red, one green, and one blue – and stack them on top of each other, with the **red brick at the top**, the **green brick in the middle**, and the **blue brick at the bottom**. The pose of the three bricks should be determined using the camera in the simulator.

The x axis of the brick is aligned with its major axis; see Fig. 1. The dimensions of the brick in the x , y , and z directions are 31.8 mm, 15.8 mm, 11.4 mm respectively.

You can assume that the bricks are placed in the field of view of the camera, that they are completely visible, that they are placed in distinct locations that allow them to be grasped and that they are not placed close to the final stack position.

The `cameraInvPerspectiveMonocular` example in the `module5` package demonstrates the use of the camera model to convert the brick coordinates from pixels to millimetres.

The (x, y, z) position and orientation ϕ of the first brick in the stack is specified in an input file `assignment5Input.txt` located in the data subdirectory in the assignment package.

The robot configuration file and the camera model file are also localted in the data subdirectory.

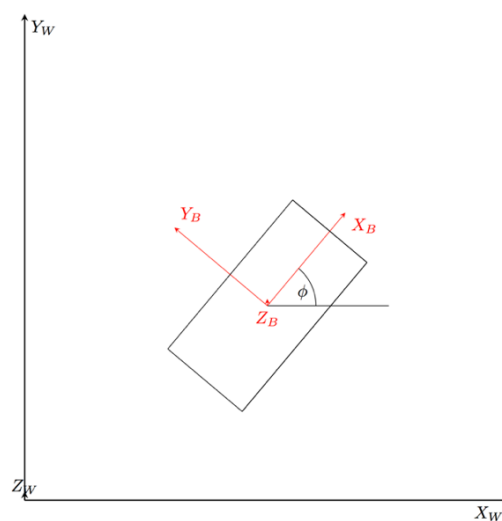


Figure 1. Pose of a brick.

Input

The input file `assignment5Input.txt` comprised the following.

Line 1: the filename of the robot configuration file.

Line 2: the filename of the camera model file.

Line 3: the (x, y, z) position and orientation ϕ of the first brick in the stack.

Sample Input

```
robot_3_config.txt
cameraModelCoefficients.txt
0 220 0 0
```

Instructions

This is an individual assignment; collaboration is not allowed.

Submit the three source code files named with your student ID, i.e.

```
mystudentidApplication.cpp
mystudentidImplementation.cpp
mystudentid.h
```

in a zip file named with your student ID by the deadline shown above.

Marking Scheme

Marks will be awarded based on a blind tests where the three bricks are placed at random positions and orientations in the field of view of the camera in accordance with the assumptions set out above. Marks will be allocated as follows:

Successfully pick the red brick	10 marks
Successfully place the red brick	10 marks
Successfully pick the green brick	10 marks
Successfully place the green brick	10 marks
Successfully pick the blue brick	10 marks
Successfully place the blue brick	10 marks
Intact stack after last placement	20 marks
Correct colour order	20 marks