

COMP5232

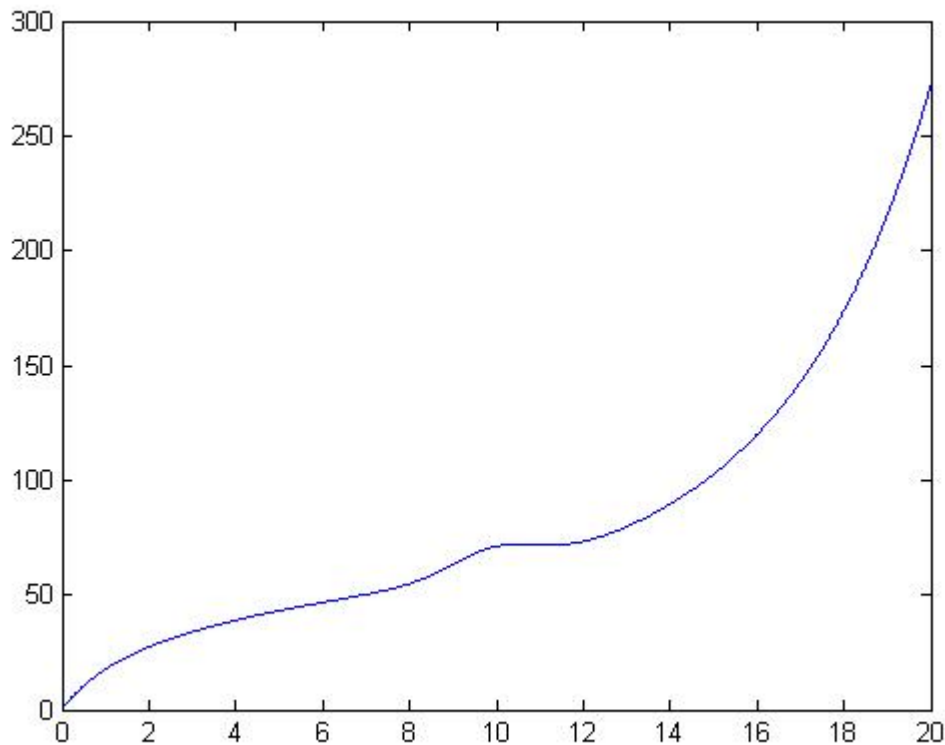
Coursework

Deadline: Noon, Friday week 27 (4th April 2008)

Evolutionary Computing Exercise (worth 25% of the module's assessment)

One aspect of working with robots is the ability to simulate them. To create a simulator of any system, the first step is to identify the system. System identification is a big area of study in Robot Control (and in general, all types of control theory).

You are given the following graph and a data set of measured points. This graph represents the power (in Watts, vertical axis) needed to keep the robot moving at a certain speed (metre/second, horizontal axis) in a certain terrain (acceleration is another problem).



To **solve the problem you need to find a function (equation)** that approximates that graph/points. By achieving this you would be able to use this equation as part of a simulator for your robot.

The file containing the data points for the graph can be downloaded from Blackboard (Assessment section for this module).

Your task is to find a **solution** to this problem using Evolutionary Computing; and to configure the problem completely so that it can be solved using this paradigm. It is expected that the bulk of the work will be in describing how you will solve the problem, and an in detail description of the design.

After careful study of the problem, the main points you will need to address will be:

- Decide what the **solution** to the problem will be (how will it look like).
- Configure the Algorithm:
 1. Encode the solution as a chromosome, describe this in detail.
 2. Describe in detail how to create the initial population.
 3. Describe in detail how to measure fitness and with respect to what.
 4. Describe in detail how each genetic operator will be applied.
 5. Describe your termination criteria.

Remember to use points 2-4 (and describe how you did it) to validate the different aspects of the Chromosome.

Once your design is complete you can attempt to implement it in the language of your choice. (Please note that Support can be provided by your module lecturer in C and Matlab only!)

Submit a report with you problem configuration as detailed above, and description of the development and analysis of the results of your implementation. **Do not** submit Source code, but source code and a Demo of the implementation must be available for inspection by your module lecturer at any time after submission.

Your report must also include a conclusions/reflections section in which you will reflect on what it means to solve a problem using Evolutionary Computing techniques rather than finding the solution directly.

MAG 25th Feb 2008.