Android Sensors
(other than microphone and camera)

Android Sensors

- Android supports a wide range of sensors, but not all sensors are available on a single device.
  - eg. Samsung Note 8.0 has the following sensors:
    - acceleration, magnetic, orientation, light, proximity, auto-rotation

    But unlike Samsung Note 2, it does not have the following sensors:
    - gravity sensor and gyroscope sensor

- To see a list of sensors available on your Android device:

```
sensorManager = (SensorManager) getSystemService(SENSOR_SERVICE);
Boolean sensorAvailable = false;
List<Sensor> sensorList = sensorManager.getSensorList(Sensor.TYPE_ALL);
for(int i=0;i<sensorList.size();i++){
    Toast.makeText(this, sensorList.get(i).getName(),
Toast.LENGTH_SHORT).show();
}
```

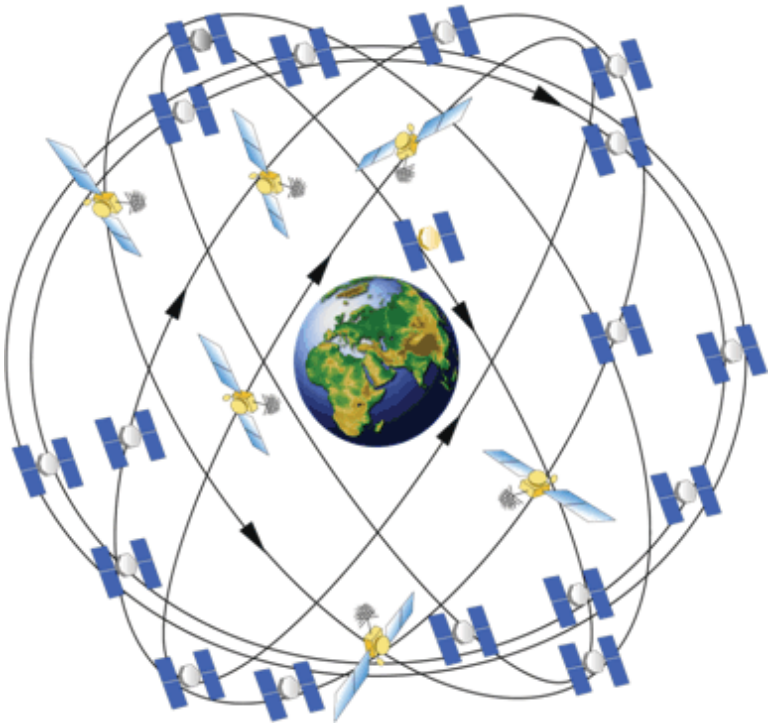
Location Sensing

Mobile phones in general can use 3 localization systems:

- Global Positioning System (GPS)
- Telco Cell Towers
- WiFi Network Access Points

Each of the three methods has its own strengths and weaknesses.
An App Developer can decide which localization system to use.

GPS



source: Professional Android Sensor Programming

- GPS consists of 27 satellites
- at least 4 satellites are visible at any point on earth at any time
- GPS position is known as ephemeris data
- each GPS satellite continuously transmits ephemeris data (current position) and almanac data (orbiting data as well as overall state of the GPS system).
- GPS satellites and GPS receivers must have their clocks synchronized
- by noting the transmission time and receiving time, and assuming the signal travels at speed of light in vacuum, the distance between the receiver and satellite can be computed. By using a minimum of 3 satellites, the position of receiver can be computed by triangulation.

- Note that if we use only 3 satellites, location computed is 2D only (latitude and longitude). If we can get 4 satellites, the height (altitude) of receiver can also be computed.

- Mobile platforms also make use of assisted GPS (A-GPS) and simultaneous GPS (S-GPS).

- A-GPS:
  - makes use of the mobile network to transmit almanac (receiving from GPS directly is slow)
  - fast acquiring of almanac also means fast initial acquisition of GPS signals

- S-GPS: traditional mobile devices share the some hardware components for GPS sensing and making mobile phone calls. Therefore, GPS sensing and phone calls cannot happen simultaneously. S-GPS solves this problem by adding another hardware so that GPS sensing and phone calls can happen simultaneously.

Problems with GPS:

- cannot work indoor
- in urban areas, may have multipath problem
- consumes battery significantly (compared to, say, WiFi access point method)

Continuous Location Tracking and Battery Life

- To reduce battery consumption:
  - reduce location update frequency
  - limiting location providers

note that proximity alerts consumes battery heavily because they need location updates