CS 6301 Introduction to Robot Manipulation and Navigation Homework 1

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# Problem 1

Grübler’s Formula. Exercise 2.7 in Lynch and Park, Modern Robotics.

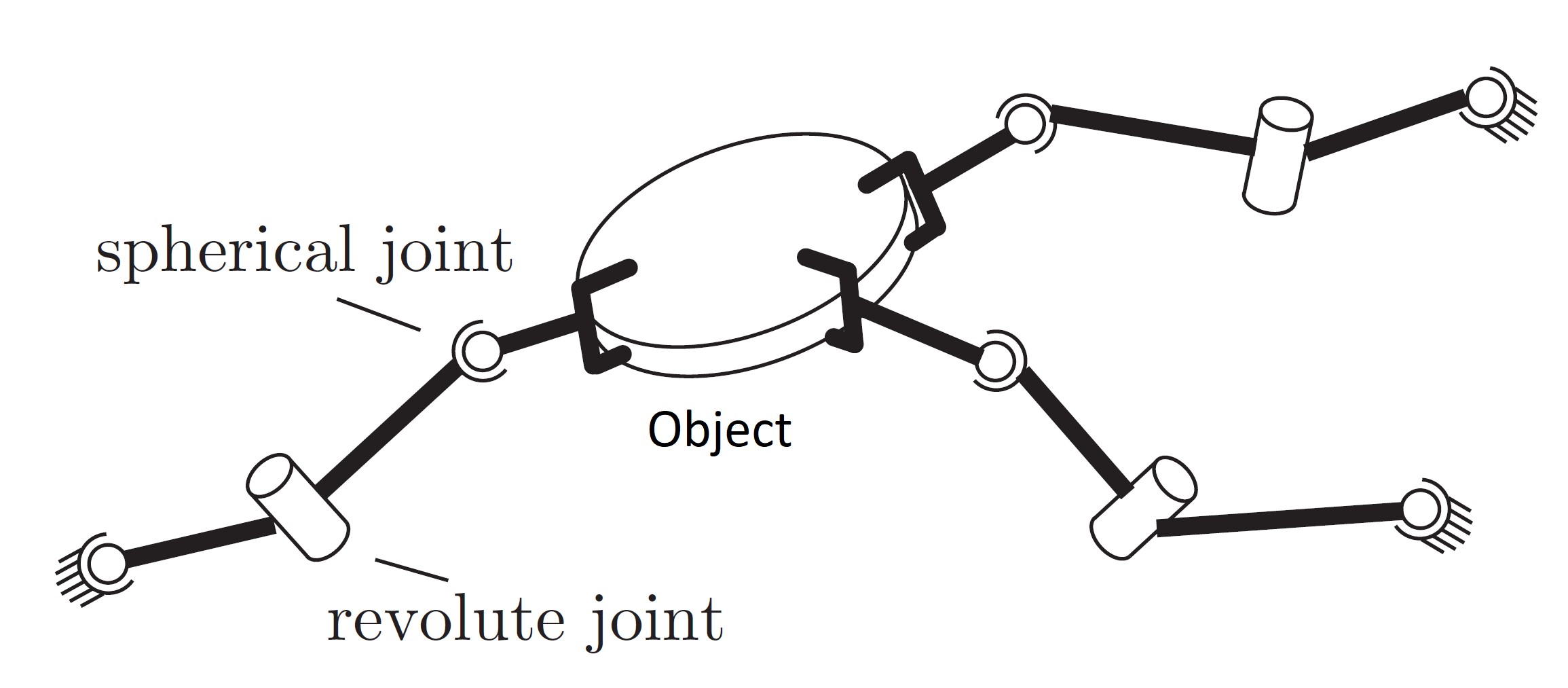


Figure 1: Three cooperating SRS arms grasping a common object.

Three identical SRS open-chain arms are grasping a common object, as shown in Figure 1. Find the number of degrees of freedom of this system using Grübler’s formula. Write down how you apply Grübler’s formula to this system.

**Solution:**

Grübler’s Formula is applied to the above system as follows:

Number of Links including ground, N = 1(ground) + 1(Planar disc) + 6(2 links each for 3 arms) = ***8***

Number of joints, J = 6(Spherical Joints) + 3(Revolute Joints) = ***9***

Degree of freedom of each link, m = ***6*** (Spatial system)

Sum of degree of freedom of all joints,  = 6(3) + 3(1) = ***21***

Grübler’s Formula:

**Degree of freedom of above system is *9*.**

# Problem 2

Zip file:

A screenshot of a computer

Description automatically generated

Rviz interface by running “roslaunch urdf\_tutorial display.launch”.

A computer screen shot of a robot

Description automatically generated

Rviz visualization of a Fetch mobile manipulator.