

Towards optimal satellite image classification for waterlogging and flood detection

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Waterlogging and flood detection is an operative task at the Institute of Geodesy, Cartography and Remote Sensing (FÖMI) as part of the disaster recovery project [?]. The process helps to estimate the measure of logging damage and predict the date of water withdrawal. To allow decision makers to react based on up-to-date information, the process must be performed in a limited time frame whenever it is necessary. As both floods and waterlogging may occur over large areas, multiple high resolution aerial and satellite imagery must be processed as soon as possible. Hence, the process shall be both fully automated and handle large amounts of data.

Previously, we presented [?] an approach utilizing distributed computing enabling the automated execution of this task on large input data with better response time. The approach is based on the MapReduce paradigm, its open-source implementation, the Apache Hadoop framework [?] and the AEGIS geospatial toolkit [?]. Image analysis is performed using unsupervised object-based image classification [?]. Results showed that significant performance benefits can be achieved at the expense of minor accuracy loss compared to the supervised classification method.

This paper presents the follow-up research based on two major broadly applicable changes in comparison to the previous work. First, due to the nature of object-based classification, several algorithms with various parameterization can be utilized. To obtain the most optimal solution, a variable chromosome length genetic algorithm [?] is used enabling the optimal selection for images based on various image properties. The second is the replacement of the MapReduce paradigm with the actor model implemented in the state-of-the-art Orleans framework [?]. Building on the top of the actor model the computational steps can be organized much freely, thanks to its communication model, thus an approach different than the one supported by the MapReduce can be employed.

References

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