

Get into Space with Computer Science

How is computer science used in space?

Space is invading our lives. You may not necessarily be aware of it, but with the increased use of mobile devices and the applications that come with it, there are many ways in which space benefits your life. Companies are developing innovative apps and programmes that take advantage of our presence in space. There are many different technologies that can be exploited and there are unending opportunities for innovation and creativity.

Telecommunications

Having access to a broadband signal is becoming more and more important as we become more connected through the internet. Traditionally this is provided via wired connections and if you want to improve the speed or reach new locations it meant digging up the roads and laying new cables, all at a great cost and inconvenience. Internet service providers, mobile operators and others now have the option of providing a broadband connection using satellite technology. This lifts previous restrictions on geographic locations that didn't have cable running to them.

In order to provide this service, however, control of the satellite is required. It will be programmed so that it is responsive to the user's needs. That could mean providing additional mobile coverage at a music concert or football ground or secure communications for armed forces in a conflict zone.

Control

Once a satellite or a spacecraft has been launched into space we need to be able to control it. Operating systems are designed so that the operators can control the position of the spacecraft, which will include operation of any thrusters or engine on board. It is important that the operators know the status of the object and are able to engage or disengage the instruments. Due to the varied use of satellites and spacecraft, these systems will be designed and adapted specifically for that object. Incorporated into all of this is security of the systems (a hacker must not be allowed to gain control) and robustness of the system (if something fails there must be a back-up system or the spacecraft may be lost). So far, we have a pretty good record when it comes to designing robust systems. Take the example of the Voyager spacecrafts: they were launched in 1977 and are still communicating with NASA even though they are about to leave the Solar System. At their current position it takes 17 hours for a command from Earth to reach it.

An important aspect of the operating system for a spacecraft on a mission to explore the Solar System is its ability to look after itself. There are lots of different things that can go wrong with a spacecraft. It could be hit by a micrometeorite, lose power to some of its systems or there could be a malfunction in its memory storage. The worst case is that it loses contact with Earth. When something happens, it must be able to look after itself, to protect its systems. This can also mean not doing something we ask it to. For example, there can be sensitive instruments on a spacecraft which, if pointed towards the Sun, would be destroyed. If we gave a command for it to turn the instruments to the Sun, its pre-programmed self-preservation would kick in and it would ignore us.

Data, data and more data

There are many people who rely on data from satellites and spacecraft, but how is it accessed? Companies develop applications to allow data to be retrieved and analysed by the end user. This can also mean developing security protocols and understanding legal implications for the use of different systems. This is especially important when you have many partners using something like GPS.

Try to imagine what it would be like if we suddenly lost all of our satellites. What would your day be like?

There are many aspects that have not been mentioned. Why not explore this topic for yourself?

See what you can discover!

For more guides like this and further information on space careers visit www.lfthomas.co.uk

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How do I get into space?

Subject options for your A-levels, Highers or International Baccalaureate are very important as they influence what courses and career options you have in the future. There are many different subject combinations available if you want to go and study computer science. This means it is helpful if you have a look at university entry requirements when making your decisions. Take care! University entry requirements vary from place to place and year to year, so when applying always check against the most recent information.

A high proportion of the roles within the space industry are “highly skilled” and require a university level qualification.

If you are considering computer science then there is one important aspect you must be aware of and enjoy: to successfully complete the course you may need to spend a large amount of time programming. If you can, try to learn a programming language whilst at secondary school, or at least try out what it's like to program. You will be taught various programming languages as part of your studies, but you will need to use your own skill to apply them in a variety of different projects. This is where having a diverse subject background can be an advantage as there are many ways in which you can use your programming skills: from building a website to designing an artificial intelligence.

What can I do in space?

Below is a small selection of employment areas. More options can be found at www.futuremorph.org and salary information is sourced from www.prospects.ac.uk

IT Consultant | Average salary: £43,000

In this role you work with clients to advise on solutions to their needs. This would mean analysing the business and establishing their objectives. You will have an excellent knowledge of the technical options available to them and would recommend solutions and how to implement them. This could mean advising satellite owners and operators or manufacturing organisations.

Systems Developer | Minimum requirements: university degrees | Starting salary: £23,000 - £27,500

This type of job is responsible for designing and writing programmes to achieve a certain goal. In the space industry this could be an operating system for a satellite or a new application to enable users to download and analyse data from a spacecraft. A high level of technical knowledge is required along with excellent problem solving abilities.

Communications Engineer | Minimum requirements: university degrees | Starting salary: £22,000 - £27,000

Using specialist technical knowledge, you could find yourself contributing to projects designed to deliver a broadband service via satellite to remote areas or even increasing capacity in a mobile network. This includes developing new solutions, testing them and working with colleagues to implement your ideas.

Useful links

Institute of Engineering and Technology	www.theiet.org
British Computer Society	www.bcs.org
Futuremorph	www.futuremorph.org/my-future-finder/space
UK Space Agency	www.bis.gov.uk/ukspaceagency
ESERO: the UK Space Education Office	www.esero.org.uk
UCAS	www.ucas.ac.uk

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