ME/EE/CS 133a Homework 1

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1. Problem 1

- (a)

  There exists 5 degrees of freedom. A Rigid Body in 3D space has 6 Degrees of Freedom bieng (x, y, z) and (pitch, yaw, roll). A line segment has no thickness so its incapable of achieving the roll rotational DOF. A line segment is 2 dimensional.

- (b)

  There exists 2 degrees of freedom. A Rigid Body in 3D space has 6 Degrees of Freedom bieng (x, y, z) and (pitch, yaw, roll). A torus is a 2 dimensional manifold. It can only rotate vertically (pitch) and horizantally (yaw).

- (c)

  5 Degrees of freedom.

- (d)

  6 degrees of freedom.

2. Problem 2

- (a) and (b)

  For both Scenarios there are 3 Degrees of Freedom. Both cars (controlled by one infront) can move along (X, Y, Θ). The car can travel horizantally, then rotate around its axis then move along vertically.

3. Problem 3

- (a) There Exists 5 Degrees of Freedoms on the human arm excluding the wrist and hand. Shoulder joint has 3 degrees of freedom bieng veritocal, horizantal and rolling movement. The elbow can rotate horizantally and roll.