CASA0023 Weekly Diary

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Table of contents

Welcome

This is my weekly study notes for the CASA0023 course. My undergraduate major was Geographic Information Science, and my thesis focused on vegetation extraction from remote sensing imagery. Therefore, some of my personal reflections may be related to my undergraduate background.

1 Introduction

1.1 Summary

Remote sensing is a science that uses electromagnetic radiation as a medium to identify surface features and apply surface information to relevant fields (Navalgund, Jayaraman, and Roy 2007). Various sensors function like human eyes that can perceive a broader range of spectral bands, providing richer and more extensive ground information, thus laying the foundation for further analysis.

1.1.1 Active and Passive Remote Sensing

Figure 1.1 and Table 1.1 demonstate the differences between active and passive remote sensing in terms of working principles, advantages and applications.

Table 1.1: Comparison of Active and Passive Remote Sensing

Category	Active Remote Sensing	Passive Remote Sensing
Energy Source	Sensor-generated energy	Relies on surface radiation
Advantages	• Independent of surface radiation, unaffected by lighting conditions. • Can penetrate clouds, vegetation, etc.	• Can cover large areas simultaneously. • High revisit rate,capable of providing time-series data
Applications	Suitable for all-time, all-weather, and extreme environment measurements	Suitable for large-scale continuous observation

1.1.2 Interaction with Earth's Surface

As Figure 1.2 shows, solar radiation undergoes a series of interactions at the Earth's surface, such as cloud scattering, surface scattering, and atmospheric absorption. The energy ultimately received by the sensor is the result of these combined processes, representing rich information while also potentially introducing interference to the research. For example, atmospheric correction is required in the preprocessing of remote sensing images because the

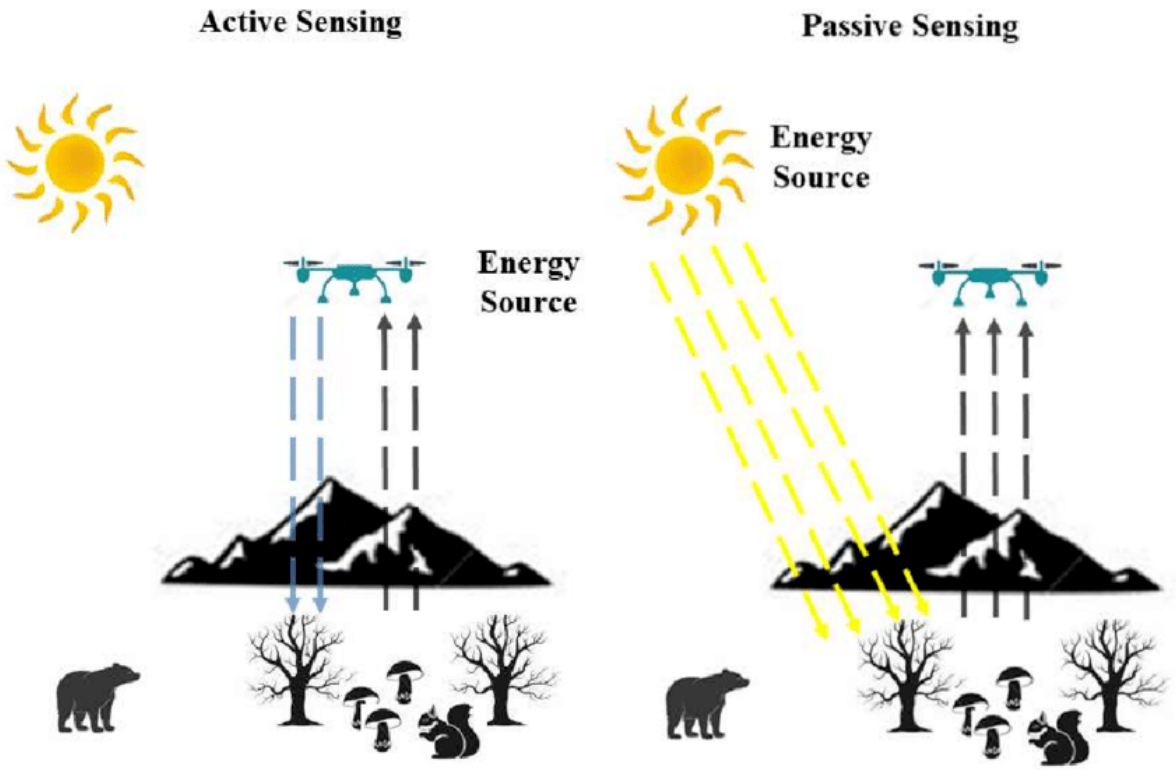

Figure 1.1: Principle Differences Between Active and Passive Remote Sensing

energy received by the sensor is affected by atmospheric scattering and absorption, leading to reduced image contrast.

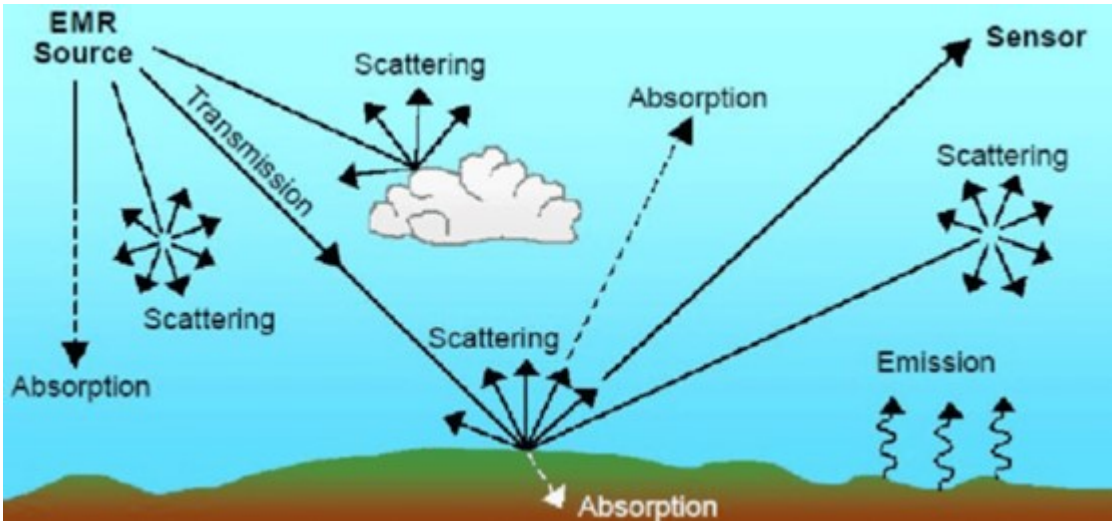

Figure 1.2: Interaction with Earth's Surface

1.1.3 Four Types of Resolution

Typically, the design of remote sensing sensors requires a trade-off between these four types of resolution based on their primary application areas. For example, high spatial resolution often comes at the cost of a smaller coverage area, which results in a longer revisit period, meaning lower temporal resolution. Additionally, due to technical constraints such as data transmission, spatial resolution and spectral resolution cannot be simultaneously maximized.

Table 1.2: Definitions of the Four Types of Resolution in Remote Sensing

Resolution Type	Definition
Spatial Resolution	The smallest ground unit distinguishable by the sensor, which corresponds to the size of a raster pixel.
Spectral Resolution	The number and width of spectral bands that the sensor can detect.
Temporal Resolution	The revisit cycle of the sensor.
Radiometric Resolution	The smallest detectable energy variation by the sensor.

2 Summary

In summary, this book has no content whatsoever.

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References

Navalgund, Ranganath R., V. Jayaraman, and P. S. Roy. 2007. "Remote Sensing Applications: An Overview." *Current Science* 93 (12): 1747–66. http://www.jstor.org/stable/24102069.