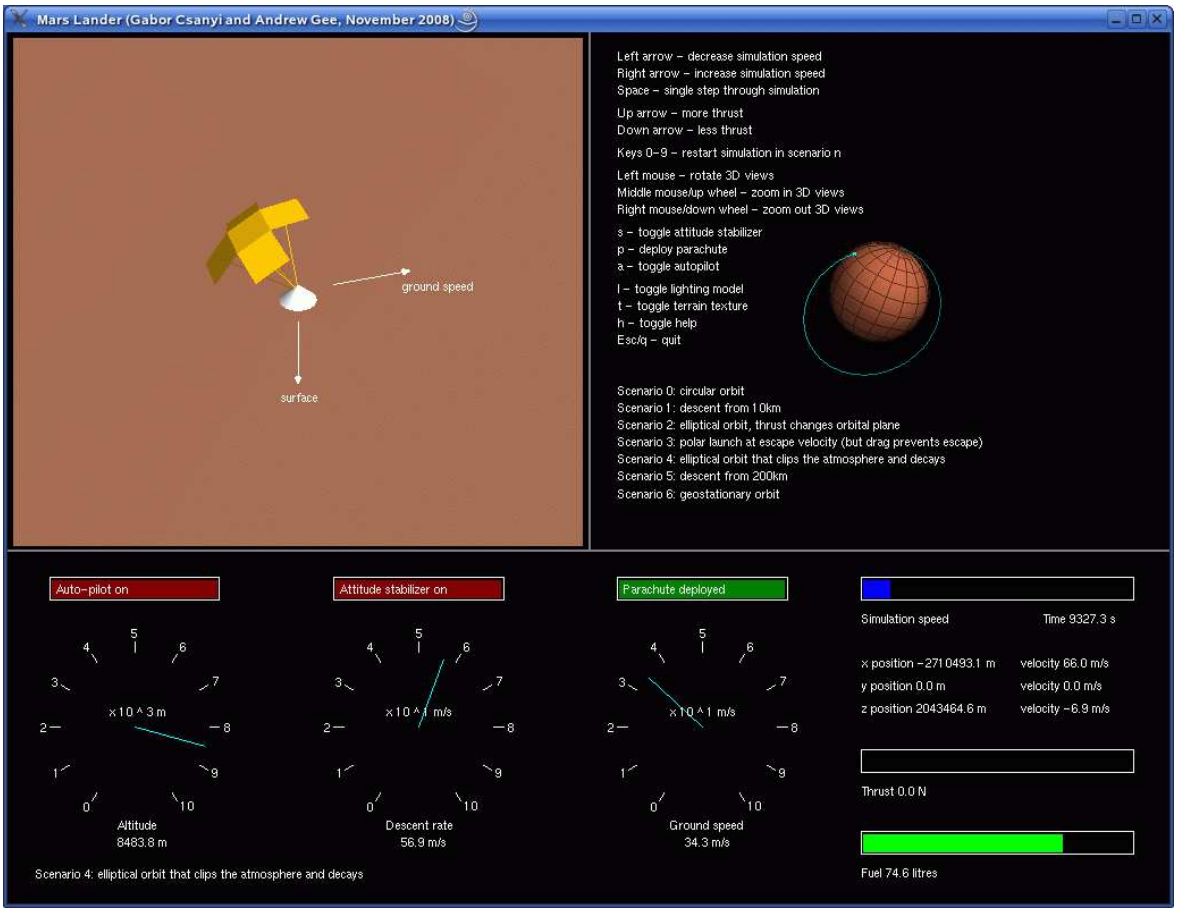
Mars Lander Vacation Exercise

What is it?

Mars Lander is a fun exercise that will teach you some essential maths and prepare you for the control theory in Part IB. By simulating the dynamics of a space probe as it orbits and then attempts to land on Mars, you will learn about the Euler and Verlet techniques for the numerical integration of dynamical equations of motion. Implementing these algorithms in Python and C++, and then merging your code with the supplied graphical visualization functions, you will produce your very own "game", complete with realistic physics and fun graphics.



After trying to land the probe manually, you will go on to develop an autopilot: this is a gentle introduction to the control theory you will see in Part IB. Additionally, you will gain experience and confidence developing software in Python and C++ on your own PC.

When should you do it?

During the long vacation between Parts IA and IB. **However, you should install a C++ compiler on your PC right now!** Check that you can compile and run the supplied C++ source code. You can then seek help in case of any difficulties. You do not want to start the exercise in September, only to discover that you cannot make the compiler work on your PC.

Where is the handout?

Everything you need for this exercise is hosted on Moodle (`vle.cam.ac.uk`). After logging on via Raven, navigate to **My courses** and then scroll down to **1CW: Mars Lander**: you should have been automatically enrolled on this course. There you will find the main handout, the supplied source code and **getting started pages for Windows, macOS and Linux**, including step-by-step instructions on how to install the necessary compilers. There is also a forum for online support from other students and teaching staff.

How long will it take?

All students should attempt the core assignments, which should take no more than a few days. If you find it interesting, there are a series of optional, open-ended extension assignments, the hardest of which could take several weeks to complete!

How is it assessed?

Although the Mars Lander exercise is not optional (the Part IB Control course assumes you have completed the core assignments), it is not formally assessed at CUED. Instead, it is run in the style of the "Preparatory Problems" that you worked through before commencing Part IA. Many Colleges will be arranging small-group feedback sessions at the start of Part IB. For those that do not, there will be an examples class-style feedback session at CUED.

Prizes

There will be a first prize of £200 and three runners-up prizes of £100, to be awarded for the most innovative solutions to the exercise.

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