

```

#!/usr/bin/env python
import sys
sys.path.append(r"/Users/robertbrothers/Desktop/Fall 2014/Fundamentals_of_Robotics/r
obo_git/python/")
import robotics_functions as rf, numpy as np, scipy as sp, sympy as sy

[l1, l2, l3, t1, t2, t3, a1, a2, a3, d1, d2, d3] = sy.symbols("l1 l2 l3 t1 t2 t3 a1
a2 a3 d1 d2 d3")
[q1, q2, qdot1, qdot2, qddot1, qddot2, m1, m2, r1, r2] = sy.symbols("q1 q2 qdot1 qdo
t2 qddot1 qddot2 m1 m2 r1 r2")

link_list_cm = [[
    [0, np.pi/2, q1, 0],
    [0, 0, q2, 0]
],
    [
        sy.Matrix([[ -l1/2],[0],[0],[1]]),
        sy.Matrix([[0],[0],[l2/2],[1]])
    ]
]

m = np.array([m1, m2])
l = np.array([l1, l2])
r = np.array([r1, r2])

M = [sy.Matrix([
    [m[i],0,0],
    [0,m[i],0],
    [0,0,m[i]]
]) for i in range(len(m))]
I = [sy.Matrix([
    [m1*l[0]**2/3,0,0],
    [0,m1*np.pi*r[0]**2/3, 0],
    [0, 0, m1*l[0]**2/3]
]),
    sy.Matrix([
    [m2*l[1]**2/3,0,0],
    [0,m2*l[1]**2/3,0],
    [0,0,m2*np.pi*r[1]**2/3]
])]
q = sy.Matrix([
    [q1],
    [q2]
])
qdot = sy.Matrix([
    [qdot1],
    [qdot2]
])
tdv_vec = [
    (qdot1,qddot1),
    (qdot2,qddot2),
    (q1, qdot1),
    (q2, qdot2),
]
if __name__ == "__main__":
    print sy.pprint(sy.simplify(sy.trigsimp(rf.sym_pt_jacobian(link_list_cm)[1])))

```