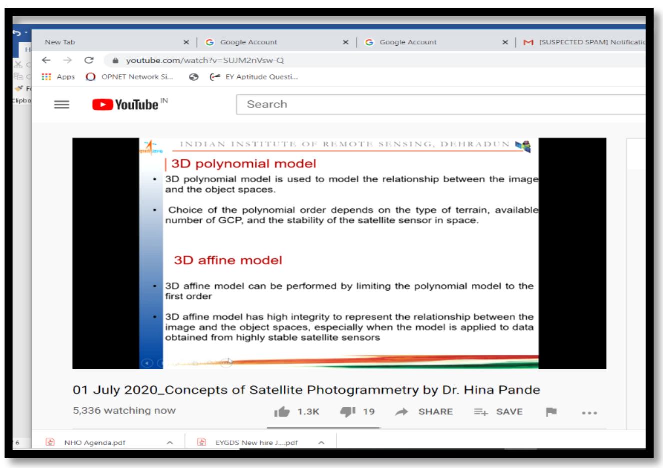
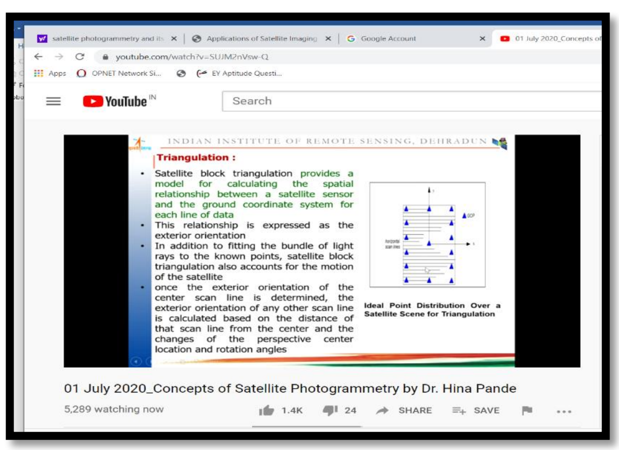
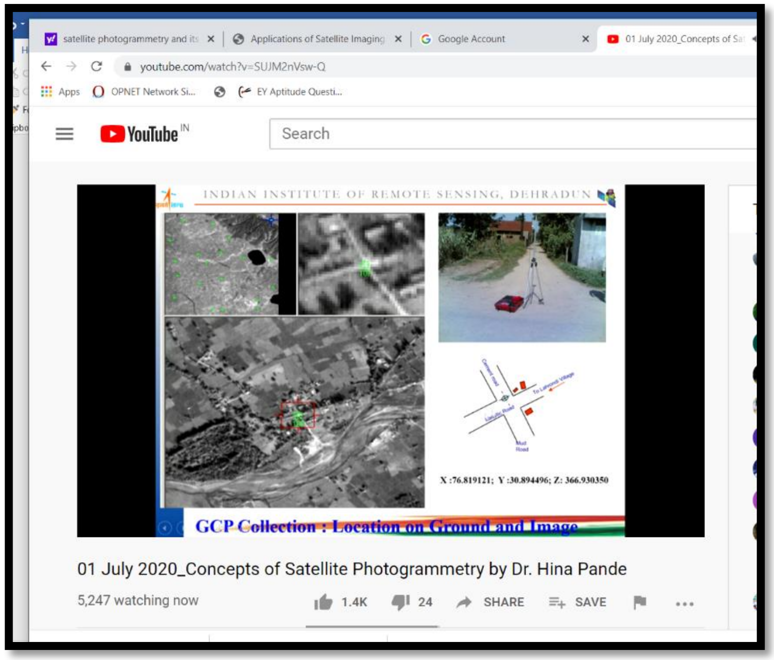
DAILY ASSESSMENT

Date:	**01/07/2020**	**Name:**	**Davis S. Patel**
Course:	**IIRS Outreach Programme on "Satellite Photogrammetry and its Applications"**	**USN:**	**4AL16EC045**
Topic:	**Concepts of Satellite Photogrammetry**	**Semester & Section:**	**8th - A**
GitHub Repository:	**Davis**		

FORENOON SESSION DETAILS
Image of session







REPORT –

Photogrammetry, as its name implies, is a 3-dimensional coordinate measuring technique that uses photographs as the fundamental medium for metrology (or measurement). The fundamental principle used by Photogrammetry is triangulation or more specifically called Aerial Triangulation. By taking photographs from at least two different locations, so-called “lines of sight” can be developed from each camera to points on the object. These lines of sight (sometimes called rays owing to their optical nature) are mathematically intersected to produce the 3-dimensional coordinates of the points of interest.

Remote Sensing is a closely aligned technology to photogrammetry in that it also collects information from imagery. The term is derived from the fact that information about objects and features is collected without coming into contact with them. Where remote sensing differs from photogrammetry is in the type of information collected, which tends to be based on differences in color, so land use and land cover is one of the primary output of remote sensing processing. Remote sensing was originally conceptualized to exploit the large number of color bands in satellite imagery to create 2D data primarily for GIS. Nowadays remote sensing tools are used with all types of imagery to assist in 2D data collection and derivation, such as slope. Software tools today tend to hold a much wider range of image technologies such as image mosaicing, 3D visualisation, GIS, radar as well as softcopy photogrammetry.

Spatial resolution describes the ability of a sensor to identify the smallest size detail of a pattern on an image. In other words, the distance between distinguishable patterns or objects in an image that can be separated from each other and is often expressed in meters.

Spectral resolution is the sensitivity of a sensor to respond to a specific frequency range (mostly for satellite and airborne sensors). The frequency ranges covered often include not only visible light but also non-visible light and electromagnetic radiation. Objects on the ground can be identified by the different wavelengths reflected (interpreted as different colours) but the sensor used must be able to detect these wavelengths in order to see these features.

Radiometric resolution is often called contrast. It describes the ability of the sensor to measure the signal strength (acoustic reflectance) or brightness of objects. The more sensitive a sensor is to the reflectance of an object as compared to its surroundings, the smaller an object that can be detected and identified.

Temporal resolution depends on several factors–how long it takes for a satellite to return to (approximately) the same location in space, the swath of the sensor (related to its ‘footprint’), and whether or not the sensor can be directed off-nadir. This is more formally known as the ‘revisit period’.

Historical perspective, Metric camera, Aerial photography; Statement of fundamental problem of Photogrammetry in state space formulation, Relation between Image and Object spaces; Space based platforms for Earth/Planetary observations, their classification; Satellite Orbits, their classification, formulation of orbital constraint, Space based imaging and ranging sensors, their geometric modeling; Platform attitude, platform stability, modeling of platform attitude with time; Formulation of observation equation for orbit constrained imaging; Stereo Photogrammetry from Space, Single orbit multiple devices, Multiple Orbit- Single device, Single device-single orbit-multiple imagings, Formulation of stereo observation equations for these cases with examples; Bundle adjustment; Practical uses of Satellite Photogrammetry; Characterization of sources of error based on measurements on images; Characterization of platform stability from image measurements; Approximations of Photogrammetric model by Rational Polynomial Coefficients; Specific case studies based on Indian Earth and planetary observation satellites Cartostat 1, Chandrayaan 1; Digital Elevation Model of Earth/Planetary topography from Space based observations like Cartosat-1, ASTER, SRTM, Chandrayaan-1; its characteristics and limitations; Orthocorrection of Space Imagery.

Remote Sensing Applications by Instrument

Wind Scatterometer (WSC) Applications

Wind scatterometers use accurate measurements of the radar backscatter from the ocean surface when illuminated by a microwave signal with a narrow spectral bandwidth to derive information on ocean surface wind velocity. At a given angle to the flight path of the satellite, the amount of backscatter depends on two factors, namely the size of the surface ripples of the ocean and their orientation with respect to the propagation direction of the pulse of radiation transmitted by the scatterometer. The first is dependent on wind stress and hence wind speed at the surface, while the second is related to wind direction.

Scatterometer instruments aim to achieve high accuracy measurements of wind vectors, and resolution is of secondary importance. The resolution of the ERS scatterometer is 50 km, though the grid sampling is 25 km. Because the scatterometer operates at microwave wavelengths, the measurements are available irrespective of weather conditions. The assimilation of scatterometer data into atmospheric forecasting models greatly improves the description of cyclonic features so important in predicting future weather patterns. There are numerous other applications, such as the measurement of sea ice extent and concentration, and emerging land applications such as regional-scale monitoring of ice shelves, rainforests and deserts.

Radar Altimeter (RA) Applications

The radar altimeter is designed to make accurate measurements of the satellite's height above the sea surface which is then converted to the sea surface's height above a reference ellipsoid. When the altimeter takes a height measurement, it is measuring a height contributed to by many different types of phenomena, from the underlying marine geoid, through the large-scale general circulation of the oceans, to mesoscale eddies 100 km across. In addition to highly precise height measurements, the altimeter makes measurements of the heights of waves that appear in its footprint, and of surface wind speed.