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THE OIL SPILL TRAJECTORY AND FORECASTING ON THE OCEAN SURFACE BY DEEP LEARNING AND CNN ALGORITHM

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ABSTRACT

Oil spills are a very dangerous occurrence for marine ecosystem is affected and the marine life-forms' existence gets unnecessarily threatened. Oil destroys the insulating ability of fur-bearing mammals, such as sea otters, and the water repellency of a bird's feathers, thus exposing these creatures to the harsh elements. Without the ability to repel water and insulate from the cold water, birds and mammals will die from hypothermia, as a result, it becomes important to employ various oil spill cleanup methods. In our system we may automatically detect & cleaning the oil in the sea water by using a modern technique. In this paper, we present a CNN architecture for semantically segmenting SAR images into multiple classes. The proposed CNN is specifically designed to run on remote embedded systems, which have very limited hardware capability and strict limits on power consumption. Even if the performance in terms of results accuracy does not represent a step forward compared with previous solutions, the presented CNN has the important advantage of being able to run on remote embedded systems with limited hardware resources while achieving good performance. The presented CNN is compatible with dedicated hardware accelerators available on the market due to its low memory footprint and small size. So that the amount of data that needs to be transmitted to ground and processed on ground can be substantially reduced, which will be greatly beneficial in significantly reducing the amount of time needed for identification of oil spills from SAR / real-time images and send SMS alert. And IoT devices equipped with GPS modules are deployed in strategic locations to monitor for oil spills. These devices are capable of collecting GPS location data.

Keywords: CNN architecture, SMS alert, Ecological disasters and SAR images

1.INTRODUCTION

Oil spills, caused by accidents or by ships cleaning their tanks, represent big threats for maritime and coastal ecosystems health. For many years, oil spills have posed a huge and inescapable threat to the seas and oceans. Oil spills caused by the purposeful or unintentional discharge of liquid petroleum hydrocarbons into water are to blame for a number of ecological disasters, which disrupt the marine life cycle as well as degrade the productivity and quality of the marine environment, posing significant environmental dangers.

1.1 OIL SPILL

Ocean environment plays an important role in global ecosystems, while oil spill is one of the main sources of marine pollution. It is necessary to monitor the sea surface and realize oil spill detection. Marine environmental monitoring since it could work at all-weather and all-time, has attracted the attention of a large number of researchers. SAR images cover large areas, the gray level of pixels on the image when the oil spill layer forms on the sea, it usually floats on the water surface, thus dampening capillary waves, short gravity waves and Bragg scattering, and exists as dark spots on the SAR image. However, environmental factors such as low-winds, internal wave and biogenic films are also presented in the form of dark spots, which affect the detection results, so how to distinguish oil spill areas from these look-alikes becomes the focus of research. Several machine learning methods have been proposed. Early studies used texture information and morphology features of dark spots as criteria, adopted different classification methods to identify oil spill areas. The main problem of morphology and texture analysis is the extraction of dark spots---it's hard to draw their edges accurately, so researchers turned their attention to polarization information. Fully polarized SAR data can be expressed in oil areas. At the same time some researchers began to use machine learning method to detect oil spill. As a kind of feed forward neural network, convolutional neural network (CNN) has excellent performance in image processing, which was first proposed in. Traditional convolutional neural network consists of convolution layer, pooling layer and full connection layer: due to the large amount of parameters of full connection layer, it has the disadvantages of long time cost, while the recent study have proved that using CNN layer proposed in instead of full connection layer can greatly improve computing speed The ability of refined CNN with GAP layer for oil spill detection with fully plyometric SAR data SAR images, and the ability of the above parameters for identifying oil spill areas are tested. Oil spill accidents usually occur in areas with advanced marine environments. Therefore, it's onerous to directly enter the impure space to wash or build observations within the early stage. Such events typically last day's weeks, or maybe months, thus continuous observations are required to review the spreading of oil spills and the way abundant they impact environmental safety. The artificial Aperture measuring device (SAR) are often considered a detector accustomed live the ocean surface roughness. Ocean surfaces lined with oil films seem dark in SAR pictures as a result of the capillary waves and short gravity waves that contribute to the ocean surface roughness are damped by the physical phenomenon of oil films However, several oceanic and atmospherically phenomena aside from oil spills can also scale back the ocean surface roughness and seem dark in SAR pictures. A typical process framework for automatic SAR oil spill detection.

Typically contains roughly 3 steps. The primary step is to get dark patches from SAR pictures by a picture segmentation algorithmic program, the second step is to extract options from these dark patches to make a feature extraction, and therefore the third step is to coach is detecting the picture of images. The obtained classifier will then be accustomed establish oil spills and lookalikes within the dark patches extracted from SAR pictures by identical segmentation algorithmic program classification algorithms are developed for SAR oil spill detection Deep learning (DL), like the model used a Convolutional Neural Network (GCNN) oil spill emulsion. The CNN was trained with 800 samples and obtained a recognition then designed a two-stage Convolutional Neural Network (TSCNN) to classify the pixels of a Side-Looking system device (SAR) image oil spill, No oil spill coastal, or ocean water. This can be truly a segmentation algorithmic program since it works at a constituent level. The CNN achieved Associate in oil spill detection supported an information set of 533 SAR pictures. Projected an awfully deep Residual Encoder-Decoder Network (RED-Net) to section out the oil spill from SAR, that obtained a though there's no accepted definition for a way several layers represent a "deep" learner, a typical deep network ought to generally embrace a minimum of four or 5 layers from this time have read, the layers of the deciliter networks mentioned higher than are all comparatively shallow. So far, we've got not seen a deciliter network for SAR oil spill detection with quite five weight layers (including convolutional layers and Fully Connected layers (FCs).

2. LITERATURE SURVEY

1. Xiong Yaohua Meng Xudong et al proposed "A SAR Oil Spill Image Recognition Method Based on Dense Net Convolutional Neural Network" IEEE-2019

Synthetic Aperture Radar (SAR) satellites can monitor oil spills at sea. Due to the small difference of SAR image features between oil film and oil-like film, a dense connection network model based on Dense Net convolution neural network is proposed in this paper. The model extracts multi-scale features of the image, and improves the ability of capturing subtle features of the image and the accuracy of classification and recognition before reusing the features of each convolution layer. After filtering and denoising, the original oil spill SAR image is input into CNN network. Then the feature of SAR image is extracted by using CNN model. Finally, the feature is classified by using Soft-max. Experiments using ERS-2 SAR image data prove the effectiveness of this method in identifying "oil slicks" and "oil like slicks" images.

2.Tao Chen Shijian Lu et al proposed "Subcategory-Aware Feature Selection and SVM Optimization for Automatic Aerial Image-Based Oil Spill Inspection" IEEE-2017

Oil spill inspection is critical to the marine and coastal ecosystems, and has been widely studied by various remote sensing technologies, such as synthetic aperture radar and hyper spectral. To improve the temporal resolution and the inspection flexibility, we propose a novel aerial image-based system that can find oil spills timely from images captured using onboard optical cameras installed in unmanned aerial vehicle or airplanes. In particular, a subcategory-aware feature selection (FS) and support vector machine (SVM) joint optimization technique is proposed to learn a discriminative model that can tell the existence of oil spills within an optical image of the marine surface. A set of color-based features is first extracted and concatenated together to characterize the oil spill incidence in an image, where a new color autocorrelogram is designed, which can better describe each color's spatial distribution in an image. Furthermore, subcategory-aware joint FS and SVM optimization technique is designed, which is capable of generating the optimal feature subset and SVM component models. Experiments on a set of real-world marine surface images show that the proposed technique outperforms the state-of-the-art techniques and achieves promising results for aerial image-based oil spill inspection.

3.Tingyu Meng Xiaofeng Yang Kun-Shan Chen et al proposed "Radar Backscattering Over Sea Surface Oil Emulsions: Simulation and Observation" IEEE-

Oils floating on the sea surface can be observed as "dark" patches on radar images since the backscattered signals from the contaminated area are reduced in two dominant ways. First, oil slicks could damp short gravity and capillary waves on the sea surface responsible for backscattering energy. Second, the oil-covered sea surface permittivity decreases significantly if the oil film is sufficiently thick or mixed with seawater, i.e., oil emulsion. In this article, the geometry of the oil-covered sea surface is accounted for by the damping of sea waves, which is described by the model of local balance (MLB) combined with the sea wave spectrum. The radar backscattering is predicted by the advanced integral equation method (AIEM) model. The reflection coefficients are calculated based on a layered-medium model to analyze the impact of oil thickness and emulsions on the radar scattering. Numerical simulations demonstrate that.

4. Ali Alenezi Ali Abdi et al proposed "On Multiple Wireless Channels in Oil Wells Drill Strings" IEEE-2017

Wireless communication of information in oil wells is a key component of drilling operations. For cost-effective, fast, and low-risk drilling, information such as temperature, pressure, etc., should be transmitted from downhole to the driller on the surface. Data transmission through drill strings and via sound signals is a feasible approach. However, due to the superposition of many reflections from tool joints connecting pipes in the drill string, it behaves similarly to a multipath wireless channel with strong signal fades. Here, we study multichannel reception using several receivers to improve communication system performance. We propose a strain sensor and a tri-axial accelerometer as a four-channel receiver. Given the complexity of studying the strain channel and the three acceleration channels analytically, we conduct experiments to obtain these channel impulse responses. Our measurements show that these wireless channels are nearly uncorrelated, and therefore, can provide diversity gain. This is further confirmed by presenting low bit error rates that this system provides. Comparison with single channel receivers shows the usefulness of the proposed system for wireless communication via drill strings.

5. Suman Singha Rudolf Ressel et al proposed "A Combination of Traditional and Polarimetric Features for Oil Spill Detection Using TerraSARX"IEEE-2016.

Synthetic aperture radar (SAR) images are operationally used for the detection of oil spills in the marine environment, as they are independent of sun light and weather-induced phenomena. Exploitation of radar polarimetric features for operational oil spill detection is relatively new and until recently those properties have not been extensively exploited. This paper describes the development of an oil spill detection processing chain using coherent dual-polarimetric (copolarized channels, i.e., HH-VV) TerraSAR-X images. The proposed methodology focuses on offshore platform monitoring and introduces for the first time a combination of traditional and polarimetric features for object-based oil spill detection and look-alike discrimination. A total number of 35 feature parameters were extracted from 225 oil spills and 26 look-alikes and divided into training and validation dataset.

Mutual information content among extracted features have been assessed and feature parameters are ranked according to their ability to discriminate between oil spill and look-alike. Extracted features are used for training and validation of a support vector machine-based classifier. Performance estimation was carried out for the proposed methodology on a large dataset with overall classification accuracy of 90% oil spills and 80% for look-alikes. Polarimetric features such as geometric intensity, copolarization power ratio, span proved to be more discriminative than other polarimetric and traditional features.

3.SYSTEM DESIGN

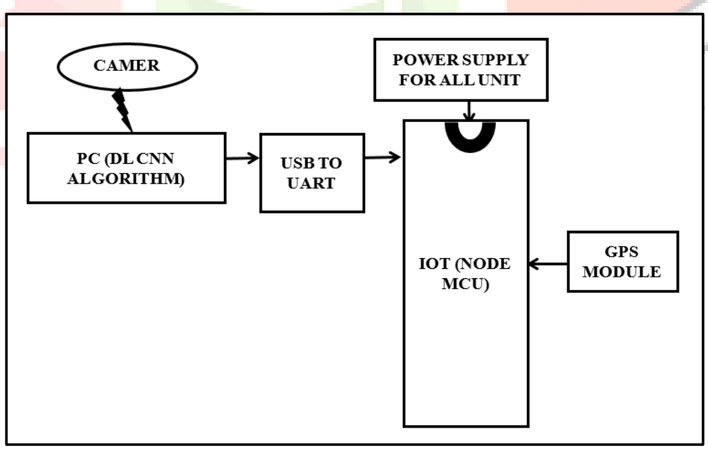
3.1 EXISTING SYSTEM

This existing system is a mathematical model based on the law of motion for predicting the trajectory of an oil spill on the ocean's surface using the random walk method. The existing system processes SAR images for speckle noise removal, dark spot detection, feature extraction, and classification of dark spots as oil spills and lookalikes for comparability. Utilizing the centroid skill score metric, the accuracy of prediction is assessed, and the results of the model's predictions are compared. The model's outcomes are found to be in strong agreement with the SAR images that are currently available.

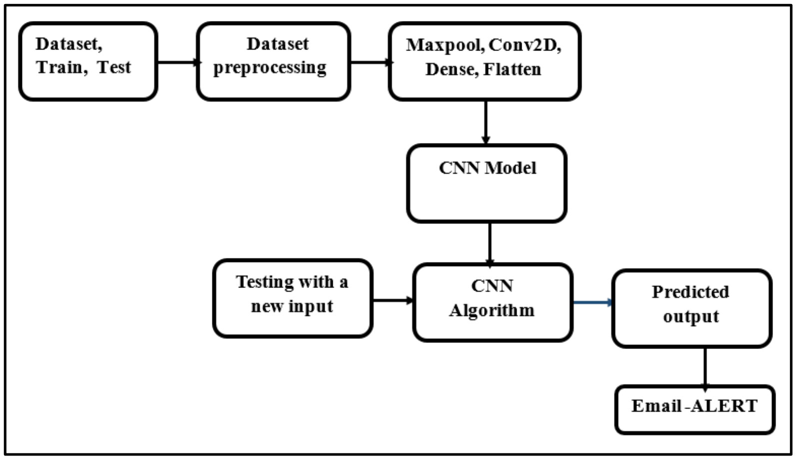
3.2 PROPOSED SYSTEM

In this paper we approach a new method of Deep Learning Algorithm Convolutional Neural Network for the detection of oil spill area on the sea shore without contact. Safety, Capital and human cost is most valuable thing. Risking of human lives is not acceptable. So, it is a need to find an outcome for reducing the mortality of lives of aqua birds and animals. Oil can kill surface-dwelling animals and birds by poisoning or suffocation, as well as affecting buoyancy and natural waterproofing. The proposed system overcomes the existing contact methods and replaces it by high definition imaging cameras. The Feature Extraction gives us a broad view about the image which is captured and help us to process the image for preprocessing. The given system has overcome the errors and has higher efficiency than the current image processing Methods. By the usage of multiple hidden layers such as conv2D, maxpoolD, Flatten and Dense the area of the oil spill is detected, the area is calculated and it can be viewed by the user in the shell of python. And IoT devices equipped with GPS modules are deployed in strategic locations to monitor for oil spills. These devices are capable of collecting GPS location data.

3.3 PROPOSED BLOCK DIAGRAM



3.4 ARCHITECTURE DIAGRAM



3.5 MODULE DESCRIPTION

Image Dataset Collection
Image Preprocessing
Importing Modules
Training Dataset
Camera Interfacing

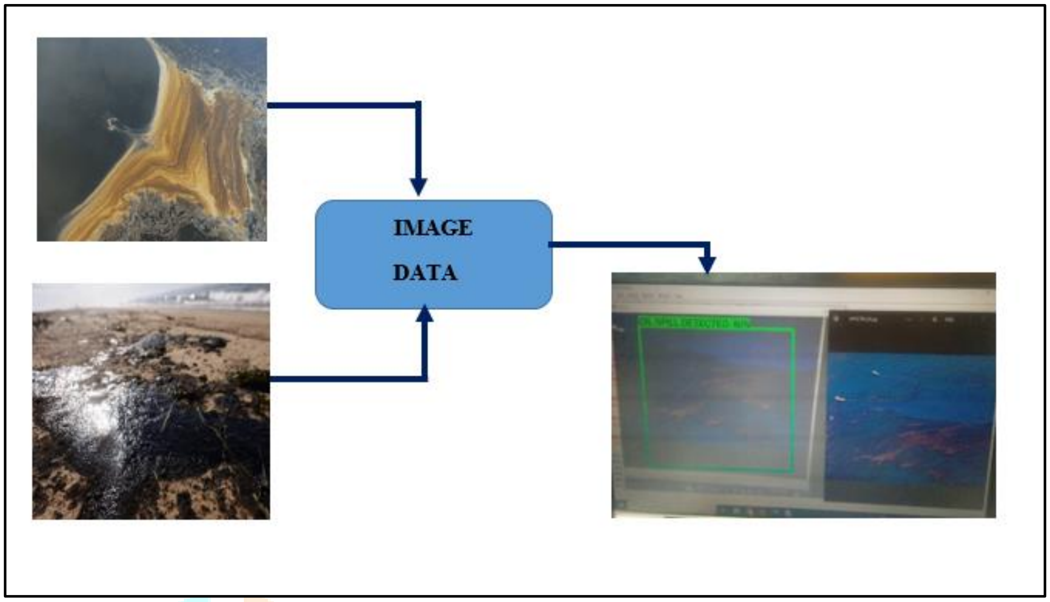
3.6 SOFTWARE DESCRIPTION

Python
Opencv
Pillow
Pytesseract

4. RESULT AND DESCUSION

Oil spill detection using Convolutional Neural Networks (CNNs) involves training a neural network model to detect the presence of oil spills and No oil spill images. The results of using CNNs for oil spill detection can be very accurate and can provide a fast and efficient means of detecting spills. In terms of discussion, there are several factors to consider when evaluating the results of oil spill detection using CNN. Once the model is trained, it can be applied to new satellite imagery to quickly identify the extent and severity of an oil spill. This information can be used by response teams to plan and allocate resources for cleanup and mitigation efforts. It is important to note that while a CNN can be an effective tool for detecting oil spills. The detected oil spills can be analyzed in terms of their severity, size, and potential impact on the environment. The Cayenne app can provide detailed information about GPS location. Users can explore individual incidents to assess the severity and devise appropriate response strategies.

5. OUTPUT - OIL SPILL



6. CONCLUSION

Oil spills are a major environmental and economic problem that can have severe consequences for marine life, coastal communities, and industries such as fishing and tourism. They occur when oil is released into the environment, either through human activities or natural disasters. The use of CNNs for oil spill detection has shown promising results, but there are still factors to be considered for further improvement. By using high-quality training data and carefully selecting the appropriate model architecture, the accuracy and speed of oil spill detection using CNNs can be further improved. CNN-based oil spill detection system with IoT, GPS location, cloud technology, and the Cayenne app offers a powerful solution for monitoring and responding to oil spills. The system enables real-time detection, analysis, and visualization of oil spills.

7. REFERENCE

1. Mohsin Karovaliya, Saifali Karedia, Sharad Oza, Dr.D.R. Kalbande, "Enhanced Security for ATM machine with OTP and facial recognition features," International Conference On Advanced Computing Technologies and Applications (I CATA- 2015).
2. W. A. Shier, S. N. Yanushkevich "Biometrics in Human- Machine Interaction," The International Conference On Information and Digital Technologies2015.
3.Joyce Soares, A. N. Gaikwad "A Self Banking Biomtric M/C with Fake Detection Applied to Fingerprint and Iris along with GSM Tech. for OTP," International Conference on Communication and Signal Processing, April 6-8, 2016, India.
4.Samarth Bharadwaj, Mayank Vatsa* and Richa Singh, "Biometric quality: a review of fingerprint, iris, and face," Bharadwaj et al. EURASIP Journal onImageandVideoProcessing2014,2014:34http://jivp.eurasipjournals.com/content/ 2014/1/34.
5.Ekberjan Derman#1, Y. Koray Gecici#2, Albert Ali Salah*, "SHORT TERM FACE RECOGNITION FOR AUTOMATIC TELLER MACHINE (ATM) USERS," 978-1-4799-3343- 3/13/$31.00 ©2013IEEE.
6.Yun Yang, JiaMi, "ATM terminal design is based on fingerprint recognition," 978-1-4244-6349-7/10/$26.00 ©201 0 IEEE.
7.http://www.360biometrics.com/faq/fingerprint_scanners.phpL ast seen 02 Sept2017
8.Joyce Soares, A.N. Gaikwad, "Fingerprint and Iris Biometric Controlled Smart Banking Machine Embedded with GSM Technology for OTP," 2016(ICACDOT).
9.Shweta Singh, Akhilesh Singh, Rakesh Kumar, "A Constraint- based Biometric Scheme on ATM and Swiping Machine," 2016 International Conference on Computational Techniques in Information and Communication Technologies(ICCTICT).

10.Iwasokun Gabriel Babatunde, Munda Josiah Lange, Akinyokun Oluwole Charles, Dehinbo Johnson Olumuyiwa, “Experimental Study of Thumbprint-Based Authentication Framework for ATM Machines,” Science and Information Conference 2014 August 27-29, 2014 | London, UK.

11.J. F. Penner and D. G. Long, “Ground-Based 3D radar imaging of trees using a 2D synthetic aperture,” Electronics, vol. 6, no. 1, pp. 1–13, Jan. 2017. [13]

12.F. M. Bianchi, O. Martine, M. Espeseth, and N. Borch, “Large-Scale detection and categorization of oil spills from SAR images with deep learning,” Remote Sens., vol. 12, no. 14, Jul. 2020, Art. no. 2260. [14]

13.D. Malmgren-Hansen and M. Nobel-Jorgensen, “Convolutional neural networks for SAR image segmentation,” in Proc. IEEE Int. Symp. Signal Process. Inf. Technol., 2015, pp. 231–236. [15].

14.J. Zhang, H. Feng, Q. Luo, Y. Li, J. Wei, and J. Li, “Oil spill detection in quad- polarimetric SAR images using an advanced convolutional neural network based on superpixel model,” Remote Sens., vol. 12, no. 6, pp. 1–26, Mar. 2020.

15.T. Y. Lin, P. Dollár, R. Girshick, K. He, B. Hariharan, and S. Belongie, “Feature pyramid networks for object detection,” in Proc. IEEE Conf. Comput. Vis. Pattern Recognit., 2017, pp. 936–944. [21]