German University in Cairo (GUC)
Faculty of Engineering & Materials Science (EMS)
Mechatronics Department (MCTR)

Project Milestone 01

Objective:

The first milestone of the project is with the following details:

Milestone 01	Deadline Date	Description
M-01 (5%)	Wednesday 27th October, 2021	1. Start the **fabrication process** of the robot parts (start adjusting the CAD model to include the actuators available in the Egyptian market which have almost the same specifications of the actuators used in the model, start 3D printing the parts of the robot and purchasing the suitable motors, power supply and microcontroller (Arduino) to be used in the robot). 2. Design basic circuit for the connections of the actuators, microcontroller, power supply and sensors (if any), etc. using one of the circuit designing applications (**Fritzing or Proteus**). 3. Place the CAD assembly of the assigned robot in **Simscape Multibody** and test its motion by actuating the joints using constants, signal builders, sine waves and sliders etc. and analyze the system's motion.

**The weight of each deliverable is stated above.*

Requirements:

The requirements from this milestone of the project are as follows:

1. Each team is required to start the fabrication process of their assigned robot following the listed steps:
   a. Search the Egyptian market for the available actuators that are compatible to those used in the robot's assembly having almost the same specs of the used ones and can fit in the robot designed model with minimal design modifications. The actuators used for the robot can be found through: https://github.com/poppy-project/poppy-humanoid/blob/master/hardware/doc/en/assemblyGuide.md.
   The robot's assembly and CAD parts can be found on the CMS, or you can download the CAD files from the following links:

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https://github.com/poppy-project/poppy-humanoid , https://github.com/poppy-project/poppy-humanoid/tree/master/hardware

b. Modify the CAD model to be able to fix the motors that will be used in the project. Modify the matings done in the CAD assembly to be realistic allowing the robot to perform its logical motion. You can also be required to modify dimensions of certain parts to ease its 3D printing process.
c. Start the fabrication process of the robot by starting the 3D printing process of the least modifiable parts, in addition to purchasing the components to be used in the project (actuators, power supply, microcontroller (Arduino), sensors (if any), etc.).

2. Accordingly, each team is required to provide a market research report for the components to be used in the project including actuators, sensors, batteries, power supply, microcontrollers, etc… needed for the project implementation. *(Note that: possible modifications can be performed to the list based on the implementation limitations)*.
3. Each team is required to draw a simple circuit diagram having the hardware connections of the systems components (robot, actuators, sensors, microcontrollers, power supply, etc.) using **Fritzing** or **Proteus** applications.
4. Place the CAD assembly model after all the modifications in **Simscape Multibody (MATLAB/Simulink)** through the connection of **SOLIDWORKs** and **MATLAB/Simulink.** To perform this step you have first to follow the steps present in the **Simscape Multibody Link Installation Document** available on the CMS. Actuate the joints of the system by providing inputs to the joints. The inputs to be used are **sine waves, signal builders and sliders** provided as input angles to the joints. Analyse and visualize the motion of the robot, commenting on the performance in terms of the rotations performed for each joint (about which axis) taking into consideration the coordinate frames placed on the robot links and joints and commenting also on the limitations/constraints of the system's motion.

Submission:

The submission of the 1st milestone will be in the form of a **Google Drive Link** having a ZIP file named (EDPT1009-TeamNumber-M01.zip), the Google Drive Link should be submitted through:

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https://docs.google.com/forms/d/e/1FAIpQLScSyVC-Pfdz7i2KRlZ5fB14221mJR1kR6LATA2MMDFyg9h4jQ/viewform?usp=sf_link

The contents of the zip file:

1. **PDF file** includes the following requirements. Note that Word and Latex templates to be used are available on the CMS **"EDPT1009 Robotics: Word Template"** and **"EDPT1009 Robotics: Latex Template"** (Latex is preferable):
   - Introduction on the project mentioning the assigned project and its aim.
   - The list of components needed for the project should be presented in a table format including the name of the component, the location of purchasing, the number of items per each product and the price of each component.
   - This task should include screenshots of the system diagram that can be divided into several screenshots including the hardware diagram (CAD assembly after modifications), the circuit diagram (Fritzing or Proteus).
   - Results of Simscape Multibody (MATLAB/Simulink) including the comments on the system performance based on the different inputs provided and the stating the limitations/constraints of the system.
2. **ZIP file** includes the following items:
   - **STL files** of the robot.
   - **XML file** exported.
   - **Simulink .slx file** of the system actuated by the inputs required.
3. **Narrated video** that includes the following:
   - **Video** for the Simscape Multibody simulation having different test cases of different inputs for the joints (sine wave, signal builders, sliders). You should include in the video the analyses of the motion of the robot, commenting on the performance in terms of the rotations performed for each joint (about which axis) taking into consideration the coordinate frames placed on the robot links and joints and commenting also on the limitations/constraints of the system's motion.

The deadline of the **submission** is on **Wednesday 27th October, 2021 at 11:59 PM**. Late Submissions will result in deduction from the grade of this deliverable.