ECE 0202 Spring 2024
Embedded Processors and Interfacing

Term Project

Due on week the of Monday April 15th

You are required to use the Nucleo-STM32L476 MDK to develop a demonstration for four-level elevator control.

Project specifications:

1- Your prototype must include as hardware: the Nucleo-STM32L476RG microcontroller, servo motor(s) to mimic the motion of the elevator and doors, push buttons for elevator call from different levels (floors), keypad to register the destination level, seven segment display to present the current level, and LEDs to reveal the levels where calls have been made.
2- The main program of the microcontroller should be primarily written in assembly language.
3- The rotation of the motor(s) should demo the motion of an elevator, e.g., clockwise rotation is upward lift, and counterclockwise rotation is downward lift. The number of rotations should demo the number of levels.
4- Similar to the previous requirement, the rotation of another motor, or set of motors, should demo the motion of the elevator doors, e.g., clockwise rotation is doors opening, and counterclockwise is doors closing.
5- The user should be able to call for the elevator from at least four different levels by pressing a push button.
6- The user should be able to use a keypad to register a destination level upon entry to the elevator. This requires some delay.
7- The microcontroller should dynamically change the order of which the elevator stops at different levels according to the calls made from the levels.
8- The prototype should allow the user some time to exit the elevator at the registered destination level.
9- The admin should be allowed to pull the elevator to the first floor and reset the sequence of operations upon a button press.
10- The status of the system and operations should be communicated in real-time via Tera Term®.
11- The hardware arrangement should be neat, not a rat's nest.
12- The software should be well annotated but avoid over annotating.

Additional features:

Not a requirement but can credit your score. You are encouraged to be creative and implement any features that can deem your implementation unique and successful.
Examples of additional features:

- The detection of motion "in between doors" that should stop the door from closing.

- The inclusion of a greater number of levels (floors).
- A panic button that should stop the elevator at the nearest level.

Project constraints:

Constraints usually comprise elements, of technical or non-technical nature, that affect the solution to the design problem, but the designer has little or no control over. The constraints are the rules, requirements, relations, conventions, and/or principles that define the context of designing. Engineering designers need to work their way around in order to optimize their solutions in spite of those constraining factors, or bottlenecks.

You are required to determine at least three technical constraints that are specific to the developed prototype.

Rules and deliverables of the project:

1- This project is worth 10% of your final grade.

2- You are required to work on this project in teams of a minimum of two students and a maximum of four students. You are required to register your team for the project before April 1st.

3- You are required to deliver a three- page report describing the operation of your implementation, a schematic of your design, the design constraints you have faced, and the successes or failures of your testing. Submissions of the report, video recording demonstrating a working prototype and codes should be made on Canvas before midnight on April 19th.

4- You and your team-member(s) will present your prototype to the instructor in an assigned slot on April 16th or April 18th, during lecture time from 9:30 to 10:45 am.

5- Additional features like can merit additional credit for upwards of 5%.