

German University in Cairo

Advanced Mechatronics (MCTR903)

Assignment 1

Deadline: Thursday 21st of October, 2021

Name	ID	Tutorial Number

Table of Contents

1. Regulations.....	3
2. Objective of Assignment.....	3
3. Problem 1 Description.....	4
4. Problem 1 Requirements.....	4
5. Submission Files.....	5

1.Regulations

- This is a group-based assignment consists of 3-5 members (*Same as Project Team*).
- 1. The deadline of the assignment is **Thursday 21st of October, 2021 at 11:59 PM.**
- Cheating Cases will **NOT** be tolerated so you are responsible for the genuine of your work.
- Submissions files will be uploaded to your G-Drive and a sharing link will be submitted through the link (information will be provided below).

2.Objective of Assignment

- The objective of assignment 1 is to teach the student:
 1. how to build a simple Finite State Automata (FSA) using MATLAB/Simulink software,
 2. compare between the Mealy and Moore machine in terms of performance,
 3. how to deploy the code written by MATLAB/Simulink on an Arduino with the use of C-code generation tool, and
 4. make a simple embedded program showing the system states, inputs, and outputs with the use of simple components.

3. Problem 1 Description

- An elevator is designed to operate between **three floors**.
- The elevator receives a **request** from a specific floor and based on the floor it is currently in, it sends to the actuator order to **move up or down** and number of floors in transient stage.
- The elevator is designed to only receive **one request at a time** and does not accept new request unless it reaches the previous required floor.

4. Problem 1 Requirements

1. Implement the system using Mealy and Moore machines, identifying the states, inputs and outputs.
2. Write both designed machines on Simulink with the use of MATLAB functions. *(Hint: you can use switch cases, if-statements, or any other programming algorithms).*
3. Choose the solver to be discrete with a fixed sampling time of 5 seconds to be able to observe the difference in performance in terms of clock cycles.
4. Insert switches and/or signal builders in the Simulink code to change the inputs. *(Test different cases to verify your code).*
5. Plot the curves showing the triggering inputs and how this would change the states and the outputs.
6. Comment on the generated graphs and the pulses during the clock cycle to compare the Mealy and Moore machines.
7. Deploy your program on Arduino UNO using the C-code Generation tool.
8. Connect 3 push buttons to be your request inputs.
9. Use 3 LEDs to show the output of the system which indicates the elevator direction of motion.
10. Use another 3 LEDs to show the states of the system indicating the floor in which the elevator is.
11. Comment on the performance.

5.Submission Files

1. A **report** contains screenshots of the system description, programs, codes, graphs, and others.
2. Commenting on the results as mentioned in the requirements.
3. A **video** showing the experiment deployed on the Arduino and explaining the system performance by showing different test cases using the buttons as inputs and explaining the states and outputs LEDs.
4. Add all requirement in a single .zip folder, upload it to your G-drive, enable the sharing link, and submit this link in the form below:

https://docs.google.com/forms/d/e/1FAIpQLSdTl0daPuc5mPqdB5n6lKjf3ifA_u-8dOoslHBKICllaKeBg/viewform?usp=sf_link