



## Thirsk School & Sixth Form College

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### Astro Pi Submission

#### Thirsk School

Mr Aldred - Head of Computing and ICT

Tom, Elisha, Callum, Jacob, Archie, Thomas, Flynn, Robot, Luke, Kieron, Gemma,  
Year 7 (11 / 12 years old)

We started with many ideas. Many, many ideas which as a group we talked through and evaluated. We decided on a visual tracker. We wanted to use the Raspberry Pi to track the location of the ISS and then inform the crew which country they were currently orbiting over.

We used OneDrive and created a shared document to create the code, we could share all our ideas in real time and edit our code anywhere. We used the code guides which our teacher had created in a simple guide book. We set about making around 65 countries flags and relevant messages. We soon realised that there were too many countries flags to make so we monitored the ISS for a few days to track which countries it went through the most.

Our program basically calculates the approximate location of the ISS and uses these coordinates to compare to a list of countries coordinates. If the ISS is over a recognisable country then the relevant flag is shown and a message. We will run the same program here on earth and update the TLE file, we want to see how far off the predicted orbit the ISS moves.

#### Setting up your code

1. Using a Raspberry Pi ensure that the software is up to date
2. **It is essential that the time is accurate as this is used to predict the future country locations**
3. The PyEphem package is used to track the satellite
4. To install this use PiP and type: `pip install pyephem`
5. **Our program uses a TLE file which needs to be updated, however in our testing we ran the same TLE file for 4 weeks and the tracking was only out by 0.5 of a degree.**
6. You can download the latest TLE file from here:  
<http://www.celestrak.com/NORAD/elements/stations.txt>
7. This is added to your code in the following format

```
from random import randint
from astro_pi import AstroPi
import ephem
import datetime
import time
## [...]
ap = AstroPi()
```

```
name = "ISS (ZARYA)";
line1 = "1 25544U 98067A 15178.42973832 .00011523 00000-0 17276-3 0 9998"
line2 = "2 25544 51.6456 32.8760 0003760 98.7829 323.8559 15.55421066949635"
```

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1. The rest of our program uses the latitude and the longitude boundaries of each county to check if the ISS is within a country we used this website to check the points: <http://itouchmap.com/latlong.html>
2. Once set up, type **sudo idle** in the LX terminal and then open the program.
3. Enjoy
4. You can track the ISS and compare with this website: <http://www.isstracker.com/>
5. Some of the countries were very wiggly so it was hard to perfectly match to boundary

### Testing and results

- Used the Astro Pi to test the flags once all were working we added them to the overall code
- Several student tracked the latitude and longitude of each of the major countries
- Students translated around 50 messages into the countries languages
- Adjusted the time to simulate the tracing of another country

### Further changes

- We are still adding flags and cover all countries, we have two weeks left of school to complete this!
- With the Maths department we are creating a grid method to accurately track all counties and the sea. This uses a pixel grid method, it will make out tracking more exact
- We are adding the national anthems and top ten for each country

### What we thought of Astro Pi and what we have learned!

- We have learnt how to do coding
- Astro Pi was amazing and it was good to see friends. I learnt that it was a lot more fun than I thought it was.
- Python is my favourite code, I learnt what a condition was
- That coding is a lot harder and that if you get the space in the wrong place it just messes it up.
- I learnt that there are different codes for different colours. Also learnt that sir is the BEST TEACHER EVER! 4 words to describe astro pi: ASTRO PI IS AWESOME!
- Working as a team was the best
- I know most of the languages that each country speaks
- My brain was overloaded with the co-ordinates of each county, it helps you see the country sizes and compare them.
- There is so much water in the world
- The ISS travels very fast

Thank you all for this opportunity

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