Developing a walking controller for a three-link 2D biped

Here is a schematic of the three-link 2D biped:

Three-link 2D Biped

You will be developing a **walking controller** for this toy model. To this end, you would need to complete the following three stages:

1. (Step 1) Model and visualize the 3-link biped
2. (Step 2) Solve the equations of motion of the 3-link biped (simulation)
3. (Step 3) Design a walking controller, and evaluate the resulting gait

Model and Visualize (Step 1)

In the first step you generate the kinematics and dynamics of the three-link biped. For that you need to complete the following scripts in the presented order:

```
generate_kinematics.mlx (in the "generate_model" folder)
visualize.m
generate_dynamics.mlx (in the "generate_model" folder)
eval_M.m, eval_C.m, eval_G.m, eval_B.m
eval_A_m.m, eval_A_p.m, impact.m, eval_energy.m
```

The function `visualize.m` should plot a schematic of the 3-link biped, and it is used to help you verify your code. Later this function will be used for making an animation of the 3-link biped simulation.

To generate the kinematics and dynamics, use the generalized coordinates $q = [q_1; q_2; q_3]$ as shown in the figure above. *Pay careful attention to the positive direction of the angles and the inertial coordinate system at the stance foot (figure above).*

By the end of this task, you have calculated the formulas for the matrices M, C, G, and B in the equations of motion:

$$M\ddot{q} + C\dot{q} + G(q) = Bu$$

where, $u = [u_1; u_2]$ is the control vector. The matrices M, C, G and B will be calculated by the functions `eval_M.m, eval_C.m, eval_G.m, eval_G.m` in the `dynamics` folder (which you will complete).

Moreover, you develop an impact map `impact.m` which maps the generalized coordinates and their derivaties $(q^-, \dot{q}^-)$ right before the impact to after impact $(q^+, \dot{q}^+)$.