

APSC 1001 & CS 1010

Deep dive into Raspberry Pi

RPM of a cordless screwdriver – senseHAT application

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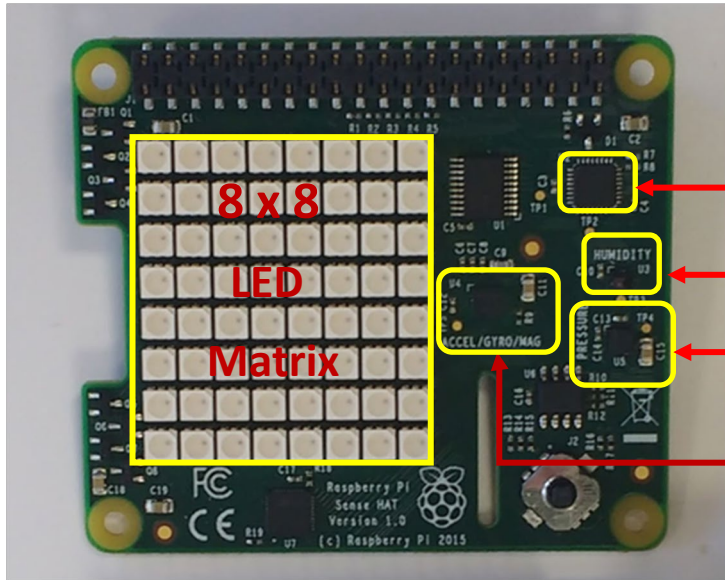
School of Engineering
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THE GEORGE WASHINGTON UNIVERSITY

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Photo: Kartik Bulusu

Revisiting the senseHAT



▪ The Sense HAT has a variety of sensors that can be read from:

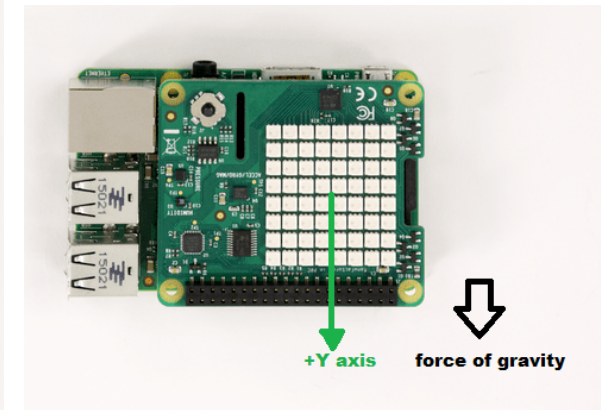
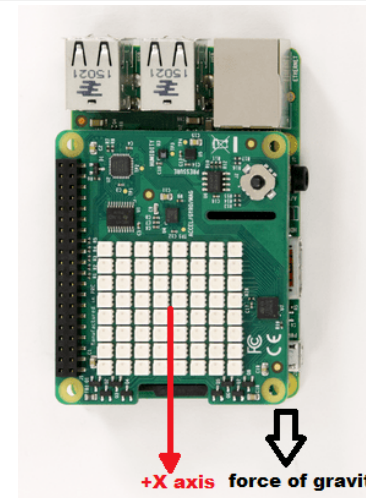
"Temperature"	reads temperature in degrees Celsius
"Humidity"	reads humidity in % RH
"Pressure"	reads atmospheric pressure in millibars
"Rotation"	reads gyroscopic motion in revolutions per second
"Acceleration"	reads acceleration in terms of standard accelerations due to gravity on Earth's surface
"Orientation"	reads orientation relative to magnetic north in degrees
"Magnetic Field"	reads strength and direction of a magnetic field around the sensor in microteslas

Image source: <https://projects.raspberrypi.org/en/projects/getting-started-with-the-sense-hat/2>

Magnetometer - instrument that measures magnetism, either magnetization of magnetic material like a ferromagnet, or the direction, strength, or the relative change of a magnetic field at a particular location.

Compass - simple example of a magnetometer, one that measures the direction of an ambient magnetic field.

Sources:
<https://en.wikipedia.org/wiki/Magnetometer>
<https://www.whitelist1.com/2017/07/6-raspberry-pi-and-sense-hat-iii.html>



Source: <https://www.mathworks.com/help/supportpkg/raspberrypi/examples/auto-rotate-an-image-displayed-on-sense-hat-led-matrix.html>

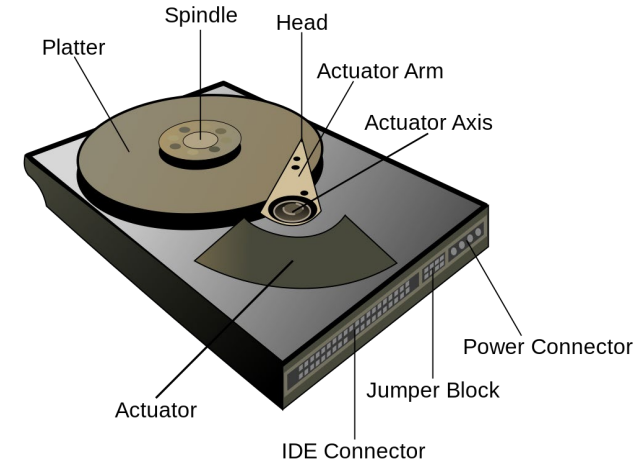
Concept of Rotations Per Minute (RPM)

Revolutions per minute (abbreviated **rpm**, **RPM**, **rev/min**, **r/min**, or with the notation min^{-1}) is the number of turns in one minute.

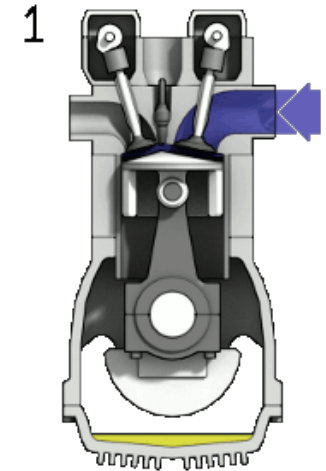
It is a unit of rotational speed or the frequency of rotation around a fixed axis.

The rotation rates of bacterial flagella have been measured to be 10,200 rpm for Salmonella typhimurium, 16,200 rpm for Escherichia coli,

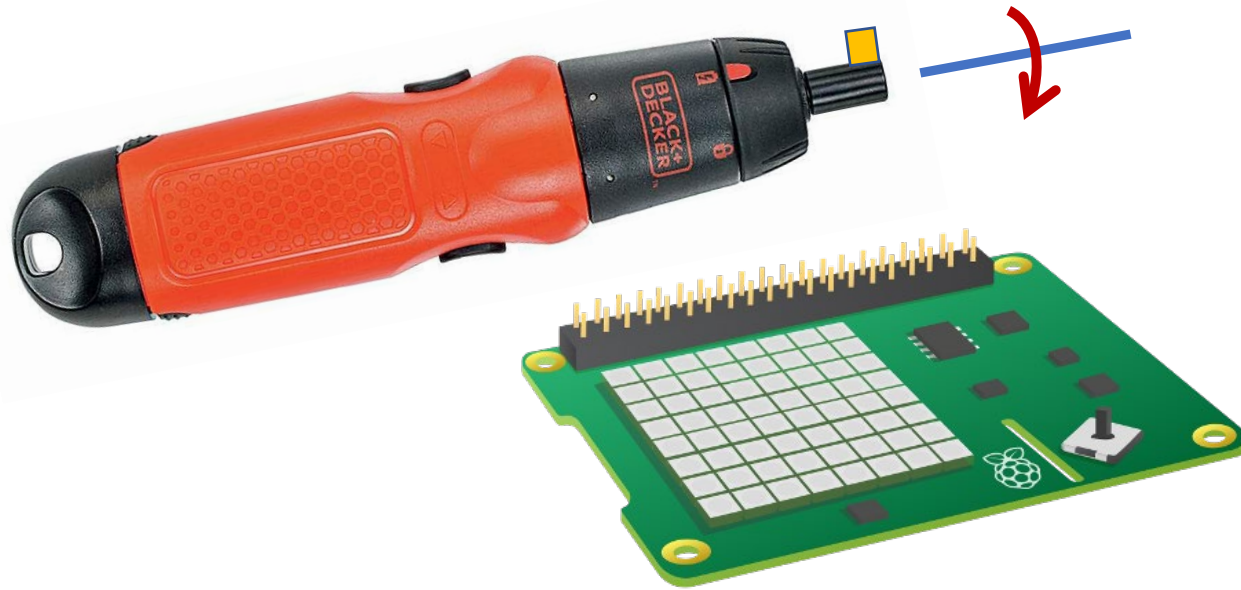
Computer hard drives typically rotate at 5,400 or 7,200 rpm



Modern automobile engines are typically operated around 2,000–3,000 rpm when cruising.



Images, animations and other sources:
https://en.wikipedia.org/wiki/Revolutions_per_minute
https://en.wikipedia.org/wiki/Hard_disk_drive#/media/File:Laptop-hard-drive-exposed.jpg
<https://en.wikipedia.org/wiki/Engine>



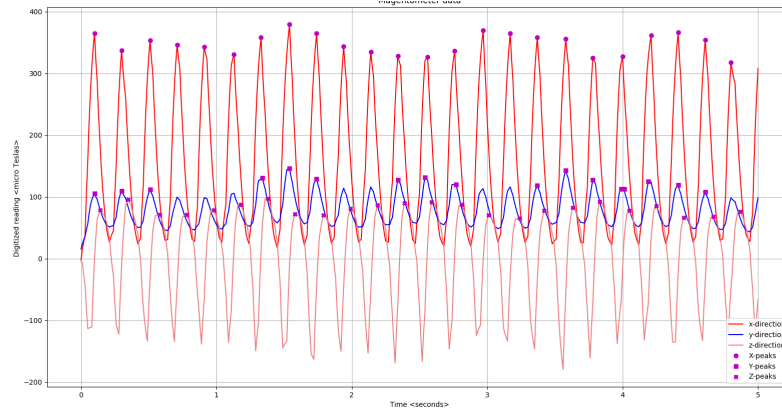
What we will do today

- Co-work
 - Observe, ask and try in groups
- Measure the RPM of a cordless screwdriver with the sense HAT and a Python program
- Think about
 - Challenges, Opportunities, Gaps and Surprises

What we will learn today

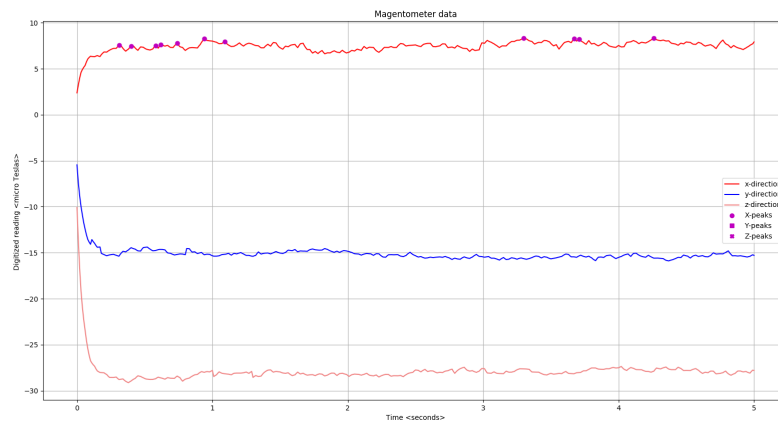
- Communicate with the magnetometer located on the Sense HAT using Python
- Access the output of the Sense HAT
- Display data graphically

Typical magnetometer-generated data and peaks a magnet mounted on the cordless screwdriver shaft



Signals generated by the magnetometer measurement system on the senseHAT

Magnetometer-generated data without any magnetic field



Magnetometer-generated data without magnet mounted on the cordless screwdriver shaft

