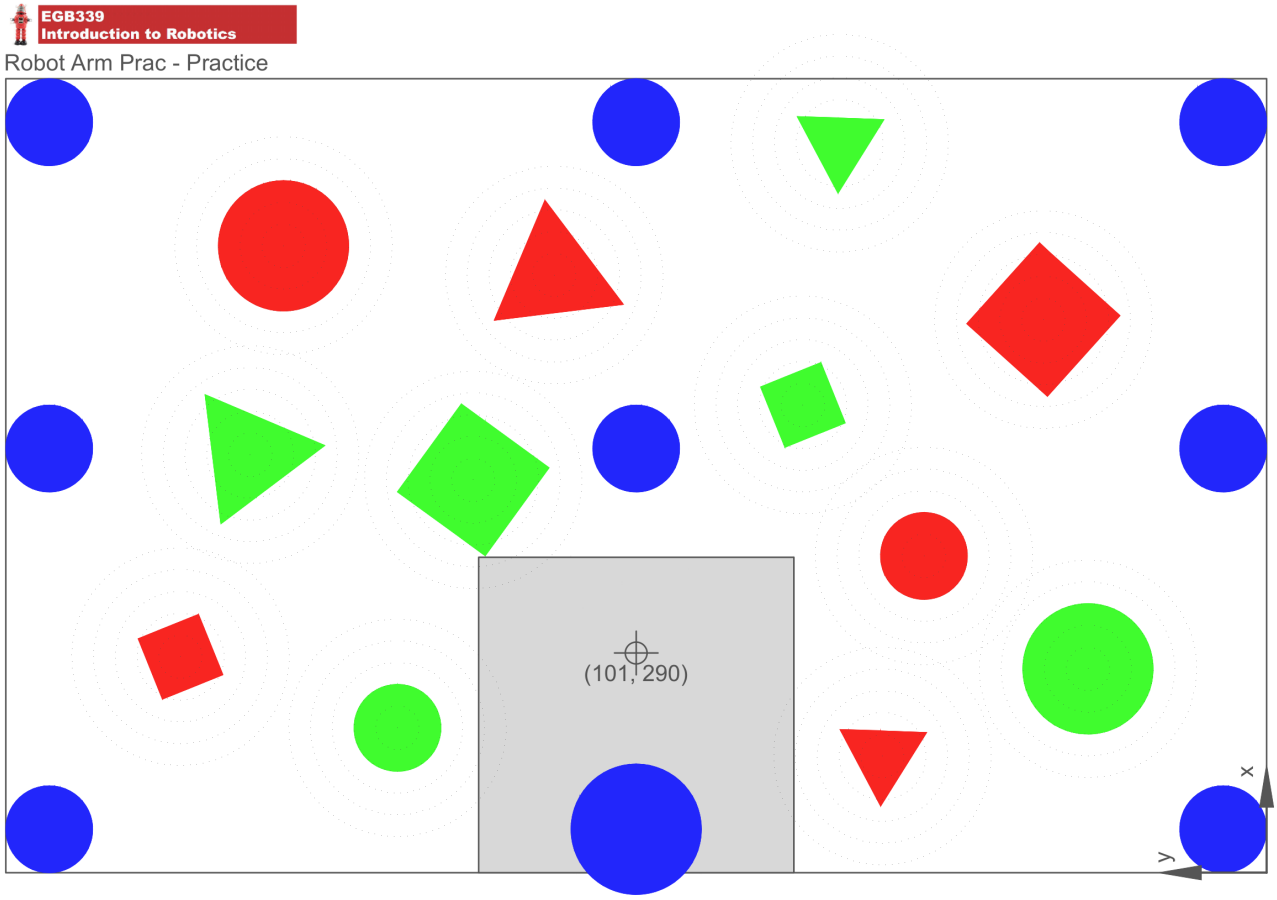
EGB339 - Kinematics Prac Exam



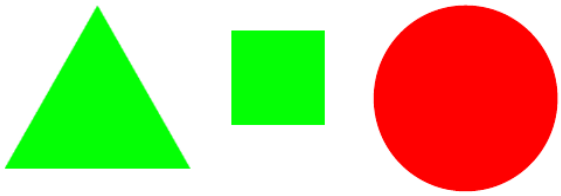
Setup

A work sheet (see example above) will be secured to your bench top at the beginning of the Prac Exam session. The shapes other than the grey square and the blue calibration marks will be in the set [small, large], [red, green], [triangle, circle, square].

1. The blue circles are calibration markers. Note that one blue circle is bigger than the others.
2. Each shape will appear at least once in each of red and green.
3. Each shape will appear at least once in each size.
4. Each size+shape will appear at least once. That is, there will be at least one small triangle, one large triangle etc.
5. The shape and size are independent of colour. That is, all large triangles are the same size, all small circles are the same size, etc.
6. There will not be more than one object of a particular size+shape+colour.

Your task is to use the robot arm to move three small cylinders from their initial position on the work sheet to a destination position.

The initial positions and goal positions will be provided in the form of two small test sheets, similar to the ones used in the vision prac exam. Each test sheet contains three coloured shapes (red or green, circle or square or triangle, small or large). One sheet provides the initial positions, the second sheet the destination positions. An example is given below



Initial Positions

Destination Positions

In this scenario, your task is to move the cylinder placed on the large green triangle to the small red triangle, the cylinder from the small green square to the large red square, and the one from the large red circle to the small green circle.

The shapes on the test sheets will be printed to the same scale as the work sheet. You will have a total of 4 minutes to take the photos you need for the remaining steps (a photo of the test sheet and of the exam work sheet).

Tasks for a team of three

As a team of three team members, you must develop a program that will perform the following steps:

1. Automatically identify the coloured shapes (shape, colour and size) of the test sheets you are given, and calculate their coordinates on the bigger work sheet. This resembles the task of the vision prac. For each shape on the test sheets, let your program print the shape, color, size, and calculated coordinates on the work sheet first for the initial positions, then for the destination positions. Display the coordinates in units of mm.

   (3 marks)

   Alternatively you can forfeit the 3 marks and enter the coordinates of the initial and destination positions directly into your script.

   (0 marks)

2. Move all 3 cylinders from their initial positions to the correct destination position as specified on the test sheets or the received coordinates. You will receive marks for accurate placement of the cylinders.

   (17 marks)

   Alternatively move the tool tip of your robotic arm in the following sequence:
   a. First initial position, then first destination position
   b. Second initial position, then second destination position
   c. Third initial position, then third destination position

   You will receive marks for accuracy. Notice the cylinders will be removed from the work sheet if you choose to attempt this alternative task.

   (12 marks)

Total marks: 20

Tasks for a team of two

As a team of two team members, you must develop a program that will perform the following steps:

1. Automatically identify the coloured shapes (shape, colour and size) of the test sheets you are given, and calculate their coordinates on the bigger work sheet. This resembles the task of the vision prac. For each shape on the test sheets, let your program print the shape, color, size, and calculated coordinates on the work sheet first for the initial positions, then for the destination positions. Display the coordinates in units of mm.

   (2 marks)

   Alternatively you can forfeit the 2 marks and enter the coordinates of the initial and destination positions directly into your script.

   (0 marks)

2. Move all 3 cylinders from their initial positions to the correct destination position as specified on the test sheets or the received coordinates. You will receive marks for accurate placement of the cylinders.

   (18 marks)

   Alternatively move the tool tip of your robotic arm in the following sequence:

   a. First initial position, then first destination position
   b. Second initial position, then second destination position
   c. Third initial position, then third destination position

   You will receive marks for accuracy. Notice the cylinders will be removed from the work sheet if you choose to attempt this alternative task.

   (15 marks)

Total marks: 20

END OF PAPER