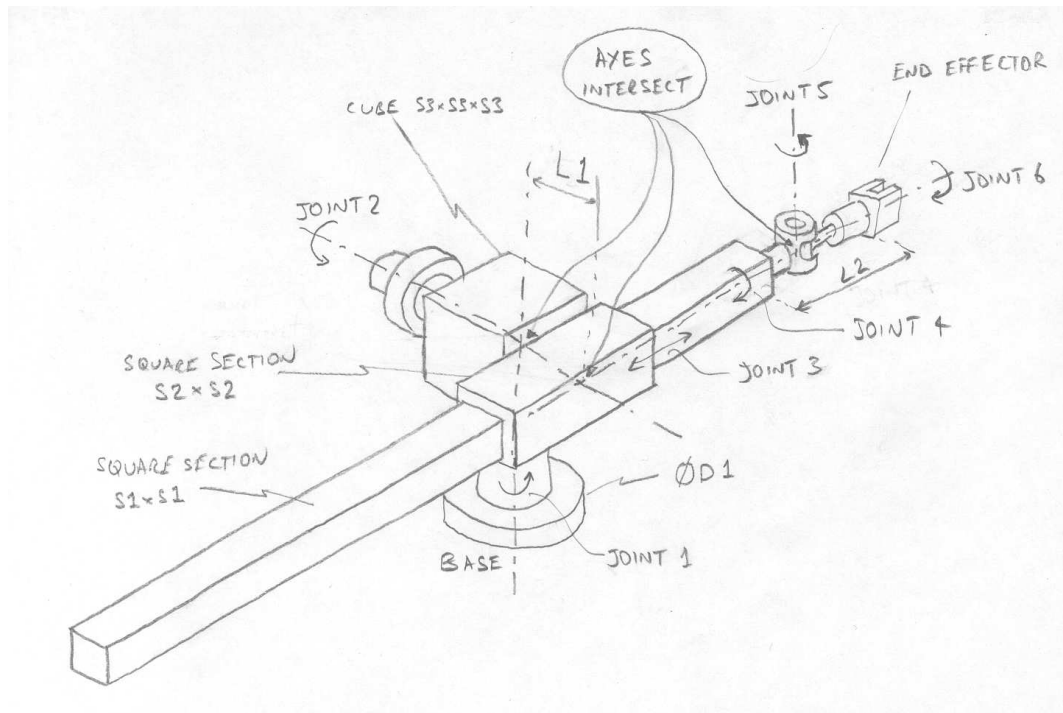


Robotics 2005 - Assignment 2

Due: 10am, Friday, 19th August



Q 1.

(1 mark)

At a Sunday BBQ, a group of enthusiastic ANU robotic students decide to build a robot. They go into the garage and collect some old car parts and whatever scrap metal they can find, and weld together the contraption shown in the above Figure. Since they want to use the robot (to turn the sausages over) they need to know what position and orientation is attained by the end effector for a certain set of joint parameters. Being resourceful (but not having studied very much) they ask you, as a first step, to write down the Denavit Hartenberg parameters. Show working and reasoning.

Q 2.

(1 mark)

Having determined the Denavit Hartenberg parameters of the device in the Figure, the group of students are impressed. However, they are getting hungry,

and they want the transformation matrix relating the end effector pose to the base of the robot. Determine this matrix as a function of the joint parameters (show working including a diagram of assignment of frames).

Q 3.

(0.5 marks)

The students seem happy with the transformation calculated in the previous question, however the sausages are burning! They need to know the position of the point P, lying on the axis of joint 6 at a distance of L3 to the right of (as presented in Figure) joint axis 5. If

$D1 = 300\text{mm}$, $S1 = 100\text{mm}$, $S2 = 150\text{mm}$, $S3 = 250\text{mm}$,
 $L1 = 300\text{mm}$, $L2 = 300\text{mm}$, $L3 = 250\text{mm}$

and, according to your frame assignment, the positions/rotations of the joints 1 to 6 respectively are:

$0, +\pi/2, +500\text{mm}, 0, -\pi/2, 0$

find the position of P in the base frame. Draw a diagram of the manipulator in this configuration.