**PROJECT SYNOPSIS**

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| DEPARTMENT | Computer Science and Engineering | | | |
| TITLE OF THE PROJECT | Change detection in aerial scenarios | | | |
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| MINI - PROJECT TIMELINE  (Tentative Start date- End Date) | August 2019 to May 2020 | | | |
| PROJECT GUIDE | Dr. Shubha Bhatt | | | |
| Field of PROJECT | (ML/AI /Deep Learning/Computer Vision) | | | |
| PROJECT INTRODUCTION | Object detection in aerial images aims at locating objects of interest (e.g., vehicles, airplanes) on the ground and identifying their categories. With more and more aerial images being available, object detection in aerial images has been a specific but active topic in computer vision. However, unlike natural images that are often taken from horizontal perspectives, aerial images are typically taken from bird’s-eye view, which implies that objects in aerial images are always arbitrary oriented. Moreover, the highly complex backgrounds and variant appearances of objects further increase the difficulty of object detection in aerial images.  The image change detection using stereo imagery and digital surface model (DSM) technique uses a two different dates images we can also detect changes from multispectral images. Such a change is detected by using an image processing tool box in a OpenCV. Previously developed change detection method for medium resolution of satellite images is not efficient for high resolution images. When the real land cover changes are mixed with irrelevant changes. To detect an image changes, it is necessary to do DSM co-registration to avoid the any shift in two images due to different angle of camera. The effect of shadow and vegetation can be removed by using image refinement. For two different dates panchromatic images are obtained because it produces a realistic reproduction of a scene as it appears to the human eye. There are different methods to generate a DSM by using a tool like OpenCV, Geomatica etc. Erdas Imagine software can also be used to detect an image change. Before proceeding to DSM first the thresholding is done on an image. Hough transform is used for detection of randomly shapes in an image. Sobel edge detection algorithm is used for detection of edges in an image. The high-resolution remote area image can be obtained by TerraSAR-X, Region view and Drone Data. The image from Drone satellite is considered in this project. Image change detection can be implemented by based on information measure. | | | |
| Literature Survey Summary | The base papers that we have chosen are “IMAGE CHANGE DETECTION USING STEREO IMAGERY AND DIGITAL SURFACE MODE” written by Roshan V Patil and Dr.D.J.Pete Department of Electronics &Telecommunication Datta Meghe college of Engineering and “LEARNING ROI TRANSFORMER FOR ORIENTED OBJECT DETECTION IN AERIAL IMAGES” written by Jian Ding, Nan Xue, Yang Long, Gui-Song Xia, Qikai Lu.  The first paper deals with the design and implementation of change detection of images in aerial scenarios. The paper deals with detecting the changes that takes place in the images that are taken at two different times.  A change detection system takes as input two images of a region captured at two different times, and predicts which pixels in the region have undergone change over the time period. Since pixel-based analysis can be erroneous due to noise, illumination difference and other factors, contextual information is usually used to determine the class of a pixel (changed or not). This contextual information is taken into account by considering a pixel of the difference image along with its neighborhood. With the help of ground truth information, the labeled patterns are generated. Finally, Broad Learning classifier is used to get prediction about the class of each pixel. Results show that Broad Learning can classify the data set with a significantly higher F-Score than that of Multilayer Perceptron. Performance comparison has also been made with other popular classifiers, namely Multilayer Perceptron and Random Forest.  This Paper cannot detect changes in a video file and does not use cloud to train the model.  The second paper deals with object detection in image real-time. YOLO algorithm is used to train the model and get results with good accuracy. The frames are processed at a speed of 21 frames/sec.  The YOLO algorithm is faster and achieves the same results with same accuracy. | | | |
| PROJECT Problem STATEMENT and challenges | Detecting the objects in real-time and regions of changes in the images of the same scene taken at different time is of widespread interest due to a large number of application in diverse disciplines.  Challenges:   * If the Image resolution is low then the conversion of pixel and detection of objects becomes very difficult. * In digital surface model it is necessary to do DSM co-registration   To avoid any shift in two images due to different angles of camera.   * Training Model is difficult as it is stored and processed in cloud. * It is difficult to detect the changes in videos. * It is difficult to get high resolution images as much as an eye can resolute. * It is difficult to detect multiple objects in real-time. | | | |
| OBJECTIVEs OF THE PROJECT | * To understand different Image processing algorithms: * To learn the fundamental concepts of Digital Image Processing using machine learning and neural networks. * Use the image processing algorithms to detect the changes in the two images taken at different time. * To analyze the changes that takes in images and recommending actions particularly. * To Identify the objects in an image and name them. | | | |
| Proposed Solution | Video Data Video Data  (at time t1) (at time t2)  Converting the video Converting the video  Into Images Into Images  Digital Surface Model 1 Digital Surface Model 2    Differencing the Image    Change Analysis  Change Detection | | | |
| PlaTform that will be used for implementation | OpenCV using virtual machine on cloud services. | | | |
| Python | | | |
| Raw video Data | | | |
| Demonstration Details | Demonstrated Using Graphical User Interface | | | |
| System Diagram | Start  Get video or image Location  Get IP, port and other information  Training Model  Process file  Process Stream  Display Results in output window  Generate and Display report | | | |
| aAre THERE any standard datasets available | Yes, a set of video data is available From DRDO | | | |
| PReferences | 1. Jiaojiao Tian, Shiyong Cui, and Peter Reinartz, “Building Change Detection Based on Satellite Stereo Imagery and Digital Surface Models,”IEEE Trans. on Geoscience and Remotesensing,vol.52,no.1,pp.406-417,Jan2014.  2. Gong Cheng, Peicheng Zhou, and Junwei Han. Learning rotation-invariant convolutional neural networks for object detection in VHR optical remote sensing images. IEEE Trans. Geosci. Remote Sens., 54(12):7405–7415, 2016  3. L. Gueguen, P. Soile, and M. Pesaresi, “Change detection based on information measure,” IEEE Trans. Geosci. Remote Sens., vol. 49, no. 11,pp. 4503–4515, Nov. 2011.  4 Seyed Majid Azimi, Eleonora Vig, Reza Bahmanyar, Marco K¨orner, and Peter Reinartz. Towards multi-class object detection in unconstrained remote sensing imagery. arXiv:1807.02700, 2018.  5. Jiaojiao Tian, Houda Chaabouni-Chouayakh, Peter Reinartz, “3D Building Change Detection from High Resolution Space borne Stereo Imagery,” German Aerospace Center (DLR), Remote Sensing Technology Institute, 82234 Wessling, Germany. | | | |