

# Homework 4

## Honor Code: ...

All homework is to be done individually. You are only authorized to receive help from an instructor.

## Forward Kinematics

Create a Jupyter notebook and this at the top.

```
%matplotlib inline
```

```
from __future__ import division, print_function
from matplotlib import pylab
```

1. Write a function that takes in the DH parameters ( $\theta$ ,  $\alpha$ ,  $d$ ,  $a$ ) and returns the homogenous matrix for it.

```
def homogenousMatrix(theta, alpha, d, a):
    """
    This calculates a homogenous matrix for the given parameters
    """
    ...
    return matrix
```

2. Using this function, find the homogenous matrix if:

1.  $\alpha$  is x
2.  $\theta$  is x
3.  $d$  is x
4.  $a$  is x

3. Given an array of DH parameters for a robot arm, write a function which takes this and returns a homogenous matrix for the robot arm. Where the array would look like

```
arm = [
    [theta, alpha, d, a],
    [theta, alpha, d, a],
    [theta, alpha, d, a],
    ...
]
```

```
def forward(params):
    """
    Given the params, it returns the forward kinematics equations
    """
    ...
    return eqns
```

4. Using the previous function, determine the equation for the robot arm with the following DH parameters.  
*Hint:* your answer should be . . . .

i	$\theta_i$	$\alpha_i$	$d_i$	$a_i$
1	1	2	3	4
2	1	2	3	4
3	1	2	3	4
4	1	2	3	4