OIL SPILL DETECTION FROM SATELLITE IMAGES

Project Reference No.: *45S_BE_1762*

College ***:*** *K.L.E. Institute of Technology, Hubballi*
Branch ***:*** *Department of Computer Science and Engineering*
Guide(s) ***:*** *Dr. Yerriswamy T*
Student(S) ***:*** *Ms. Pooja B Kittur*
Ms. Priyanka B
Mr. Venkatesh R Mamdapur
Mr. Vrushabh I Turamari

Keywords:

Oil spill, CNN, mask-r-cnn, SAR Images

Introduction:

Oceanic oil spills are a major environmental problem; they tend to happen when pipelines break, big oil tanker ships sink, or drilling operations go wrong. Dreadful oil spill results in great damage to the marine environment and sometimes ends up destroying a complete species. Oil on ocean surfaces is harmful to many forms of aquatic life because it prevents sufficient amounts of sunlight from penetrating the surface, and it also reduces the level of dissolved oxygen. They have a serious economic impact on coastal activities, as well as on those who exploit the resources of the sea. Efficient monitoring and early identification of oil leaks are vital for the corresponding authorities to react expediently, confine the environmental pollution and avoid further damage. Because of such serious effects caused by the oil spill on the marine ecosystem we have come up with the solution to identify the oil spills in the oceans with the help of remote sensing, so that the immediate action can be taken by the environmentalists to reduce the degree of effect caused to the ecosystem.

Remote sensing through airborne or satellite platforms provides rapid and synoptic measurements of the targets, therefore has been used for decades to assess oil spills in the ocean. Optical remote sensing (ORS) of reflected sunlight has been used to assess oil spills in the ocean for several decades. Synthetic aperture radar (SAR) refers to a technique for producing fine-resolution images from a resolution-limited radar system. It requires that the radar be moving in a straight line, either on an airplane or, as in the case of NISAR, orbiting in space. Synthetic aperture radar (SAR) images have attracted much attention due to their all-weather operation, high spatial resolution, and recent improvements in processing these images. Earth Observation (EO) satellites produce a large number of SAR images every day. It is a difficult task to find useful information from these SAR images quickly and accurately.

Objectives:

Synthetic Aperture RADAR (SAR) images are found to be an effective tool for detecting the oil spill. Manually identifying the oil spill in SAR images is a tedious task. As the color spectrum in sar image is very narrow hence it becomes very difficult for the naked eye to

identify the oil spill. Even if manual identification of the oil spill was possible the quantity of images produced by the satellite every day is huge hence going through each and every image to identify the oil spill is a time and energy consuming task.

So the main objective of this project is to attempt to develop a machine learning based solution to detect the oil spill from the dark patch. Develop and evaluate machine learning models to differentiate between oil spills and other sea surface. Creating and evaluating machine learning models that adopt automatic selection criteria which pollute areas from the images.

Methodology:

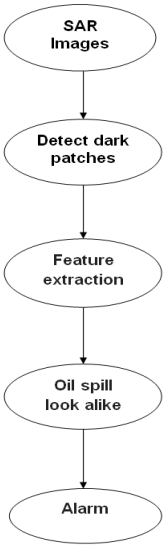

Figure 1: Methodology proposed for oil spill detection

1. **SAR Images:** The ability of SAR images to provide high resolution information about the observed scene enable them as a popular data for detecting oil spill. The licensed SAR data for our project is provided by “Multimedia Knowledge and Social Media Analytics Lab” obtained through request to the lab by our guide.

2. **Detecting the dark patches:** RADAR backscatter results in the appearance of oil spill as a dark patch. Unfortunately, dark patches also appear because of other natural phenomena and thus detection of dark patches becomes challenging. These unwanted dark patches are referred to as look-alikes. Therefore, a pre-processing technique is to be selected to accurately segment the region of interest. Along the side we need also to locate the suspected oil spill area. Another challenge in the stage is speckle noise, which can be suppressed using filters.

3. **Feature extraction:** Machine learning algorithms rely on features and the feature extraction is a challenging task. Appropriate features and number of features defines the complexity and accuracy of the classification algorithms.

4. **Classification:** Machine learning is a popular tool for classification. Many algorithms are proposed in the literature and the final stage is to propose a classification algorithm suitable for detecting the oil spill.

5. **Alarm:** The final stage is to develop a method to raise an alarm to the concerned authorities with location information and oil spread data.

Conclusion:

The conclusion is to detect the oil spill in the ocean is to develop a machine learning algorithm which segments the SAR images based on the type of area. The segmented area is then classified based on the color and then locating the oil spill in the classified images based on the color assigned to it.

Scope for future work:

Due to the oil spill in the ocean the death rate of endangered animals and plants is increasing. When exposed to oil, adult fish may experience reduced growth, enlarged livers, and changes in heart and respiration rates, fin erosion, and reproduction impairment. Fish eggs and larvae can be especially sensitive to lethal and sublethal impacts. This project is done to help the environmentalists and the officials to take immediate action and to save the marine ecosystem.