

Hyperspectral Mapping of Amazon River Mouth Region

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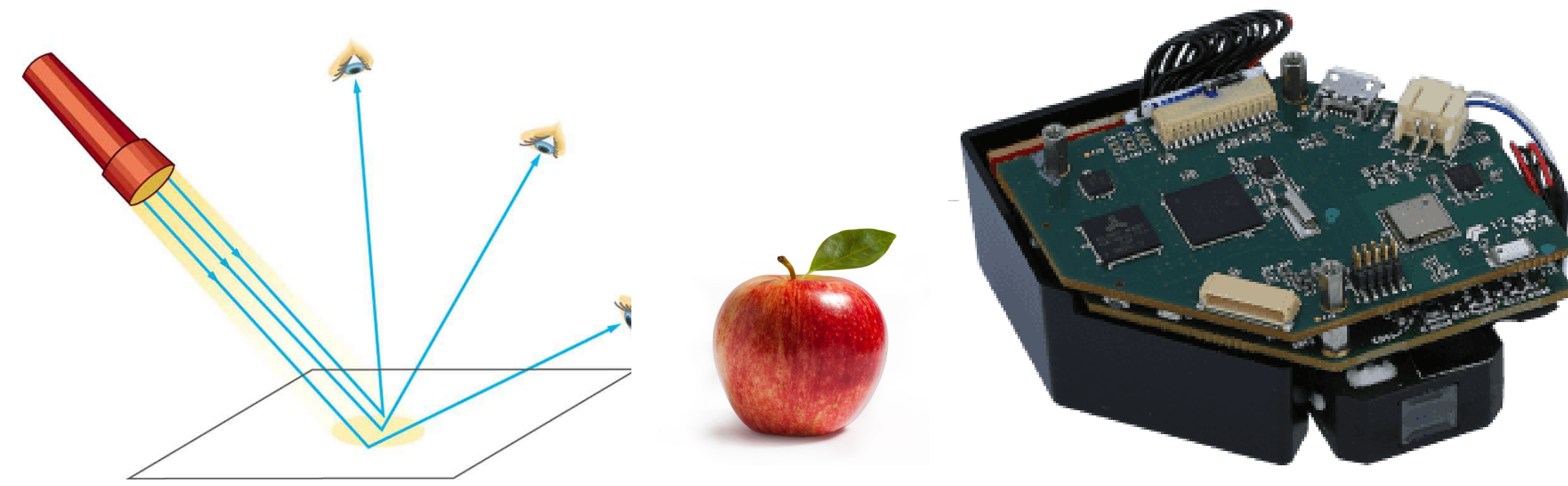
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Demonstration

Basic Idea:

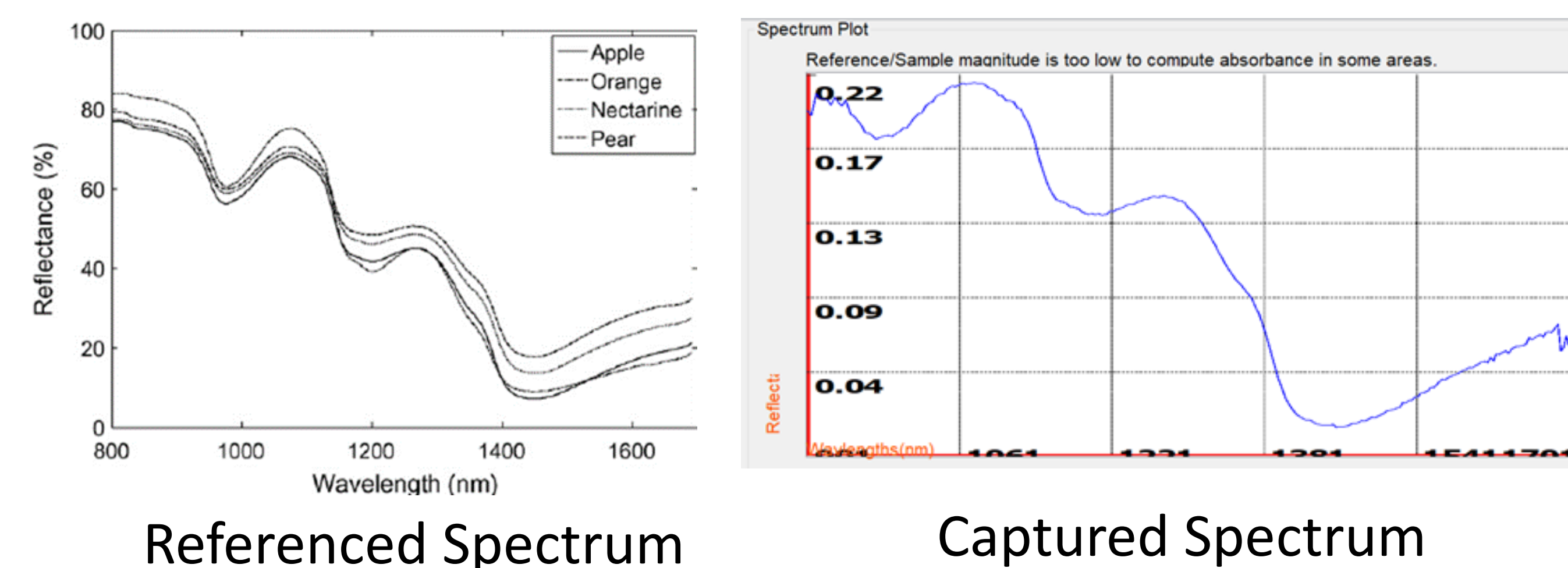
Every physical material in existence has a unique spectral signature.

Materials can be characterized based on their reflectance data.



Through the use of spectroscopy evaluation devices, the reflectance of an object across a wide range of wavelengths can be captured.

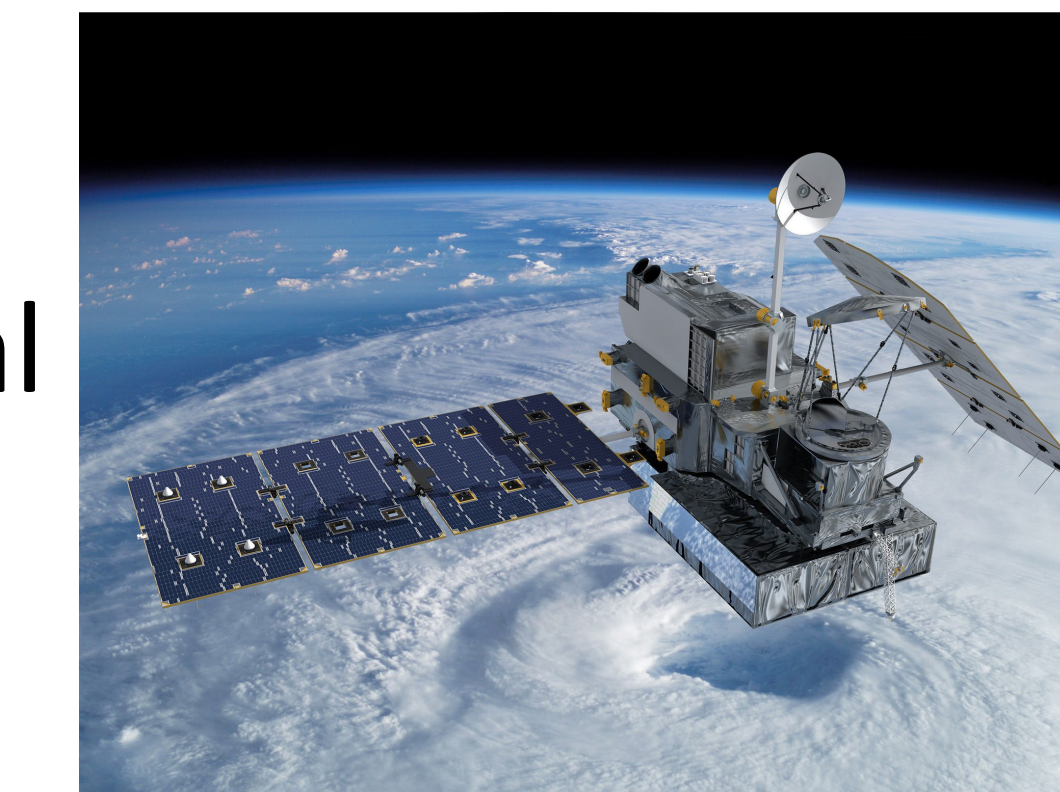
Referencing known reflectance data can provide a good idea of what the material is.



Spectral Data of a Red Apple

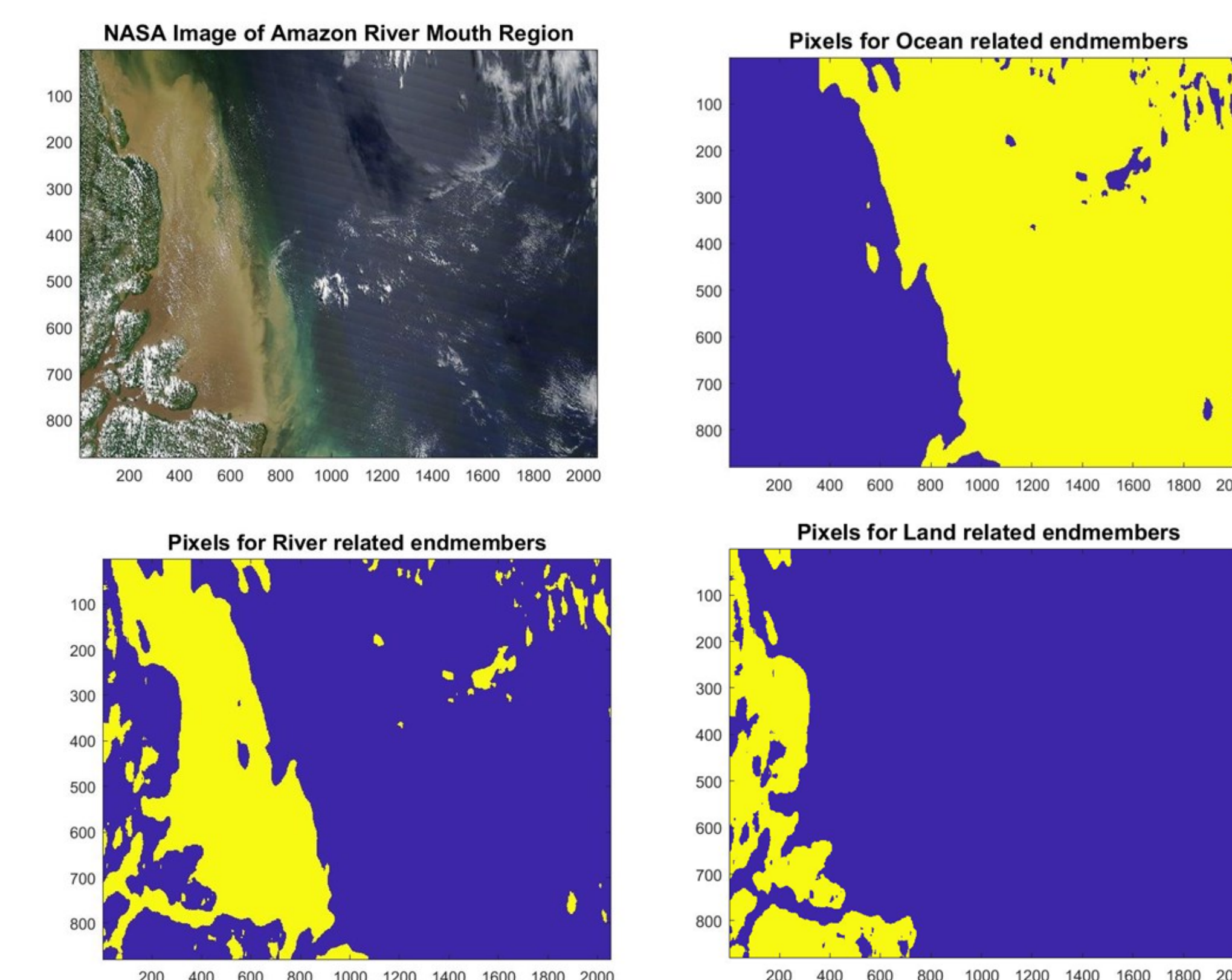
Purpose

Hyperspectral imaging technology uses spectroscopy data to construct a material composition map of the ground. The Linear Spectral Mixture Model (LSMM) mixes the spectrum data using a weighted Gaussian distribution. The ground truth spectrum data are used to calibrate the LSMM model, which can then be used to reconstruct the actual material landscape.



Model

The LSMM model mixes the raw reflectance data from various materials in the Amazon River Mouth region, then a synthetic material map can be generated to resemble the area using a random Gaussian field. This generates a 2D model based on the weighted proportion of the materials assumed by the mixing model.



The Hyperspectral Imagery Synthesis Model developed at Harbor Branch Oceanographic Institute will then de-mix the data, and by using an area segmentation method, will generate a 3D synthetic hyperspectral map of the region that reflects the contents of the original materials.

Importance and Uses

Material Characterization

Satellites/Drones capture a land mass and are able to characterize where certain minerals are prevalent.

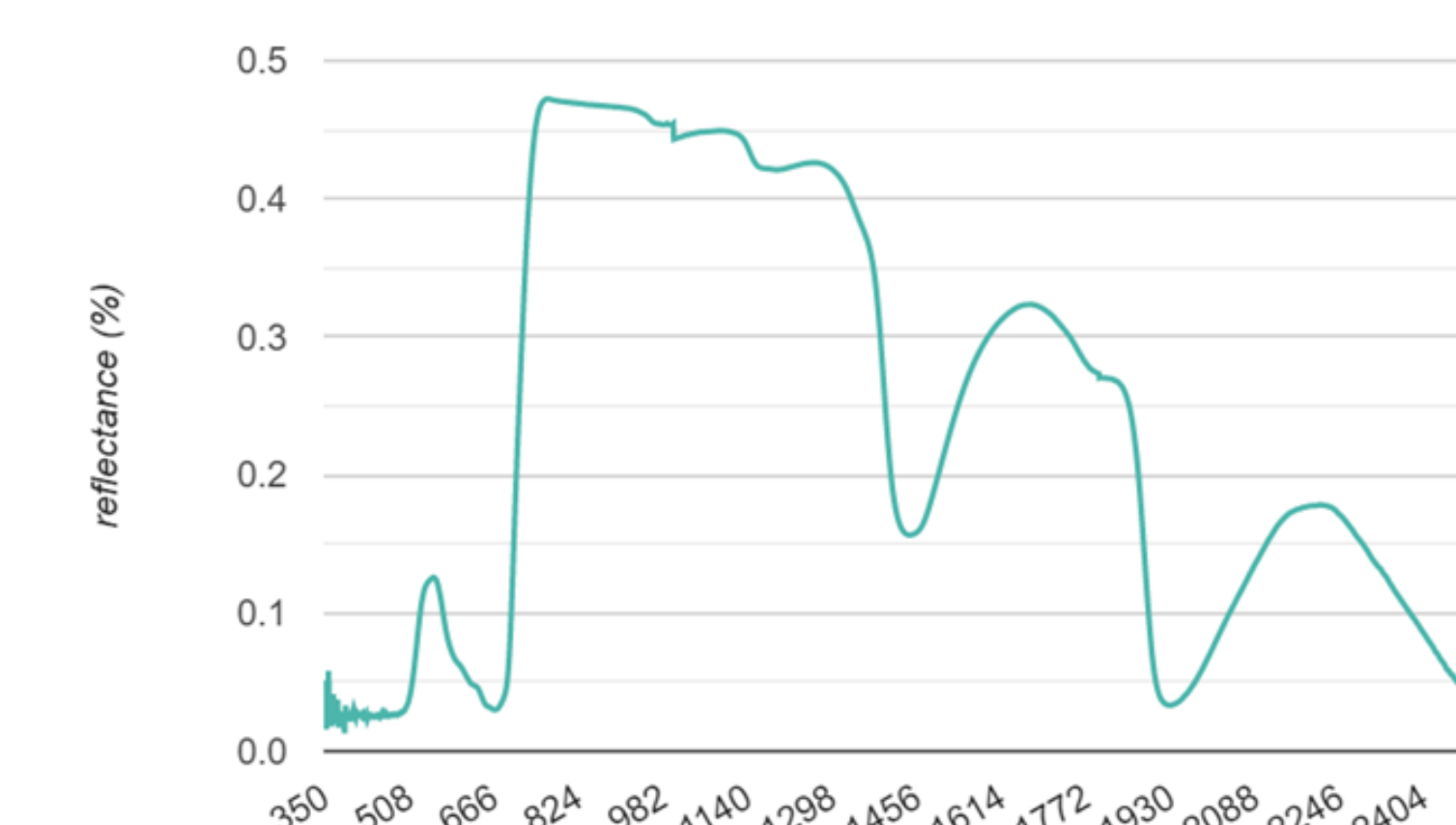
Defense

Aerial drones over a battlefield could scan wide areas for certain materials used for war vehicles such as tanks, planes, and ships.

Environmental Monitoring

Satellites rotating around the planet for months to years can automatically track environmental changes such as desert, vegetation, or ocean landscape changes.

Examples of Spectral Data



Summary

- We collected raw reflectance data from various sources pertaining to the region being observed. Sources include the USGS Spectral Library, the extraction of data from published research articles, and The European Space Agency's Copernicus Open Access Data Hub.
- The LSMM model was used to mix the raw data collected which was in turn de-mixed with the Hyperspectral Imagery Synthesis Model