**DAILY ASSESSMENT FORMAT**

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| **Date:** | **01/07/2020** | **Name:** | **Vidul Sambhaji Chavan** |
| **Course:** | **IIRS OUTREACH PROGRAMME** | **USN:** | **4AL17EC095** |
| **Topic:** | **Concepts of Satellite photogrammetry** | **Semester & Section:** | **6th sem ‘B’ sec** |
| **Github Repository:** | **Vidul-chavan** |  |  |

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| **FORENOON SESSION DETAILS** |
| **Report:**  Satellite Derived Bathymetry (SDB) is being adopted as a cheaper and more spatially extensive method for bathymetric mapping than traditional acoustic surveys, with research being conducted by the Canadian Hydrographic Service under a Government Related Initiatives Program (GRIP) of the Canadian Space Agency. Established SDB methods involve either an empirical approach, where a regression between known depths and various color indexes is developed; or a physics-based Radiative Transfer Model (RTM) approach, where light interactions through the water column are simulated. Both methods have achieved vertical accuracies of around 1 m. However, the empirical approach is limited to areas with existing in-situ depth data, and has limited applicability in heterogeneous benthic environments, while the physics-based approach requires precise atmospheric correction. This paper proposes a through-water photogrammetric approach which avoids these limitations, in heterogeneous seafloor environments, by using feature extraction and image geometry rather than spectral radiance to estimate bathymetry. The method is demonstrated in Coral Harbour, Nunavut, Canada using a WorldView-2 stereo pair.  A standard photogrammetric extraction was performed on the stereo pair, including a blunder removal and noise reduction. Apparent depths were then calculated by referencing under-water points to the extracted elevation of the water-line. Actual in-image depths were calculated from apparent depths by applying a correction factor to account for the effects of refraction at the air-water boundary. A tidal reduction brought depths to local chart datum, allowing for validation with Canadian Hydrographic Service survey data showing a mean error of 0.031 m and an RMSE of 1.178 m. The method has a similar accuracy to the two established SDB methods, allowing for its use for bathymetric mapping in circumstances where the established methods are not applicable due to their inherent limitations.  Photogrammetry is used in fields such as topographic mapping, architecture, engineering, manufacturing, quality control, police investigation, cultural heritage, and geology.  Satellite images are one of the most powerful and important tools used by the meteorologist. They are essentially the eyes in the sky. These images reassure forecasters to the behavior of the atmosphere as they give a clear, concise, and accurate representation of how events are unfolding.  Photogrammetry is primarily concerned with making precise measurements of three-dimensional objects and terrain features from two-dimensional photographs. ... Two general types of photogrammetry exist: aerial (with the camera in the air) and terrestrial (with the camera handheld or on a tripod).  The Photogrammetry is a surveying and mapping technique which has several applications in the Transportation Department. ... The photogrammetric process consists of proper project planning, image retrieval, image processing, control data for image adjustment, data accumulation and presentation of an end product results.  involves estimating the 3D coordinates of points on an object (the face, in our case), employing measurements made in two or more photographic images taken from different positions. The image is calculated from a collection of points obtained along an x, y, and z coordinate system.  Common points are identified on each image. A line of sight (or ray) can be constructed from the camera location to the point on the object. It is the intersection of these rays (triangulation) that determines the three-dimensional location of the point. More sophisticated algorithms can exploit other information about the scene that is known a priori, for example symmetries, in some cases allowing reconstructions of 3D coordinates from only one camera position.  Photos can clearly define the edges of buildings when the point cloud footprint cannot. It is beneficial to incorporate the advantages of both systems and integrate them to create a better product.  Photogrammetry appeared in the middle of the [19th century](https://en.wikipedia.org/wiki/19th_century), almost simultaneously with the appearance of [photography](https://en.wikipedia.org/wiki/Photography) itself. The use of photographs to create [topographic maps](https://en.wikipedia.org/wiki/Topographic_map) was first proposed by the French surveyor [Dominique F. Arago](https://en.wikipedia.org/wiki/Fran%C3%A7ois_Arago) in about 1840.  The term photogrammetry was coined by the Prussian architect Albrecht Meydenbauer, which appeared his 1867 article "Die Photomicrography." There are many variants of photogrammetry. One example is the extraction of three-dimensional measurements from two-dimensional data (i.e. images); for example, the distance between two points that lie on a plane parallel to the photographic [image plane](https://en.wikipedia.org/wiki/Image_plane) can be determined by measuring their distance on the image, if the [scale](https://en.wikipedia.org/wiki/Scale_(map)) of the image is known. Another is the extraction of accurate [colour](https://en.wikipedia.org/wiki/Color) ranges and values representing such quantities as [albedo](https://en.wikipedia.org/wiki/Albedo), [specular reflection](https://en.wikipedia.org/wiki/Specular_reflection), [metallicity](https://en.wikipedia.org/wiki/Metallicity#Photometric_colors), or [ambient occlusion](https://en.wikipedia.org/wiki/Ambient_occlusion) from photographs of materials for the purposes of [physically based rendering](https://en.wikipedia.org/wiki/Physically_based_rendering). |

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