Programming and Modelling

Assignement 1 - System boundary definition

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Exercise 1

We are group 6.

Exercise 2

a) Diagram of model

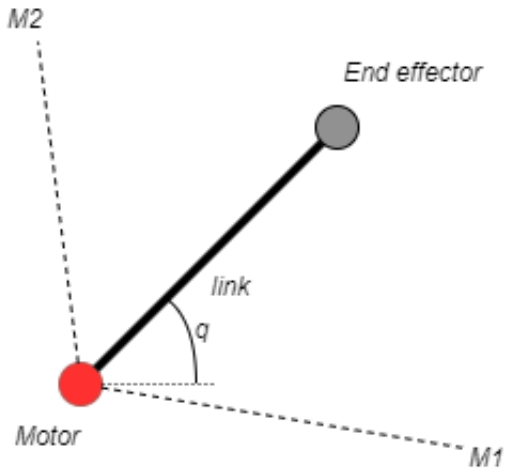

Figure 1: Diagram of simplified model

b) Components

- *joint*
- *motor* - torque motor positioned at the joint
- *link*
- *end effector* - the robotic hand

c) Variables

Variable	Units	Description
q	radians	The angle of joint
q'	radians / sec	Angular velocity of joint
q_t	radians	Target angle of joint

d) Constants

Constant	Units	Description
M1	radians	The lower bound of the safe joint angle range
M2	radians	The upper bound of the safe joint angle range

e) Explanation of selection process

As we wish the simplest most system, one which can only move without worrying about non-controllable environment factors, we only need a system that can move without breaking. This means keeping all components, but making assumptions in order to remove complex variables and constants.

f) Explanation of exclusion

To keep the system to the basics, we excluded all parts which included a relation to the environment. This includes all physical interaction of the robot arm with the world, primarily gravity. We excluded variables and constants related to gravity, that being torque and friction factors.

Exercise 3

For the system boundary definition we have not included any additional values than from the case description. However for the final robot-arm system, defining a $max_{velocity}$ constant would be necessary, to ensure safe and reliable operation of the robot arm. We would also need to define a max_{motor} which would define the max torque the motor can produce.

Exercise 4

The UML diagram includes all the constants and variables

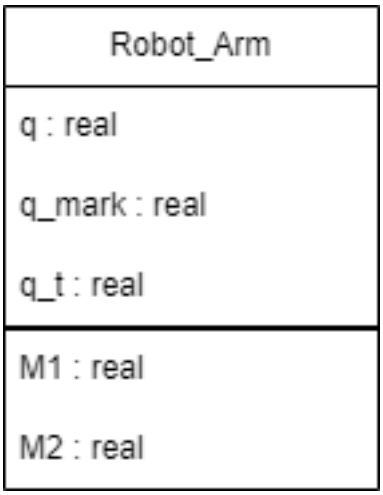

Figure 2: UML diagram of the robot arm