

SUBMISSION ONLINE on 13/10/2024 via CANVAS

Introduction

This coursework exercise will provide you with the opportunity to demonstrate the skills you have developed throughout the first half of the module. Specifically, the following learning outcomes will be assessed:

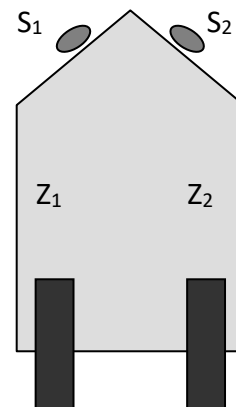
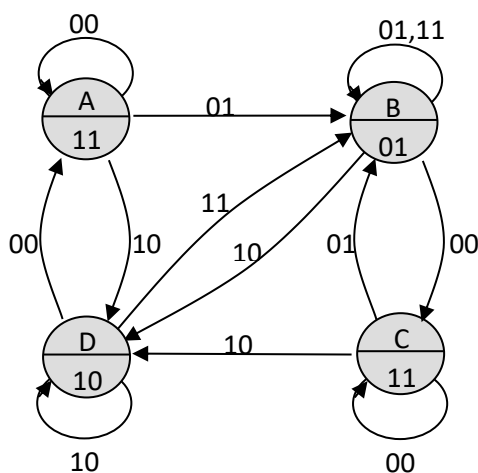
1. Have a critical knowledge of the design of complex multivariable combinational and sequential logic circuits
2. Have the ability to apply digital design principles to practical problems.

This coursework contributes 50% to the overall module mark.

Design Problem:

Task 1 : Synchronous Design Problem

The following is a model of a control system for the robot shown. The circuit inputs are the proximity sensor outputs (S1S2) which are a logic high when an obstacle is detected. The outputs (Z1Z2) are the forward drive signals to the robot's motors where a logic high represents 'drive' and a logic low 'brake'.



Robot (viewed from above)

- a. Determine any operational limitations that are present in the above solution. [5%]
- b. Design a minimal Synchronous solution to the above problem using D-type flip-flops. [40%]
- c. Produce a simulation of the system using suitable software. [15%]

Task 2 : Asynchronous Design Problem

A proposed new robot has only a single proximity sensor (Z) and avoids an obstacle by continuing to rotate in the same direction until the sensor signal is lost ($Z=0$). If the control strategy is to alternate rotation in the sequence left-right-left-etc., develop a minimal race-free asynchronous solution. [40%]

Student Submission.

The maximum marks obtainable for each section of the assessment are shown above, in order to achieve good marks, it is necessary to demonstrate an in depth understanding of the problem and the design procedures involved.

You may choose your preferred method of submission, either:

- a) A full design document that shows all of the details of how your solution was developed and answers the questions posed. This document should be no more than 10 pages long and does not need long introductions or narratives.
- b) A video presentation where you talk through your design and answer the questions. This should be edited using the reView and Panopto software within Canvas. The video should not last longer than 10 minutes.

ALL STUDENTS WILL NEED TO SUBMIT THE PROJECT SIMULATION FILE WITH THE CORRECT FORMAT.

FURTHER INFORMATION

Extension requests

Requests for extensions should be directed to the module leader in the first instance. If your module leader is unavailable, you can contact your programme leader in their absence to request an extension. For further information on the regulations governing extensions of assessment deadlines, see [here](#). Note that if you submit your work late without an agreed extension, this will be recorded as a non-submission.

Extenuating circumstances

In situations where a short extension may not suffice, the University of Sunderland has a procedure to deal with events which affect your work, but which are not predictable and are beyond your control, for example, illness, enabling you to defer a piece of work (and submit it at a later assessment point).

Important note: You should note that the policy (like that of many universities) takes the view that by sitting an examination or handing in an assessment, students have deemed themselves fit, and no subsequent claim for extenuating circumstances will be considered. The Faculty will publish deadline for the submission of such claims prior to the assessment and it is important that you are aware that such claims must be made by the deadline, as after it has passed, a claim will not be considered unless there are exceptional circumstances.

For further information on the regulations governing consideration of extenuating circumstances, guidance on extenuating circumstances and details of how to apply, see [here](#)

Academic misconduct

All work submitted is expected to be your own work. Common forms of academic misconduct include plagiarism and collusion, but are not limited to these. The penalties for academic misconduct can be very serious. If you are unsure what academic misconduct is, you should contact the module leader or your personal tutor to discuss it. Please familiarise yourself with the University's Guide to Academic Integrity and Misconduct and the University's Academic Misconduct Regulations, available [here](#).

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