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Interactive Analyses in Marine Fisheries using Passive Optical Remote Sensing Techniques

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Remote observations of the sea surface can provide a significant part of the information needed to assess and improve the potential yield of the fishing grounds. Satellite remote sensing is emerging as a powerful tool in synoptic survey of natural resources. Using satellite and airborne sensors is a powerful, operational tool for monitoring coastal zones. The use of remote sensing methods to examine physical oceanography is becoming increasingly important within marine fisheries oceanography. This paper mainly discussed the techniques of optical remote sensing. This technology can provide accurate, large-scale, synoptic environmental information essential for understanding and managing marine ecosystems. Optical multi- or hyper spectral sensor data allows the assessment of in-water properties, such as suspended matter or phytoplankton concentration, benthic substrate type, vegetation composition, and bathymetry in shallow waters. This technique can be used to detect all kind of in-water properties. In this proposed technique Generic processing systems and Hyper spectral Imaging Systems are used to sense the visible, near infrared and short-wave infrared sensors to form images of the earth's surface by detecting the solar radiation reflected from targets on the ground accurately and enables better characterization and identification of targets.

Key words: Optical Remote Sensing, Generic processing systems and hyper spectral imaging systems.

Marine conservation is the protection and preservation of ecosystems in oceans and seas. Marine conservation focuses on limiting human-caused damage to marine ecosystems, and on restoring damaged marine ecosystems. Fisheries management experts recognize that the underlying causes of fisheries resource over-exploitation and coastal environmental degradation are often of social, economic, institutional and/or political origins[2]. While the marine water bodies are used mainly for capture fisheries resources. The inland water bodies are widely used both for culture and capture fisheries in the technique of Optical Remote sensing.

Remote sensing is the utilization at a distance of any device for gathering information about the environment. Optical remote sensing can be used to detect all kind of in-water properties. It describes the way of data can be processed and the restrictions with respect to the application of optical remote sensing[3]. Imaging spectrometers are passive sensors that measure reflected sunlight from objects on the earth's surface (Figure 1). All objects have unique spectral footprints that can register in wavelengths, or bands, invisible to the human eye. Hyperspectral imaging sensors operating across hundreds of wavelengths allow this hidden world to be revealed[6].

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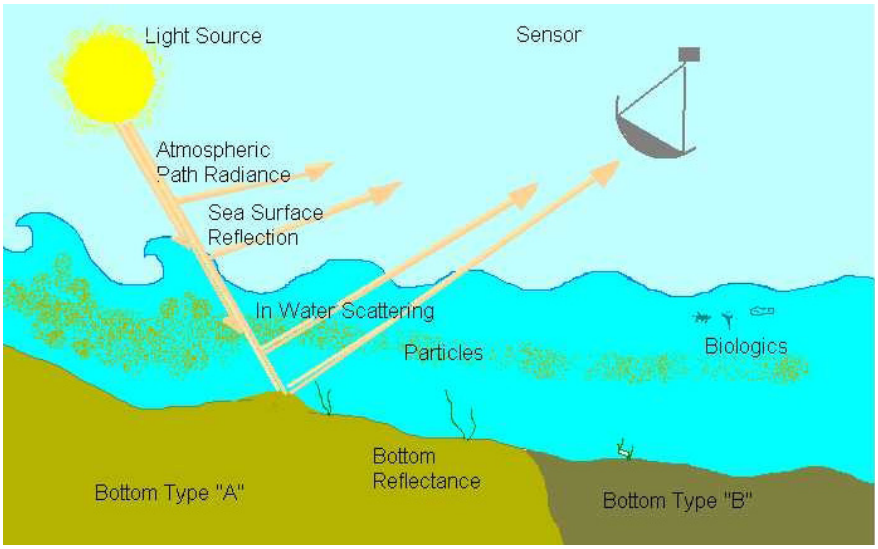


Fig. 1. Optical Remote sensing in marine applications

These finely tuned sensors are coupled with powerful processing algorithms that remove from the remote signatures the contributions due to (1) sea-surface glint, (2) atmosphere, (3) water column radiance and, (4) propagation of bottom reflectance to the surface. When combined with in-situ measurements of inherent optical properties, solution for the bottom reflectance using these techniques can be allowed. The sun is a source of energy or radiation, which provides a very convenient source of energy for passive optical remote sensing. The sun's energy is either reflected, as it is for visible wavelengths, or absorbed and then reemitted, as it is for thermal infrared wavelengths. There are two main types of remote sensing: Passive remote sensing and Active remote sensing[10].

Related work

The remote sensing technology from space cannot directly observe pelagic or deeper ocean shoals of fish, but one has to utilize the observation of physical surface parameters and relate these observations to the presence of fishery resources. The ocean color data have also been important for the attempts to monitor the ocean biological productivity[1]. The major remote sensing activities for fishery applications have been in the field of optical remote sensing sensors. Optical remote sensing is mainly used for observation of coastal and fishery regions[8]. That optical remote sensing from high resolution multispectral sensors can provide crucial data for supporting conservation management in coastal temperate regions. Remote sensing makes it possible to collect data on dangerous or inaccessible areas. Remote sensing replaces costly and slow data collection on the ground, ensuring in the process that areas or objects are not disturbed.

Techniques and methods

Hyperspectral Imaging Techniques

The marine environment can be highly dynamic and, in large parts, it could be difficult to say that the present altered organization of the ecosystem is more desirable than a structure that is closer to the pristine state. It is easier to define what specific effects of marine fisheries are not desirable rather than to define an environmental state towards which the ecosystem should be managed. The information contained in hyperspectral data allows the characterization, identification, and classification of the land-covers with improved accuracy and robustness[4-5].

Hyperspectral imaging has the ability to provide powerful target identification information to an image and has broad ranging applications including military surveillance, environmental monitoring, mineralogy, industrial, and bio-medical. It can be used for remote sensing and is ideally suited for Marine fisheries analyses (Figure 2). It has been used to monitor turbidity, chlorophyll, vegetation mapping and nutrient contents in bodies of water.

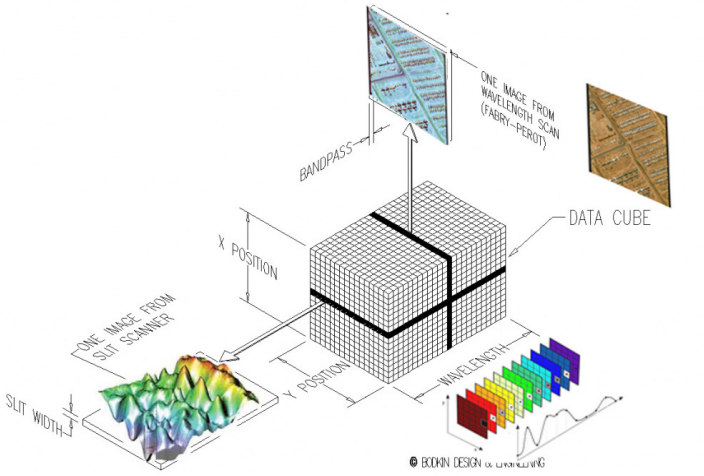


Fig.2. Graphical representation of the 3D hyperspectral data cube

Hyperspectral imaging, affords a unique opportunities to analyses the fisheries monitoring and management of remote sensing applications. It simultaneously yields precise information for all wavelengths across the complete spectral range available in the oceanography. The creation of hyperspectral data cube, a data set that includes spatial and spectral information. These remote sensing techniques can offer an efficient and cost-effective approach to mapping and monitoring reef habitats over large, remote and inaccessible areas (Fig.3). Hyperspectral Sensor Merits are, hyperspectral mode (80channels), Potential spectral range covering UV to IR (~200nm-11,000nm), Spectral resolution: visible range 10 - 50nm, IR 20 - 500nm, Maximum number of channels in hyperspectral mode: ~ 200, Better resolution than FTIR or CTIS, Physical size: 3mm or larger, Spectral Imaging Cube can be scaled to aperture size, Good resolution for telephoto or microscopy applications and Polarized optics

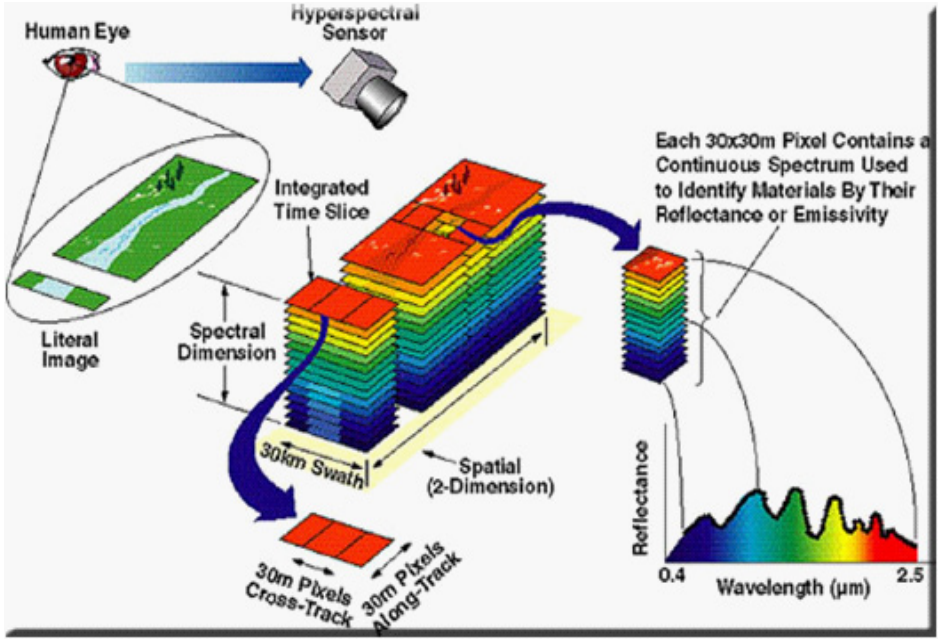


Fig. 3. Hyperspectral imaging data cube

Generic processing systems

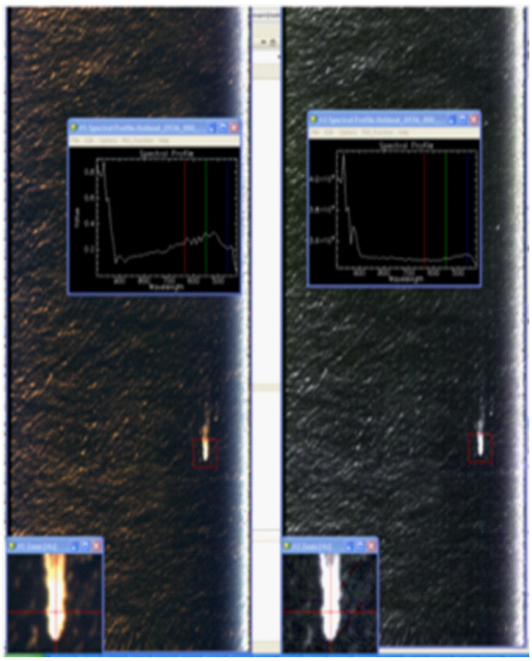
Generic processing systems cover a wide range of applications. It applied to new sites, and sensors due to a systematic, modular approach & easy adaptations for sensor site properties.

Fig. 4. Hyperspectral Image monitoring

Hyperspectral remote sensing data used for detecting (Figure 4) and identifying the targets accurately and enables better characterization of targets in water bodies or deep waters of inland waters and coastal zones (Figure 5).

CONCLUSION

In this contribution, it has been demonstrated that passive optical remote sensing is a very versatile analytical tool, with numerous applications in conservation, protecting the eco systems, biological and environmental monitoring. This technique could be very useful for many other fields of research, including the study of works



of art. Generic processing systems and Hyper spectral Imaging systems technique to detect all kind of in-water properties. This technique captured at relatively high resolution. It's used to sense the visible, near infrared and short-wave infrared sensors to form images of the earth's surface by detecting the solar radiation reflected from targets on the ground accurately and enables better characterization and identification of targets in open water bodies, like oceans and seas.

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