Remote Sensing

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Abstract— Remote sensing is the acquisition of information about an object or phenomenon without making physical contact with the object and thus in contrast to in situ observation. In modern usage, the term generally refers to the use of aerial sensor technologies to detect and classify objects on Earth (both on the surface, and in the atmosphere and oceans) by means of propagated signals (e.g. electromagnetic radiation). It may be split into active remote sensing (when a signal is first emitted from aircraft or satellites)[1][2][3] or passive (e.g. sunlight) when information is merely recorded.
***Keywords**:* RADARSAT, TerraSAR-XMagellan, electromagnetic radiation

I. INTRODUCTION

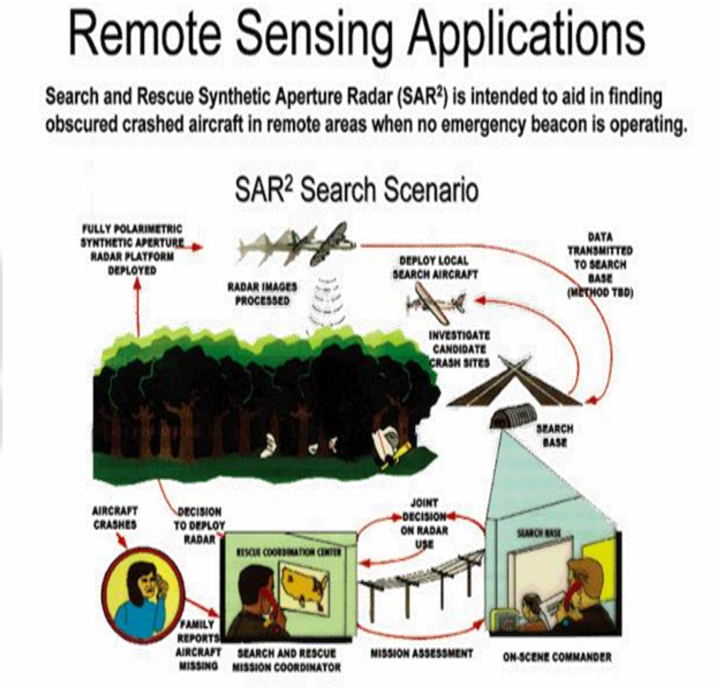
A. *Remote Sensing of Environment — An Interdisciplinary Journal*

Remote Sensing of Environment serves the remote sensing community with the publication of results on the theory, science, applications, and technology of remote sensing of Earth Resources and Environment. Thoroughly interdisciplinary, RSE publishes on terrestrial, oceanic and atmospheric sensing. The emphasis is on biophysical and quantitative approaches to remote sensing at local to global scales. In addition to original research papers, comprehensive, state-of-the-art review articles are welcome. Brief papers containing significant new data or techniques may be published as Short Communications

II. WHAT IS APPLICATIONS OF REMOTE SENSING DATA

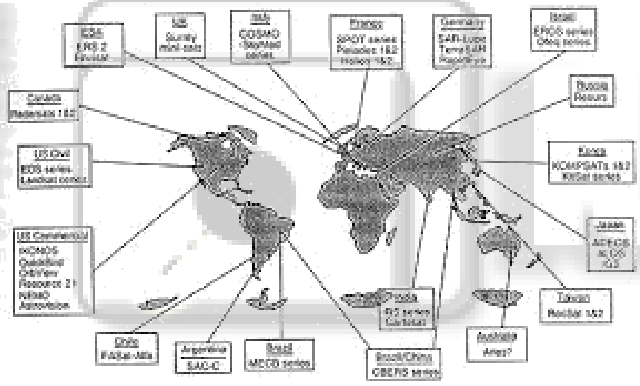
Conventional radar is mostly associated with aerial traffic control, early warning, and certain large scale meteorological data. Doppler radar is used by local law enforcements' monitoring of speed limits and in enhanced meteorological collection such as wind speed and direction within weather systems in addition to precipitation location and intensity. Other types of active collection includes plasmas in the ionosphere. Interferometric synthetic aperture radar is used to produce precise digital elevation models of large scale terrain (See RADARSAT, TerraSAR-XMagellan).

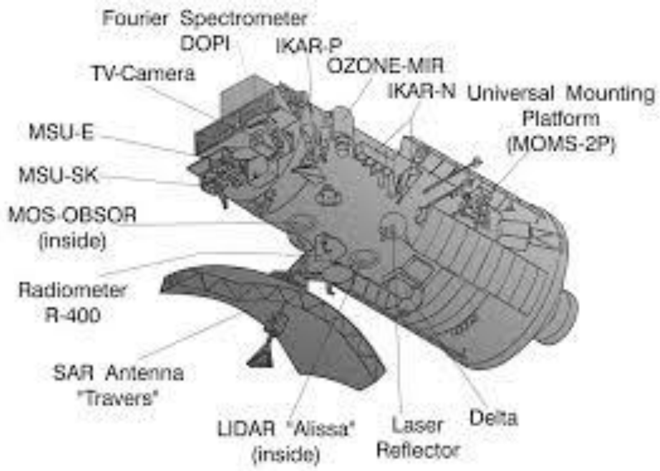
- Laser and radar altimeters on satellites have provided a wide range of data. By measuring the bulges of water caused by gravity, they map features on the seafloor to a resolution of a mile or so. By measuring the height and wavelength of ocean waves, the altimeters measure wind speeds and direction, and surface ocean currents and directions.
- Light detection and ranging (LIDAR) is well known in examples of weapon ranging, laser illuminated homing of projectiles. LIDAR is used to detect and measure the concentration of various chemicals in the atmosphere, while airborne LIDAR can be used to measure heights of objects and features on the ground more accurately than with radar technology. Vegetation remote sensing is a principal application of LIDAR.
- Radiometers and photometers are the most common instrument in use, collecting reflected and emitted radiation in a wide range of frequencies. The most common are visible and infrared sensors, followed by microwave, gamma ray and rarely, ultraviolet.

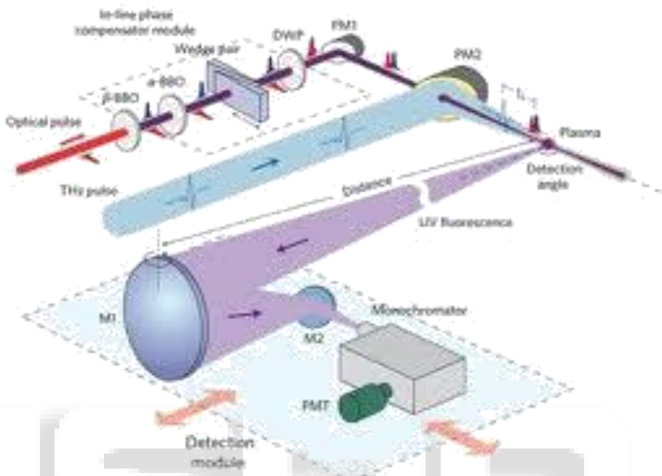


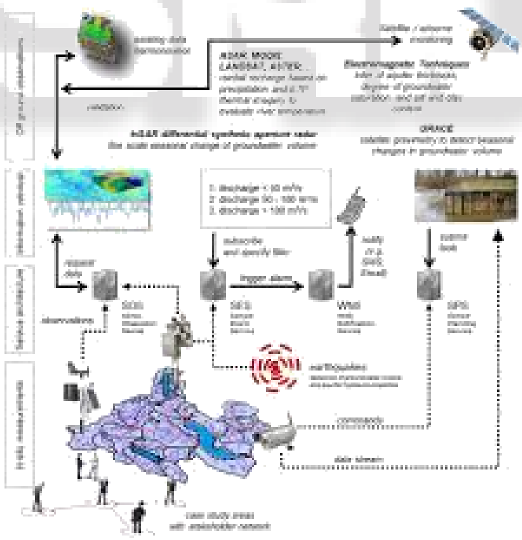
III. LEVEL DESCRIPTION

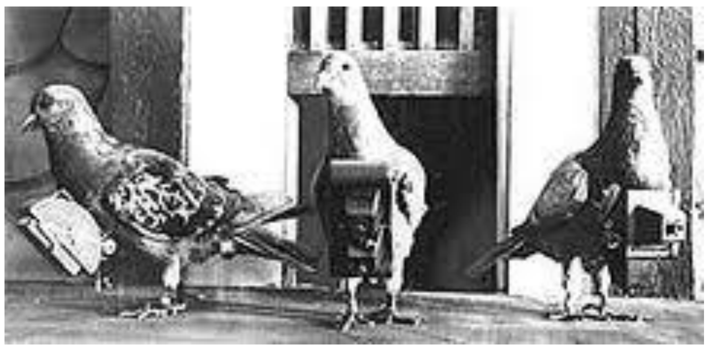
- Reconstructed, unprocessed instrument and payload data at full resolution, with any and all communications artifacts (e. g., synchronization frames, communications headers, duplicate data) removed.
- Reconstructed, unprocessed instrument data at full resolution, time-referenced, and annotated with ancillary information, including radiometric and geometric calibration coefficients and georeferencing parameters (e. g., platform ephemeris) computed and appended but not applied to the Level 0 data (or if applied, in a manner that level 0 is fully recoverable from level 1a data).
- Level 1a data that have been processed to sensor units (e. g., radar backscatter cross section, brightness temperature, etc.); not all instruments have Level 1b data; level 0 data is not recoverable from level 1b data.
- Derived geophysical variables (e. g., ocean wave height, soil moisture, ice concentration) at the same resolution and location as Level 1 source data.
- Variables mapped on uniform spacetime grid scales, usually with some completeness and consistency (e. g., missing points interpolated, complete regions mosaicked together).

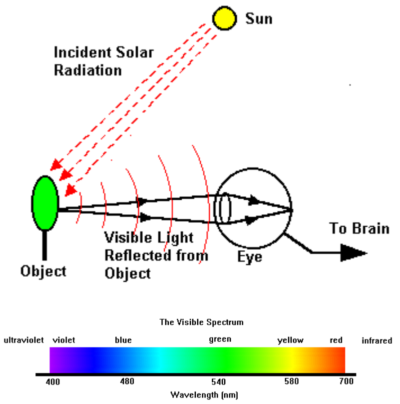






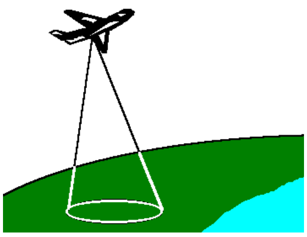






We perceive the surrounding world through our five senses. Some senses (touch and taste) require contact of our sensing organs with the objects. However, we acquire much information about our surrounding through the senses of sight and hearing which do not require close contact between the sensing organs and the external objects. In another word, we are performing **Remote Sensing** all the time.

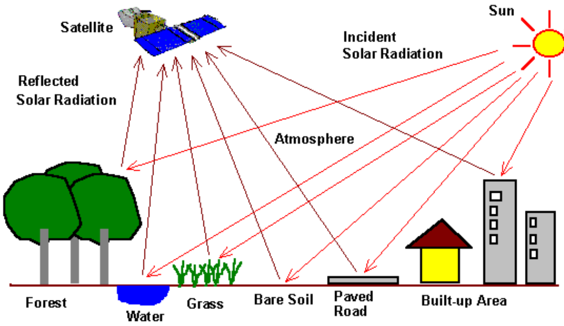
Generally, Remote sensing refers to the activities of recording/observing/perceiving (sensing) objects or events at far away (remote) places. In remote sensing, the sensors are not in direct contact with the objects or events being observed. The information needs a physical carrier to travel from the objects/events to the sensors through an intervening medium. The electromagnetic radiation is normally used as an information carrier in remote sensing. The output of a remote sensing system is usually an image representing the scene being observed. A further step of image analysis and interpretation is required in order to extract useful information from the image. The human visual system is an example of a remote sensing system in this general sense.



In a more restricted sense, remote sensing usually refers to the technology of acquiring information about the earth's surface (land and ocean) and atmosphere using sensors onboard airborne (aircraft, balloons) or spaceborne (satellites, space shuttles) platfo `What is Remote Sensing?`

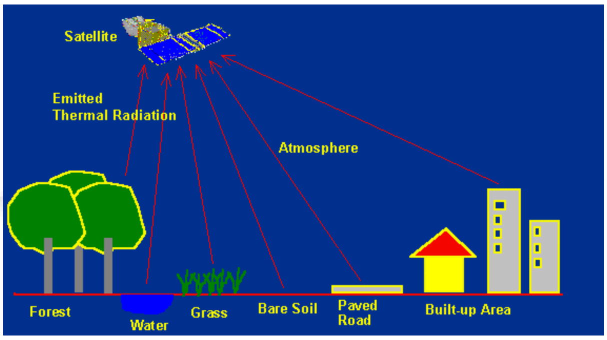
IV. OPTICAL AND INFRARED REMOTE SENSING

In Optical Remote Sensing, optical sensors detect solar radiation reflected or scattered from the earth, forming images resembling photographs taken by a camera high up in space. The wavelength region usually extends from the visible and near infrared (commonly abbreviated as VNIR) to the short-wave infrared (SWIR).



Different materials such as water, soil, vegetation, buildings and roads reflect visible and infrared light in different ways. They have different colours and brightness when seen under the sun. The interpretation of optical images require the knowledge of the spectral reflectance signatures of the various materials (natural or man-made) covering the surface of the earth.

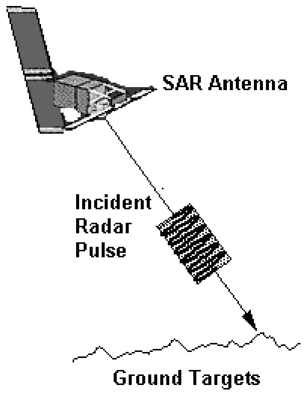
There are also infrared sensors measuring the thermal infrared radiation emitted from the earth, from which the land or sea surface temperature can be derived.

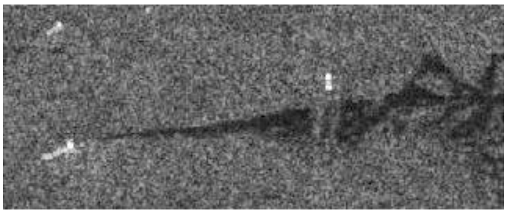


V. MICROWAVE REMOTE SENSING

There are some remote sensing satellites which carry passive or active microwave sensors. The active sensors emit pulses of microwave radiation to illuminate the areas to be imaged. Images of the earth surface are formed by measuring the microwave energy scattered by the ground or sea back to the sensors. These satellites carry their own "flashlight" emitting microwaves to illuminate their targets. The images can thus be acquired day and night. Microwaves have an additional advantage as they can penetrate clouds. Images can be acquired even when there are clouds covering the earth surface.

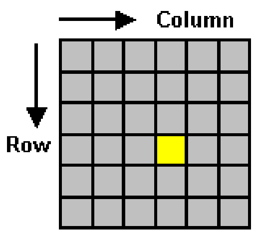
A microwave imaging system which can produce high resolution image of the Earth is the synthetic aperture radar (SAR). The intensity in a SAR image depends on the amount of microwave backscattered by the target and received by the SAR antenna. Since the physical mechanisms responsible for this backscatter is different for microwave, compared to visible/infrared radiation, the interpretation of SAR images requires the knowledge of how microwaves interact with the targets.

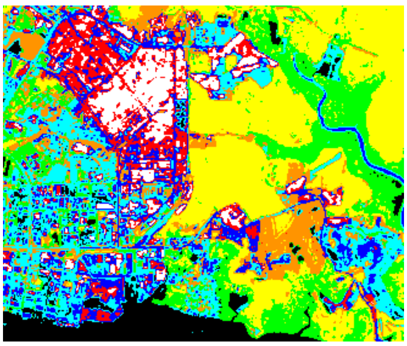


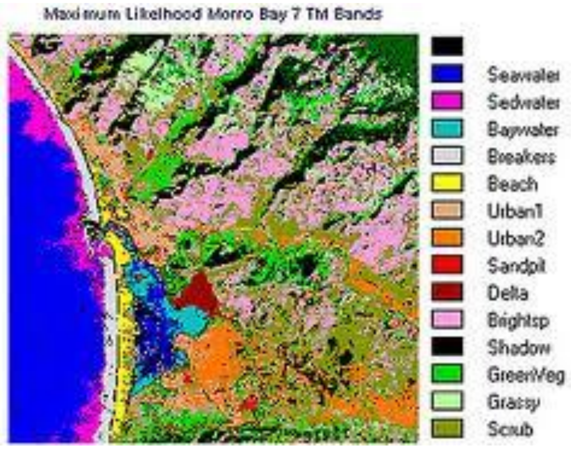


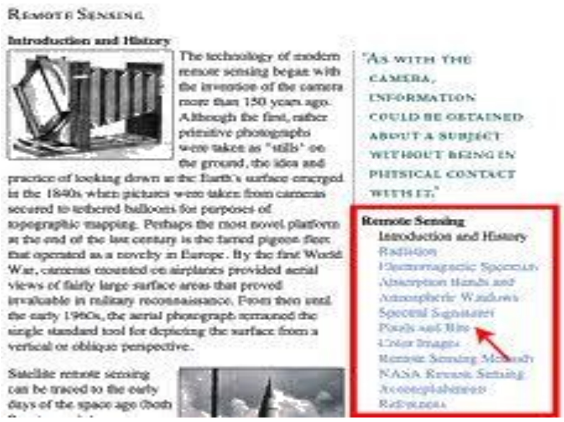
VI. REMOTE SENSING IMAGES

Remote sensing images are normally in the form of digital images. In order to extract useful information from the images, image processing techniques may be employed to enhance the image to help visual interpretation, and to correct or restore the image if the image has been subjected to geometric distortion, blurring or degradation by other factors. There are many image analysis techniques available and the methods used depend on the requirements of the specific problem concerned. In many cases, image segmentation and classification algorithms are used to delineate different areas in an image into thematic classes. The resulting product is a thematic map of the study area. This thematic map can be combined with other databases of the test area for further analysis and utilization.









REMOTE SENSING

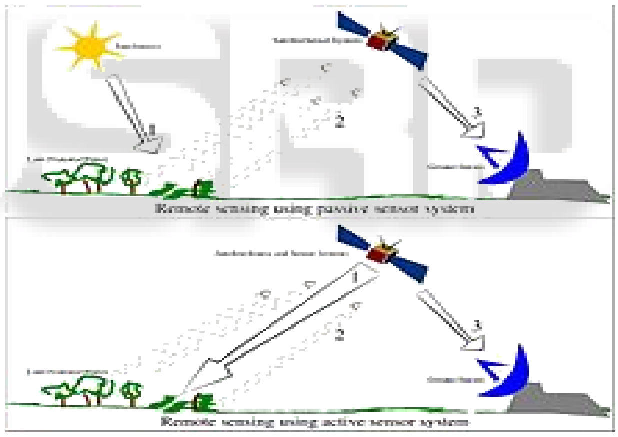
Introduction and History

The technology of modern remote sensing began with the invention of the camera more than 150 years ago. Although the first, rather primitive photographs were taken as "stills" on the ground, the idea and practice of looking down at the Earth's surface emerged in the 1840s when pictures were taken from cameras secured to tethered balloons for purposes of topographic mapping. Perhaps the most novel platform at the end of the last century is the famed pigeon fleet that operated as a novelty in Europe. By the first World War, cameras mounted on airplanes provided aerial views of fairly large surface areas that proved invaluable in military reconnaissance. From then until the early 1960s, the aerial photograph remained the single standard tool for depicting the surface from a vertical or oblique perspective.

Satellite remote sensing can be traced to the early days of the space age (both

"AS WITH THE CAMERA, INFORMATION COULD BE OBTAINED ABOUT A SUBJECT WITHOUT BEING IN PHYSICAL CONTACT WITH IT."

Remote Sensing
Introduction and History



VII. CONCLUSION

They may also be used to detect the emission spectra of various chemicals, providing data on chemical concentrations in the atmosphere.

Stereographic pairs of aerial photographs have often been used to make topographic maps by imagery and terrain analysts in trafficability and highway departments for potential routes, in addition to modelling terrestrial habitat features. Simultaneous multi-spectral platforms such as Landsat have been in use since the 70's. These thematic mappers take images in multiple wavelengths of electro-magnetic radiation (multi-spectral) and are usually found on Earth observation satellites, including (for example) the Landsat program or the IKONOS satellite. Maps of land cover and land use from thematic mapping can be used to prospect for minerals, detect or monitor land usage, deforestation, and examine the health of indigenous plants and crops, including entire farming regions or forests.[3]

Landsat images are used by regulatory agencies such as KYDOW to indicate water quality parameters including Secchi depth, chlorophyll a density and total phosphorus content. Weather satellites are used in meteorology and climatology

REFRENCES

[1] Schowengerdt, Robert A. (2007). *Remote sensing: models and methods for image processing* (3rd ed.). Academic Press. p. 2. ISBN 978-0-12-369407-2.
[2] Schott, John Robert (2007). *Remote sensing: the image chain approach* (2nd ed.). Oxford University Press. p. 1. ISBN 978-0-19-517817-3.
[3] Guo, Huadong; Huang, Qingni; Li, Xinwu; Sun, Zhongchang; Zhang, Ying (2013). "Spatiotemporal analysis of urban environment based on the vegetation–impervious surface–soil model" (Full text article available). *Journal of Applied Remote Sensing* **8**: 084597. Bibcode:2014JARS....8.4597G. doi:10.1117/1.JRS.8.084597.
[4] Liu, Jian Guo & Mason, Philippa J. (2009). *Essential Image Processing for GIS and Remote Sensing*. Wiley-Blackwell. p. 4. ISBN 978-0-470-51032-2.
[5] http://hurricanes.nasa.gov/earth-sun/technology/remote_sensing.html
[6] Mills, J.P., et al. (1997). "Photogrammetry from Archived Digital Imagery for Seal Monitoring". The Photogrammetric Record **15** (89): 715–724. doi:10.1111/0031-868X.00080.
[7] Twiss, S.D., et al. (2001). "Topographic spatial characterisation of grey seal Halichoerus grypus breeding habitat at a sub-seal size spatial grain". Ecography **24** (3): 257–266. doi:10.1111/j.1600-0587.2001.tb00198.x.
[8] Stewart, J.E., et al. (2014). "Finescale ecological niche modeling provides evidence that lactating gray seals (Halichoerus grypus) prefer access to fresh water in order to drink". Marine Mammal Science **30** (4): 1456–1472. doi:10.1111/mms.12126.
[9] Begni G. Escadafal R. Fontannaz D. and Hong-Nga Nguyen A.-T. (2005). Remote sensing: a tool to monitor and assess desertification. Les dossiers thématiques du CSFD. Issue 2. 44 pp.