13.50 ENHANCEMENT OF RADAR RAINFALL ESTIMATES FOR ESTONIAN TERRITORY THROUGH OPTICAL FLOW TEMPORAL INTERPOLATION

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Accurate and reliable precipitation maps are very important in the fields of hydrology, climatology and meteorology. For Estonias territory, high spatial and temporal resolution precipitation data is obtained by dual-polarization weather radars. Rainfall products derived from radar data have multiple applications for nowcasting over urban areas, warning systems for airports and agriculture.

Although weather radars have good measurement properties it is still method of remote-sensing and getting reliable data is not straightforward. Various sources of errors are inherent to radar data and also calculations from reflectivity to actual rain rate are done via empirical relations. Therefore, accurate precipitation estimations through radar data requires verification. Quantitative Precipitation Estimation (QPE) concept is used where rain gauges and radar data are compared.

Estonias radar network consists of two dual-polarization C-band weather radars with one located near the north coast in Harku and the other in the middle of the country in Srgavere.

The problem with radar data can be that with current 15-minute interval measurement strategy, precipitation fields can pass gauge locations introducing bias to radar and gauge data comparison. Therefore, specific interest in this work is at radar data temporal resolution enhancement to make two different datasets more comparable with each other. This problem is addressed with digital signal processing method of optical flow.

Optical flow is a widely used image processing method which extracts apparent motion from 2D image sequence. This motion information can be used to infer real 3D movements, detect motion, execute object segmentation and a lot more, but for this work optical flow is used to interpolate more timesteps between two radar image frames. Also, it could be used to extrapolate radar data into near future (nowcasting application). There are plenty of different optical flow methods with very different mathematical approaches including differential methods, region-based matching or frequency-based methods (energy-based or phase-based) where every method depends highly on the specific applicational needs. Choosing optimal method (reasonably good results with reasonable computational difficulty) and implementing it for the weather radar-oriented application is intended with this work. As there is not much to compare the results to, an error estimation is also needed to ensure measure of confidence and accuracy in used method of optical flow.