

Assignment 2 - report specification

Introduction

For this assignment, you will need perform an experiment in simulation where you demonstrate or investigate an adaptive system.

You will present and discuss your work in a scientific style report, which will be 3000 words long, not including the methods section, figure captions, bibliography and appendices. You must also submit your complete project code.

While there are different ways to achieve a very good mark, as submissions which really stand out in some areas may be forgiven for deficiencies in others, **your aim should be to submit a report which has interesting results, analyses, and discussion.** The measure of success in this assessment is not only whether you have successfully implemented something interesting and/or difficult - whether or not you have done that, if you want a very good mark, you need to **demonstrate** understanding of why your experiment either was or was not successful, as well an understanding of how your work relates to the general subject area of this module.

Topics

Some suggested topics can be found here: [Assignment 2 S](https://canvas.sussex.ac.uk/courses/27043/pages/assignment)
(<https://canvas.sussex.ac.uk/courses/27043/pages/assignment>)

If you would like to propose your own topic, then please disc

Report style and structure

You will present and discuss your work in a scientific style re

Abstract

I would like you *all* to include an abstract in your reports. It sh
briefly tells me what you did, why you did it and/or why it mat
conclusions are. A good abstract will make a selective reade

Introduction

Module chat



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In your introduction, you should begin by introducing and discussing background material. As well as discussing related research, you should use this section to introduce and **clearly define** the concepts which you will refer to throughout your report. This needs to include **a definition of adaptive systems or adaptivity which is relevant to your experiment**. You will need to refer to this in later discussion, so choose it carefully. You can use an existing definition if it is appropriate, or you can produce your own. If you produce your own, it does not have to be a definition which covers all aspects of all adaptive systems - it is perfectly acceptable to use a more restricted definition or working definition which covers a class of adaptive systems which includes your own. In either case, you should explain *and justify* your choice. If you use someone else's definitions, then you obviously need to cite their sources. What students often fail to realise is that if you provide your own definitions instead, you should still cite the sources of definitions which have *influenced* yours.

Methods

This section is not included in the word count.

You should include enough detail in your methods for someone with similar knowledge and skills to your own to reproduce your results, using the programming language and tools of their choice. This should be on the level of algorithms and equations etc. and should not include implementation detail or program code. For algorithms, you should use pseudocode or flowcharts. **You should use diagrams to illustrate your methods and designs wherever possible, including system diagrams.**

If you rely on any third party libraries in your experiment, then you must demonstrate understanding of the algorithms they implement by describing them as you would describe your own. This level of detail is not necessary for any libraries which you might use in your *analyses*, in which case you only need to briefly explain any tools you have used as well as identifying their origins.

For those of you that use *Sandbox* in your coursework, we can consider its underlying algorithms to be common knowledge, and therefore not in need of being repeated. You *do* need to fully explain the algorithms of your own controllers and anything else that you add or use which does not come from me. The details of *Sandbox* that you *should* explain, so that I can see that you have understood them, are the *models* of the systems you have used, e.g. a differential drive robot, light sources and sensors, noise and disturbance sources, as well as anything else that you have used, **in terms of mathematical equations and/or plots/diagrams**.

Third party libraries or existing code

If you want to use third-party libraries or existing program code in your project you *must* get my approval first - failure to do so could have a severe effect on your results!

The list of software which is already approved can be found here:

Project assignments approved software list

(<https://canvas.sussex.ac.uk/courses/27043/pages/project-assignments-approved-software-list>)

Results and analyses

It is of **central importance** to demonstrate and explain how your system **adapts** (or why it fails to do so). This is exposed via analysis of your results. We will see some examples of analysis in labs, but you should also have seen others when reading recommended papers or when researching your project.

If you make use of an evolutionary algorithm (EA), or other adaptive search algorithm, to evolve controllers or systems which are not adaptive in themselves, then the focus of your analyses should be the larger adaptive system which includes the EA, the problem space (e.g. a robot-environment coupled system), the fitness function, and the population of candidate solutions. There are many aspects to this, and you won't be expected to cover them all, but you should examine *how* the EA actually finds good results, e.g. how the search is affected by the features and parameters of the EA, by methods of genetic encoding, and by any parameters and constraints in the problem space.

Discussion

In your discussion, you should all cover the following points:

- What further work might follow from your experiment?
- How adaptive is your system, according to the definition you gave in your introduction?
- How does your experiment connect to the larger research area of adaptive systems?

As well as at least one of the following, but any which are applicable:

- If you set out to test any hypotheses in your experiment, then to what extent do your results support them?
- Have your results led you to form any new hypotheses?
- If you have implemented a new kind of adaptive system, then how successful was your implementation?
 - How might your system be improved?
 - How robust is it to noise and other disturbances?
 - What other applications might your system be useful for?

(Please don't just list my points/questions and then your answers - this is not a good style for a discussion. I know most of you already know this, but some few students make this mistake each year.)

This is **not a comprehensive list**, and you may have other interesting points to discuss. In general, you should focus on one or two main discussion points (whichever are the most interesting), and you should craft your report in such a way as to build up to them, from introduction to results and analyses all the way up to discussion. Other discussion points can be covered more briefly.

A separate Conclusion section can also be included, but is very rarely needed.

Figure and table captions

Captions are not included in word count, because like the methods section, they should be exactly as long as required. It should be made clear in the captions exactly what figures and tables represent, and what exactly your reader should be paying attention to. All figures and tables should be numbered and referred to by their numbers in your main text. It is perfectly acceptable to repeat the text which describes a figure or table in its caption and in the main text, if that will lead to the most clarity in both places.

Bibliography

Not included in word count.

A list of references. You must make sure that your references are complete, that you cite **all** of your sources, and **do not** cite sources which you do not actually refer to in your report. You can use whichever referencing style you prefer, as long as you are consistent.

For an assignment of this size, I would expect to see something in the region of 10 items in your bibliography. This is only a ballpark figure, and I know some of you will go well over it. To go under it will not look good - you should have researched your chosen topic, and you should also be connecting your project to some material already given in the module, so it should not be difficult to populate your bibliography with sources which you actually cite *at all appropriate points* in your report, to support your descriptions and points (I *will not look kindly* on bibliographies which are artificially inflated with items which are either not cited, or which are cited for no apparent reason).

Appendices

Appendices are also not included in the word count, but should not include any material which is part of your main narrative - i.e. appendices may not be used to circumvent the word limit - it should be entirely up to your reader whether or not they review material in appendices. No reader wants to have flick back and forth between different sections of a report as they read the main text.

Presentation of report

I recommend the use of LaTeX for typesetting your reports. It is not very difficult to learn, and will help you to produce professional-looking reports, which is exactly what you should be aiming for at this point in your studies.

Please pay attention to the following details when writing and structuring your reports:

- General quality of writing. Minor errors in English language will not have a large effect on your mark, **as long as what you have written can be understood**. We can only mark what is on the page - if we can't understand it, then we can't give full credit for it.
- General structure of report. Is it clear how one paragraph follows from another, and how one subsection or section follows from another? Is there a clear narrative to your report, which starts

with a good introduction and description of methods, and ends with an interesting discussion which connects material and concepts introduced at the beginning to your results and analyses?

- Layout and style. A report which is laid out and styled well *and* consistently is much easier for a reader to follow than one which is not, so this is something you should pay attention to if you want to get your points across well.
- Figure labels and captions. All figures should be numbered, and when they are referred to in the main text, they should be referred to by those numbers. Every figure should be described in its caption, and the caption should also make it clear what your reader should pay most attention to in the figure.
- Equations should also be numbered, and referred to by number in the main text.
- Referencing. **All sources of information, code, quotes, figures, etc. should be clearly referenced.** A failure to clearly indicate and reference all sources could be interpreted as plagiarism, so this is very important.

Marking of code

The purpose of your code is to produce the results and analyses that your report will be built upon. The quality and quantity of the code you write for this assignment will normally only directly affect your mark under one of the following circumstances:

- You submit none. In this case, either your report will include no results, or it will include results which you cannot prove are real. A failing mark is very likely either way. If you think you will have no code to submit, you must discuss this with me as early before submission as you can - at that point, I may be able to help you in some way, but once you have submitted, I can do nothing but mark what is there.
- Your code is very bad, won't run, is completely undocumented, or is fundamentally unsound in some way, e.g. it includes a lot of code duplication or convoluted logic. In this case, your code will have a negative effect on your mark, as bad code means bad methods, and bad methods means results cannot be trusted.
- Your code is outstanding in some way. In this case, your code will have a small positive effect on your mark.

I will not judge your code at all on choices such as whether or not you use object-oriented style. I am also unconcerned by how efficient, or not, your code is, unless that somehow affects your results - reliability of code matters on this module; efficiency and "elegance" of code do not.

Submission details

Your report will be submitted via Turnitin. I will create a second submission point for your code.