Development of a Hydrological Model for Automation of Watershed Analysis

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SUMMARY

Hydrological analysis is very essential in design of bridges, dams, culverts and other hydrological structures. Watershed is one of the important analysis that facilitate the determination of the size of catchment area of a hydrological feature. Development of fast computers, availability of remote sensing data, engineering techniques, algorithms and the need to automate certain tasks that previously required intelligence humans serve as a motivation factor for the automation of hydrological analysis. This study aimed at developing a model for the automatic delineation of watershed area from Shuttle Radar Topographical Mission (SRTM) digital elevation. This was achieved through the analysis of the tasks required to delineate the watershed, data curation, modelling/coding and model deployment. The software used were anaconda version 3.8. The libraries utilized were numerical python (numpy), matplotlib, geopandas, pysheds and nplleaflet. The data required by the model are digital elevation and the spatial coordinate of spill way, outlets etc. The model can detect and correct depressions of the digital elevation, create flow direction and finally generate watershed within a reasonable time. The model was deployed using Docker technology. Analysis of watersheds of the upstream of Jibia dam were used as a case study to analyse and validate the model. The result of the validation proved the model was efficient.

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