The utilization of remote sensing technology

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Abstract. Remote Sensing was introduced at the vocational school of Geomatics Engineering in 2013. Remote sensing is the science and technology relating to search information about an object without direct contact with the object. The purpose of this paper is to review research related to remote sensing in the last 5 years. Search results show that the scope of remote sensing topics includes (1) Environmental monitoring such as mapping mangrove forest carbon stocks, detection and monitoring of vegetation affected by oil spills (2) Interpreting land cover and change for paddy modeling, road detection and settlement quality (3) Mitigation and monitoring of natural disasters; Forest fire, Mapping flood areas and affected flooding (4) Identification of natural resources; copper mining, mapping ground water prospective (5) Plant identification; determination of species, identification of agricultural crops, etc. The images used are Landsat imagery, AQUA / TERRA, and others. The obstacle in this research is the storage of data that has a large volume. By reviewing the aspects studied there is a cheaper and more efficient way to improve the quality of objects. The conclusion from the search results is this review will be able to enrich the treasures of knowledge in remote sensing technology learning in Geomatics Engineering, especially with related to enrich learning content.

1. Introduction

Remote sensing is the science and technology that is concerned with finding information about an object without direct contact with the object. The object under study is recorded by satellite in the form of images. On the satellite attached a sensor that is useful for recording the image. This image will be examined to determine the direction of our research. the scope and the using of remote sensing in daily our life, results searching of journals obtained by the scope of research in remote sensing cover the following matters. Environmental monitoring such as: Detecting and monitoring the danger of oil spills on vegetation, a case study in Warri, South West Nigeria [1]. Explore a floating plastic debris in the sea [2]. Interpretation of land cover and change such as: Land use and cover used for urban and regional planning, case studies in Heidelberg, Germany [3]. Land use and land cover and their relationship to soil erosion [4]. Mitigation and monitoring of natural disasters such as: Fire forest forecasting, Mapping of flood-affected areas [5,6]. Identification of natural resources such as: Mapping of ground water prospective zone [7]. Identification of plants such as mapping plants [8], classifying species deciduous tree in hardwood forest in Eastern Ontario [9]. High or medium resolution. Can High Resolution Imagery from Google Earth, MODIS Imagery [5], ALOS Imagery, Geodesy satellites, X Sar and SRTMC. One of the constraints faced in remote sensing is that the data storage capacity is very large, we need a method to compress the data, so the storage capacity can be smaller but still without reducing data quality. This study aims to find out what utilization can be obtained from remote sensing, because
with the development of science and technology from remote sensing so rapidly from year to year, it undoubtedly helps a lot in helping to overcome various problems in many scientific fields, one of the most recent examples with this remote sensing technology it can amazingly predict the symptoms of the spread of certain diseases namely visceral leishmaniasis this disease is caused by female flies carrying the parasite leishmania case study in sinkian province, Mainland China [10], of course this study is indispensable in the health field.

2. Method

More than 20 journals are summarized and analyzed to obtain various forms of research conducted in the scope of remote sensing. From the results of this summary, it can be seen that in general there are five utilizations of this remote sensing technology. The journals reviewed show that the method used is more qualitative in nature with case studies that vary across national boundaries. Although in outline this research has the same way that is getting imagery from satellites. The journals studied were in the range of years (2015-2019) although there were some taken from the previous year for resumes. A systematic review is a valuable source of evidence, in which the author must summarize and analyze a reliable scientific literature using structured procedures based on predetermined objectives so that different researchers can be sorted out according to the field of study [11].

3. Results and discussion

In order to identify the required data, it is necessary to go through several variables such as measuring directly the field, through remote sensing and on existing data (collateral data). Field measurements are required for cross check against final measurements of the necessary collateral data such as Digital Elevation Model, land map, building map, government administration boundary map, etc. Thematic maps. While remote sensing data is obtained from the system with passive sensors or active sensors. Processing of remote sensing data is differentiated by two methods i.e. analog image processing (visual) and digitally. The basic element of a visually-deformed interpretation of imagery includes levels: hue/color, size, shape, shadow, texture, site, pattern and association.

We need to interpret the information that is in the image so that the image is useful and can be used for various purposes. We can use the same image with different spatial precision to learn a phenomenon with a different wide scope so that the phenomenon we learn can be clearer. The smaller the spatial resolution, the more detailed the object can be displayed, e.g. fashionable Citra with spatial resolution of 250 meters and the image of Landsat-7 with a spatial resolution of 30 meters. So the object will be more detail displayed by Citra Landsat-7. Future studies can use finer Remote Sensing data such as Sentinel 2, but their data archives are less abundant and less developed in preprocessing when compared to Landsat [3]. Here's a remote sensing utilization discussed in the journals reviewed:

| The Scope                                      | Result                                                                 |
|------------------------------------------------|------------------------------------------------------------------------|
| 1. Environmental monitoring                   | • Monitor oil spill due to vegetation                                 |
|                                                | • Explore a floating plastic debris in the sea                        |
|                                                | • Placement of waste and waste areas of urban areas [12]              |
| 2. Interpretation of the closure and change    | • Explored the influence of environmental factors on the distribution of Visceral Leishmaniasis |
|                                                | • Soil erosion                                                        |
|                                                | • Road extraction in Urban area                                      |
|                                                | • Open pit mine areas [13]                                            |
|                                                | • Urban regional planning                                             |
|                                                | • Mapping agriculture areas                                          |
| 3. Mitigation and monitoring of natural disasters | • Forecasting of fire danger                                         |
|                                                | • Mapping flood areas and affected flooding                          |
| 4. Identification of Natural Resources         | • Mapping of ground water                                            |
|                                                | • Oil and gas exploration                                            |
| 5. Identification of Plants                   | • Analyze the accuracy of deciduous tree species classification       |
Table 1 illustrates the scope of remote sensing technology. There are 5 main sections reviewed such as environmental monitoring, change and land cover, mitigation and monitoring of natural disasters, identification of natural Resources, Identification of Plants.

3.1. Environmental monitoring

3.1.1. Monitoring of oil spills. We have demonstrated that there is great potential to use vegetation indexes derived from Landsat 8 for the detection and monitoring of oil spills in oil-producing environments. This technique can also be useful for monitoring environmental compliance in oil-producing areas where polluted locations may require repair or cleaning. For example, the contaminated location cleanup process in Ogoniland Nigeria has been recommended by the UNEP report in the year 2011 has begun in June 2016. The results in this study are very important not only for the oil industry but also for government and non-governmental environments. Institutions responsible for maintaining a safe natural environment. Local governments can take advantage of effective and inexpensive monitoring of oil facilities using space technology. With the launch of the recent Sentinel 2 offering free data with high spatial resolution of 10 m and a 12-day temporal resolution can also be useful for detecting small spill sites with lower oil spill volumes [1].

3.1.2. Explore a floating plastic debris in the sea. Plastic waste pollution has threatened organisms in the ocean. They can get entangled or eat this plastic waste, resulting in death. By measuring microplastic spectral reflectance (<5 mm) from the North Atlantic Ocean, macroplastics (> 5 mm) are stranded along the US west coast and virgin plastic pellets in the wavelength range of 350 to 2500 nm. With remote sensing technology to detect plastic debris that spreads at sea level. This research requires a more detailed analysis of radiation transfer and the development of high signal-to-noise sensors as a basis for prectral measurements for the detection of plastic debris in various platforms [2].

3.2. Interpretation of the closure and change of land

3.2.1. Mapping agricultural areas. This study illustrates the area of rice cultivation located in Piemonte (NW of Italy) by relying on data from sentinel satellite 2 and Landsat 8. This land tessellation is only administrative by making the parts managed according to their respective spectral properties. from this study can be evaluated how tessellation schemes can condition the spectral behavior of plants by using NDVI (Normalized Difference Vegetation Index) and NDWI (Normalized Difference Water Index) [14].

3.2.2. Disease identification. This research was conducted in Sinkiang Province of China using environmental variables (such as altitude), climate and land cover with contextual targets of parking spaces and grasslands. The data is taken from the LIDAR data, according to the segmentation the presence of Visceral Leishmaniasis (VL) is identified at each place studied by using the maximum entropy model to predict the existence of this VL [15].

3.3. Mitigation and monitoring of natural disasters

3.3.1. Forecasting of fire danger conditions. Forecasting the hazard conditions caused by forest fires is one of the main components of forest fire management, how do we determine the points of fire that might spread, enlarge to add new hotspots. The variables measured in this study include; temperature, speed and direction of wind, precipitation, humidity, turbidity, solar radiation which is an operational system. By using interpolation techniques in theory this technique can overcome the uncertainty of remote sensing data. From this technique a fire map will be obtained [16].

3.3.2. Mapping flood areas and affected flooding. Data of LANDSAT satellites with spatial resolution of 30 m spatial can be applied to flood research; However, 16-day observation frequencies are usually
sufficient to observe the short-term typhoon Puddle. Or, despite the rough spatial resolution, the moderate Resolution Spectro Radiometer (MODIS) sensor provides daily data, which is ideal for flood-related investigations [5]. The study of natural disasters requires the level of detail data in the mapping. Data from remote sensing can present detailed information according to the resolution capabilities of the remote sensing image. The advantages of remote sensing data are that it can cover a wide area because it is taken from the air, obtained quickly and accurately even though the territory is difficult to reach on a terrestrial survey so that in obtaining its data can save cost, time, and energy.

3.4. Identification of natural resources

3.4.1. Mapping of groundwater prospective zones. The research area in the central part of eastern desert is famous for its dry climate conditions with long summers. Groundwater needs are increasing, requiring a way to determine the location of ground water, especially in arid regions such as deserts. The parameters investigated in this research are; slope, stream networks, lithology, lineaments and topography. Thematic maps are also used by using Geographic Information Systems (GIS) and remote sensing data. The results show the potential groundwater investigated was 12.79% very good, 26.95% good, 33.05% medium and 27.21% low. Based on the chemical analysis of the groundwater conditions of the area under study, most of these cannot be consumed (drunk), they can only be used for irrigation purposes under certain conditions. The conclusion obtained, using remote sensing data and GIS techniques is a powerful tool to develop and investigate groundwater availability [7].

3.4.2. Oil and gas exploration. Fusion of optical and radar remote sensing data using Color Normalization Transformation (CNT) has been effectively implemented to further identify lithological units and geological structures, identifying lithological and structural features using remote sensing studies incorporated with surface and sub-surface geological investigations in southern Tunisia can aid exploration for new oil and gas fields. Such an approach of integrating remote sensing and in situ geological studies can be successfully adopted in other parts of North Africa and arid regions in general [17].

3.5. Identification of plants

Identification of plants relies on Sentinel 2 and Landsat 8 data, which is a popular rice farming area located at Piemonte (NW Italia). Two geometric references to soil tessellation are considered: (a) Map of local cadastral (purely administrative land criteria) and (b) maps obtained by Image segmentation of the NDVI time series (a purely spectral land division criterion) [14]. Classifying deciduous tree species using unmanned aerial vehicles (UAVs) over timber forests in Eastern Ontario. Processing image data using ENVI 5.1 software, it might be better for researchers to use satellite imagery results and compare them with unmanned aerial vehicles (UAVs). So we can get better results. Because both of these methods have advantages and disadvantages [9].

The use of drones is thriving, and their use varies. One of the most rapidly growing areas of drone use is in agriculture. The U.S. Federal Aviation Administration approved the RMAX 80kg unmanned helicopter for spraying in agriculture in 2015 [3] and already 48% of the use of unmanned aircraft for agricultural purposes, expected to grow to 80% of the market and $82 Billion in annual sales. Construction is another growth application area for drones that already offer significant savings on the cost of survey and measurement tasks [18]. The journals also review other things related to remote sensing. Including; Unmanned Aerial Vehicle for Supporting Precision Agriculture [19]. One that is a bit troublesome indeed a considerable remote sensing data storage. To describe the advancement of remote sensing technology and its application, to highlight the potential of open-access data and open source [20]. Of course this will be very helpful for researchers in obtaining data easily for the purpose of research. Moreover, it has been a lot of open science, for the advancement of Science and technology. A multi-scale representation and various combinations to detect object in optical remote sensing [21] the result show that the improved network structure can detect objects more accurately and efficiently.
The frequency of the digital imagery is determined by the process of converting the analog signal to a digital signal. If the pixel size is sufficiently wide or the sampling frequency is rare (low), the image's appearance becomes rough. If the pixel size is small or the frequency of the tight sampling (high) then the data volume will swell. With the amount of storage and bandwidth volume required when data is transmitted to another place, data compression needs to be done to facilitate the transmission and storage of imagery. Mapping vegetation through various considerations, processes and techniques. Xie [8], describe and discuss how deep learning has been applied for remote sensing [22].

4. Conclusion
There are five exploiting in the outline obtained from remote sensing technology (can also be considered six) obtained from the literature studied, namely environmental monitoring, the interpretation of closure and change of land, Mitigation and monitoring of natural disasters, resource identification, plant identification, Identification of the disease (caused by land-related (in accordance with of closure and change of land)). The most widely discussed journals of land cover and change (7 journals) Mitigation and monitoring of natural disasters and environmental monitoring (3 journals each) Identification of natural resources (2 journals) identification of vegetation (1 journal). Other journals discuss unmanned aircraft, open data sources, LIDAR, and overview to map and classify objects through remote sensing imagery. In the future, the science and technology of this remote sensing will grow more rapidly and the benefits will be felt for all areas of science. Remote sensing technology is used in providing data and information about the areas or objects studied. With increasingly high spatial resolution and faster time resolution, with images used varied such as MODIS imagery, Landsat imagery 7 & 8, IKONOS imagery, ALOS imagery certainly also needed human resources as professionals for data processing, constraints such as large volume data storage can also be addressed with advances in science and technology. So that in the future things still considered difficult to be mapped and data with remote sensing technology will be easier and efficient.

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