DAILY ASSESSMENT FORMAT

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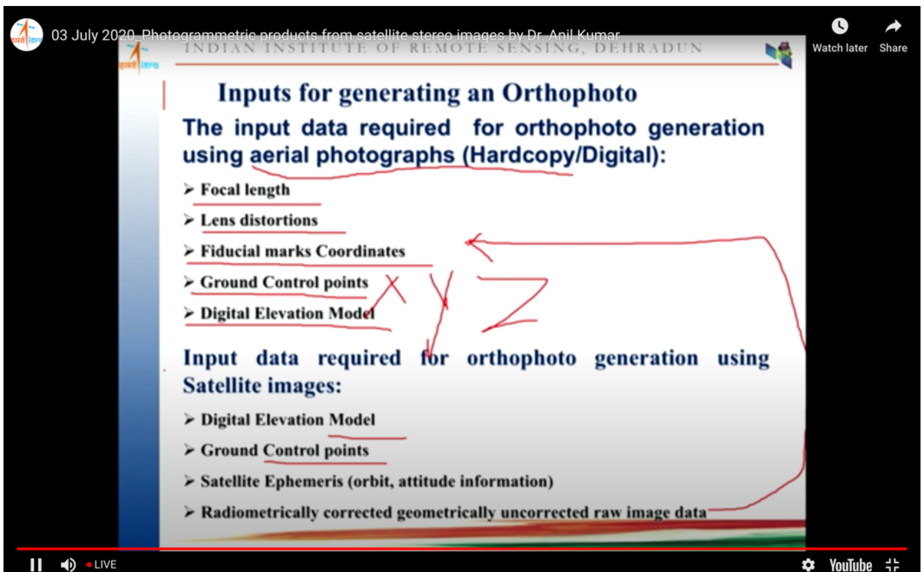
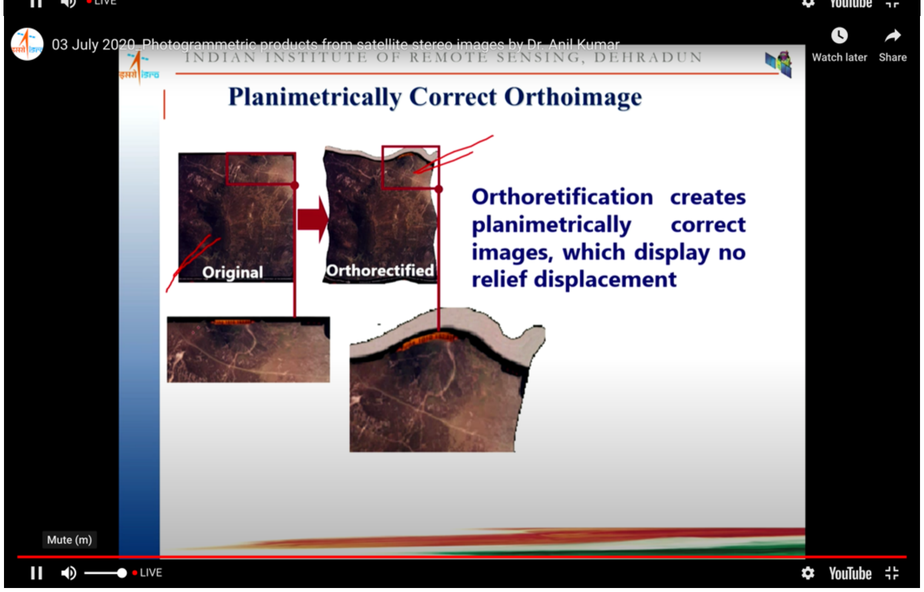
Course:	Satellite Photogrammetry and its Application	USN:	4AL17EC073
Topic:	Photogrammetric products from satellite stereo images	Semester & Section:	6 & B
Github Repository:	https://github.com/alvas-education-foundation/Prajwal-Kamagethi.git		

SESSION DETAILS

Session images





Report:
Image of session
Digital Elevation Models (DEMs) are raster files with elevation data for each raster cell. DEMs are popular for calculations, manipulations and further analysis of an area, and more specifically analysis based on the elevation. ArcGIS has several built-in functions that are very easy to use and will turn the DEM into a derivative map.
There are several basic manipulations that can be done with ArcMap. This involves tools under Spatial Analyst > Surface (the Spatial Analyst extension needs to be turned on in order for this to work properly).
1. Slope: The DEM can easily be transformed into a slope map with the Slope tool (fig. 2.1). This map describes the slope for each raster cell in degrees based on the elevation at each point.
2. Aspect: Another derivative is the aspect map (fig. 2.2). This map displays the aspect of each raster cell grouped into compass directions (north, northwest, etc.).
3. Hillshade: This tool creates a map with a shade-effect (fig. 2.3) based on the input parameters that are entered in the tool. The resulting map is easier to interpret than the original DEM, because some topographic features are better visible (on small scale especially).
4. Curvature: The curvature map (fig. 2.4) is calculated by using the curvature tool. This basically calculates the relative change in slope, could be seen as a second order DEM derivative.
5. Contour: Topographic contour lines can be plotted with the contour tool (fig. 2.6). Based on the user defined parameters the new map will display (elevation based) contour lines.
6. Viewshed & Observer Points: These tools are used to calculate a (set of) positions relative to a user defined (point) feature (fig. 2.7). This is useful to determine the visibility of a location.
7. Another useful way to display a DEM is to use the "Select attribute" feature (fig. 2.8). By inserting a query and selecting a threshold, it is possible to select certain elevations on the map and display the location of these points.
8. If you want to go a step further, maybe in order to classify the DEM based on elevation, you could use the reclassify tool (fig. 2.9). With the reclassified map it is possible to do a raster calculation in order to calculate a function for each raster cell (with each variable having its own map with values).Other possibilities with a DEM include interpolations. With certain tools it is possible to calculate unknown values based on known values that surround these unknown values. There are several ways to interpolate. It is also possible to convert the raster DEM to a vector map, and use vector related manipulations. This will however decrease the quality of the elevation data.The 3D Analyst tool can also be used to make a topographic profile of a section line in the DEM. This line can be drawn with the 3D analyst tool, and the profile can be made or customized with this tool as well.
Methods
If the aim of the survey is landscape characterization in order to monitor changes over time, the outcome of any image elaboration step
–
georeferencing, image matching, DEM extraction and morphometrical feature extraction
–
should be subjected to critical analysis.
Georeferencing

For geomorphological purposes, the image georeferencing phase is of primary importance. The georeferencing accuracy of high resolution satellite imagery is not a function of spatial resolution alone, as it is also dependent upon radiometric image quality, satellite platform attitude and the precision of the GCPs survey. The most frequently used georeferencing algorithms are based on rigorous models or on use of RPFs.

In this work, we have tested the physical model embedded within the software Geomatica (called "Toutin's model"), the physical one embedded in Socet Set (called "rigorous simultaneous") and the RPF model embedded in Geomatica (called "Rational Function").

The software user's guides suggest using only a few points (from 6 to 10 for Geomatica, even less for Socet) to georeference the image if the rigorous model is used. This is why we used only a small number of points as GCPs. The remaining were used as check points (CPs) for testing the accuracy of the output (e.g. to evaluate the difference between the value measured on the terrain and that measured on the georeferenced image).

In order to georeference the image, we run a NRTK GPS surveying campaign. To obtain a homogeneous distribution of well "matched" points, control points were chosen in close proximity to the nodes of a regular grid; grid spacing was fixed while bearing in mind the number of points required for image georeferencing, which depends on the type of mathematical transformation used. The grid was overlaid onto the image and the GCPs position was selected nearby these nodes taking care of choosing "stable" details clearly visible on the image, such as artifacts or natural objects (Figure 2, left panel). Due to the presence of many mountainous districts, devoid of any stable points that can be easily identified on the image, in some areas, there are no points in correspondence of the grid nodes.

Figure 2. Regular grids have been drawn on the image to obtain a homogeneous distribution of well-"matched" points. Control points have been chosen in close proximity of the nodes of the grid. Green circles indicate areas on the images that are close to visible control points, yellow triangles indicate "bad" points with issue of collimation (since they are located in shady areas of the image), red squares are on the location of grid nodes where it was not possible to find a point to collimate (mountain areas and/or without artifacts). Left panel: GGCPs; right panel: MGCPs. DATUM is ETRS89, frame ETRF00.