Automated Monitoring of Fractional Snow Cover From MONIMET Camera Network in Finland

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Cameras are commonly used for monitoring the conditions in the environment such as tourism (ski resorts) and security (road cameras). However, images from cameras are recently used for scientific purposes such as monitoring ecosystems continuously. MONIMET camera network is currently 28 cameras producing image series to the MONIMET camera server in 14 different locations in Finland [1]. Most of the cameras have 5 MP sensors and producing images each half an hour. The images are aggregated in the FTP server in Finnish Meteorological Institute over internet via either Ethernet connection or GPRS/3G modems.

In this work Fractional Snow Cover (FSC) is calculated by using an algorithm based on defining a threshold value according to the histogram of an image to classify a pixel as covered by snow or not is studied by [2]. Using the algorithm with orthorectification of the images, snow coverage information of the visible area is obtained. In the algorithm, the threshold level for the pixel is chosen by finding the first local minima after DN 127 for the blue channel. If blue channel value of a pixel is higher than threshold, it is considered as a snowy pixel. After classifying the pixels as snowy or not snowy, the picture can be georeferenced to a grid to obtain a snow cover map of the area. This map can be used to count the cells with and without snow to finally reach the value of the fractional snow cover. In orthorectification technique [3], the coordinates of the DEM is transformed into the camera coordinate system, which defined as a 3D Cartesian coordinate system with the camera is in the origin. Then, a perspective projection is applied to these coordinates that results to the 2D representation of the DEM as seen from the point of view of the camera. This representation is then later scaled depending on the resolution of the picture and the zoom level of the camera.

[1] http://monimet.fmi.fi.

[2] Salvatori, Rosamaria, et al. „Snow cover monitoring with images from digital camera systems.“ Ital. J. Remote Sens 43 (2011): 137-145.

[3] Corripio, Javier G. „Snow surface albedo estimation using terrestrial photography.“ International journal of remote sensing 25.24 (2004): 5705-5729.