Coursework Assignment

This document explains the requirements of the assessed practical work for the UFME7K-15-M Intelligent and Adaptive Systems module.

The description of work below is divided into that which you are expected to carry out in order to attain an adequate pass mark in this coursework, followed by suggestions for topics you might work on in order to demonstrate a fuller understanding of the more advanced parts of the topic and your capability to conduct a deeper investigation. This additional work is expressed here in a much more open-ended manner, concomitant with Masters-level study.

This assignment is to be submitted as a report, details of which are given below. This report is worth 50% of the marks for the module. You may work in pairs or individually but the report is an individual assessment.

The deadline for submission of your report is 26th April 2018.

From material covered during lectures, lab exercises and examples, and your own further reading you are to complete the following task:

Derive an Adaptive Neuro-Fuzzy Inference System (ANFIS) solution for the inverse kinematics of a 3R planar manipulator using the MATLAB fuzzy logic toolbox. You should aim to achieve low error and good generalisation over the reachable workspace using appropriate validation.

TO ATTAIN A HIGHER MARK CARRY OUT ONE OR MORE OF THE FOLLOWING:

1) Compare the ANFIS model with a Neural Network. This could be implemented using any of the Architectures which have been taught on the module but the most obvious choice would be either a MLP or RBF type of network. This should be implemented using the MATLAB Neural Network Toolbox.
2) Investigate the problems of operating the robot close to a singularity in its workspace. What methods and algorithms could you use to avoid the problems of operating in this domain?

3) Consider ways in which a search algorithm (e.g. an Evolutionary Algorithm) could be used to find optimal parameters for the ANFIS and/or ANN implementations. If time permits, implement such a system using MATLAB.

Reporting

You have to write a report, using not more than 4000 words to describe your investigations and results. You need to:

1) Demonstrate that you understand the theory behind the approaches you use to solve a problem.

2) Explain the methods used and describe the steps taken to validate your results.

3) Include critical assessment and analysis of the relative merits of the approaches you have used.

4) Include Discussion of Results and Conclusions.

5) Provide references using the Harvard system

http://www1.uwe.ac.uk/students/studysupport/studyskills/referencing/uweharvard.aspx

6) Provide any code you have written in an appendix. (This will not be included in the word count)

Your report will be marked based on analysis of your results, sufficient evidence and references that support your claims and clarity and relevance of your discussion.

Assessment weighting:

Explanation of methods used	20%
Validation testing	10%
Results obtained through calculations, coding and experiments	25%
Critical Assessment and Analysis of results	25%
Conclusions	10%
References, correctly cited	10%