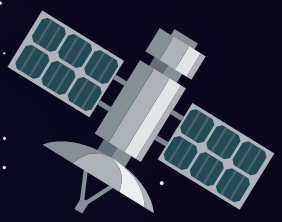
NAVIGATION SATELLITES



Helping us find our way

You've probably heard of GPS; it's short for Global Positioning System and it uses satellites that send out signals to help devices know where they are and where they're going. GPS is used in all sorts of things. Our phones and cars use it for navigation, emergency services use it to help rescue people, and farmers use it to map their fields so they can grow the best crops. Even coaches use it in different sports to help their athletes train better!

But did you know that there is more than one kind of GPS? The original system was developed in the 1970's and 80's in America to be used by their military. Some countries have created their own version of GPS. Russia, Europe, China, Japan, and India all have their own systems. While we usually call them GPS, their proper name is Global Navigation Satellite System (GNSS). In this experiment you will use a smartphone to track GNSS from different countries.

You will need

- An adult helper
- A smartphone (either an Android or iPhone)
- A pencil
- This activity sheet (with the table to record information)

The Experiment

1. Use a smartphone to go to the App Store (if using an iPhone) or the Play Store (if using an Android)
2. In the search section, type in 'GNSS View' and download the first app that appears in the search results. You'll know you have the right one if it says that it was made by the NEC Corporation
3. Once it's downloaded, open the app. Your phone may ask you if you'll allow it to see your location. You can select 'Allow While Using App'
4. Select the 'AR Display' button. It may then ask you if you'll allow the app to use the camera setting. You can allow the camera if you want to, but you don't have to
5. Point your phone towards the sky; you'll see the position of lots of different satellites orbiting above you!
6. Start counting the different satellites you can see and record your results in the table on the next page

Satellite System	Run by	Count
GPS (light blue)		
Galileo (dark blue)		
GLONASS (green)		
QZSS (pink)		
BeiDou (orange)		
SBAS (yellow)	(Any)	

Questions to think about

- How many satellites from each system did you count?
- Try looking at the app at different times during the day. Do the positions of the satellites change?
- If you were to look at the sky at night, do you think you would see any satellites? Why or why not?

Some more information

GNSS works by sending up a whole lot of satellites into orbit so devices like mobile phones on Earth are in range of at least four of them. The satellites send out signals that let the device know where they are in orbit, and at what time. Using this information, the device can work out where it is on Earth using a method called trilateration. So, it's not really the satellite tracking you, you're tracking the satellite!

The first GNSS were for military use, so soldiers wouldn't get lost when they didn't have maps or roads for navigation. However, they soon started to be used by civilians as well, and today GNSS does many important jobs. While we normally say GPS, most devices use multiple systems to help improve their accuracy. The data you use to navigate might come from Russian, Japanese, or even Chinese satellites.

At the moment, GNSS are accurate to about five metres. However, Australia is working on building a satellite-based augmentation system to help boost the signals satellites send out, and to improve their accuracy. With this technology the satellites' accuracy could improve to 10 centimetres or even less!

Where to find out more

- Behind the News: GPS Rival
- Seeker: How GPS Works
- This Day in History Class
- Rear Vision
- ESA: Satellite Navigation
- GlobalPos: How Does GNSS Work?