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Pick and Place Simulation of Parallel End Effector Grasping Fruits

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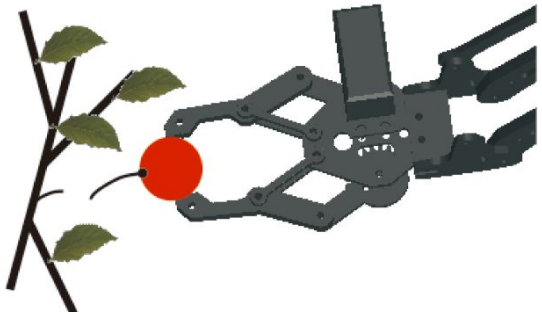

Project Objectives

Goal: Develop simulated model of robotic harvesting of a piece of fruit for rapid testing and verification of soft robotic end-effectors

Components:

- Linearly closing parallel end effector
- Simulated contact forces
- Fruit deformation

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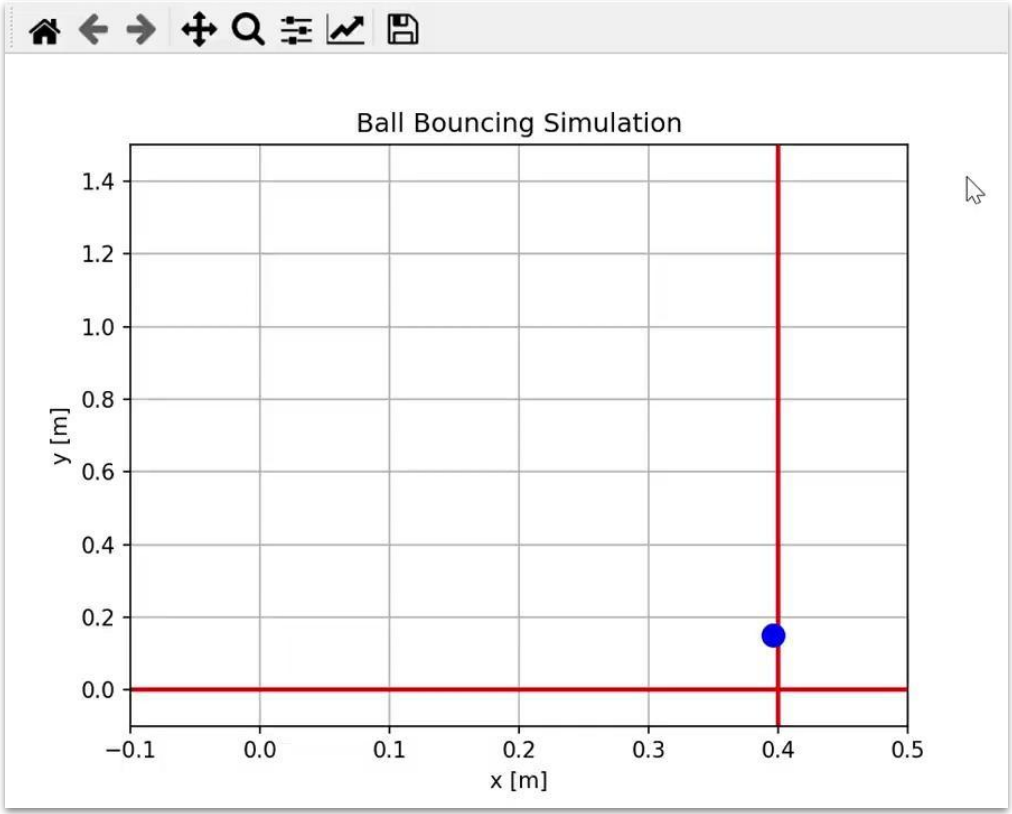
Current Progress

Basic Simulation

- Uses predictor corrector method
- Simulates simple bouncing motion
- Has collision detection in x and y directions



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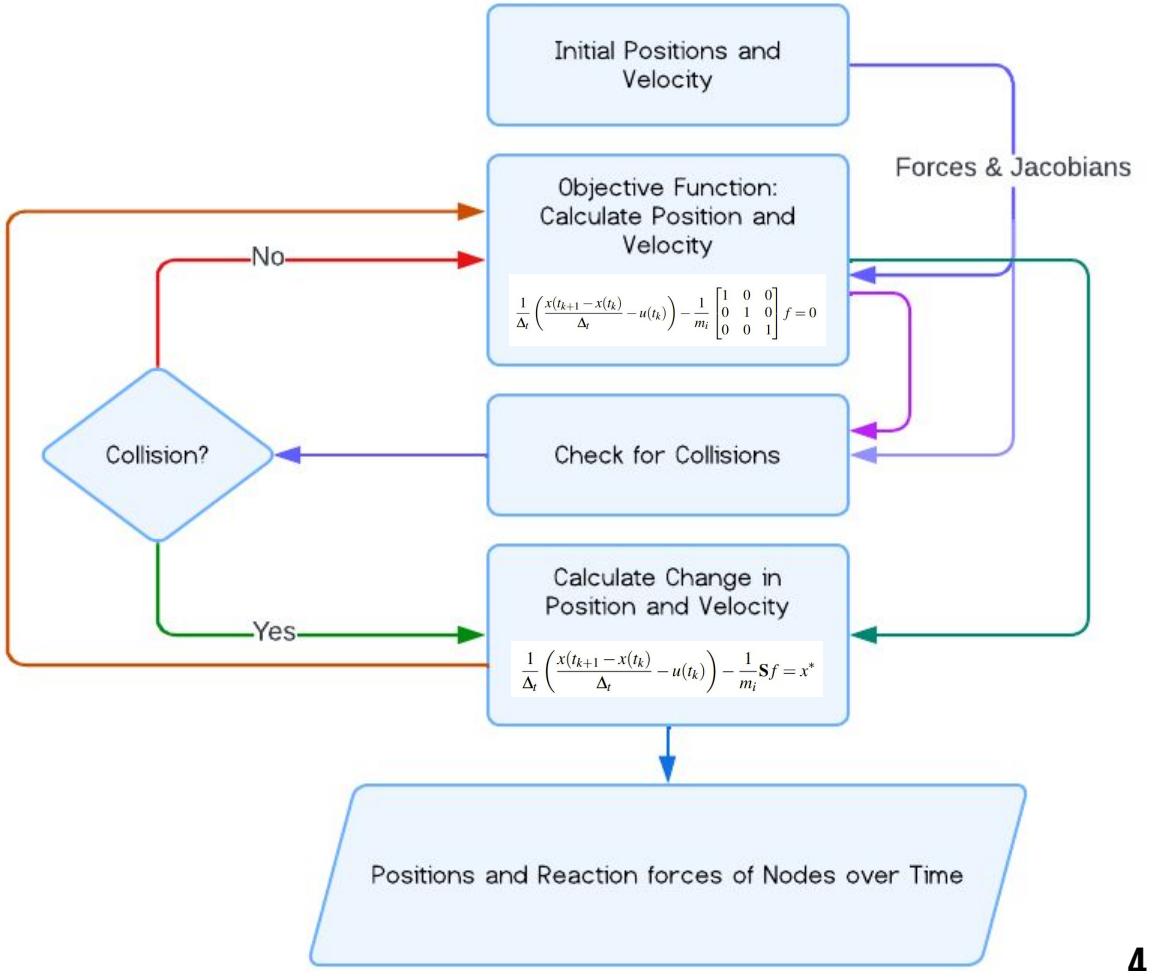
Modified Mass Method

Step 1:

- Working MMM to simulate contact
- Test with a simple simulation of bouncing



Modified Mass Method

Step 1:

- Working MMM to simulate contact
- Test with a simple simulation of bouncing

```
for timeStep in range(1, Nsteps): # Loop over time steps
  print("-----------------------------------------------------------------")
  print('t = %f\n' % ctime)
  flag_c = 0

  s_mat = np.eye(3*nv)
  z_vec = np.zeros(3*nv)
  r_force, q, flag = MMMadj.MMM_cal(q0, q0, u, dt, mass, EI, EA, deltaL, force, tol, s_mat, z_vec)
  print("Node position: " + str(q))
  print("Reaction force: " + str(r_force))
  con_ind, free_ind, q_con, mat, flag_c = MMMadj.test_col(q, r_force)
  print("Constraint nodes: " + str(con_ind))
  print("Free nodes: " + str(free_ind))
  s_mat, z_vec = MMMadj.MMM_Szcalc(mat, con_ind, free_ind, q_con, q0, u, dt, mass, force)
  print(s_mat)
  print(z_vec)

  if flag_c == 1:
    r_force, q, flag = MMMadj.MMM_cal(q0, q0, u, dt, mass, EI, EA, deltaL, force, tol, s_mat, z_vec)
    print("Node position: " + str(q))
    print("Reaction force: " + str(r_force))

  u = (q - q0) / dt # update velocity
```

References

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