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GRID-BASED REMOTELY SENSED HYDRODYNAMIC SURFACE RUNOFF MODEL USING EMISSIVITY COEFFICIENT

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

I, hereby acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The development of a hydrodynamic distributed model is designed to simulate discharge and water levels as a function of space and time. The development of the model strongly depends on the physical based parameters, examples of physical parameters that include roughness Manning's *n*, hydraulic conductivity, soil depth, river geometry and the surface land cover. Most Malaysian catchments are not gauged, albeit or scarce discharge data is available and the difficulty to access and hard to obtain in situ site area information. These scenarios have brought an interest into this study to use satellite images in obtaining information of the ground surface from inference in a digital elevation model (DEM) and other information such as the land use characteristics. The processes of infiltration and overland runoff flows are complex phenomenon. Both interact on the soil surface on the ground at its own capacity. Since soil surface is the primary order that control the hydrological and hydraulic processes, the topographic of the land use sensed by the satellite is used to describe the spatial variations of the ground surface. In this study, a quantitative surface runoff estimation using the information of emissivity from the remotely sensing technique is developed for potential input representing the surface roughness. The process from the satellite information allows an optimal judgment to decide the most appropriate Manning roughness to be used in the simulation of surface runoff. The algorithm is applied foe Sungai Pinang and Sungai Dondang river basin. Results from both catchment areas are validated against gauge recorded. A SRTM derived digital elevation model (DEM) is used to represent topography over the catchment area and provided hydrological bare earth elevations as required in the model. Model results for rainfall events are evaluated for DEM grid resolution of 30m with specified boundary and at given initial spatial condition. For model calibration purposes, the observed is quantitatively compared to the simulated surface runoff. The result for Sungai Pinang and Sungai Dondang showed satisfactorily simulation results in terms of differences between measured and simulation results. The best overall performance for Sungai Pinang is 5.05 % that indicate a good performance of surface runoff model for August 23, 2009 event. The Sungai Dondang result shows a total standard estimate of errors of 4.87 % and it is indicates as good performance of surface runoff model for Jun 6-7, 2006 event. The results from the model are promising and it is limited by its ability to model all the variables that are involved in the development of surface model. It is learned that creating an accurate description of the ground surface is a complex problem, which requires at least site study. The coupled remote sensing and surface runoff model is able to calculate surface runoff with an addition of emissivity value to represent the surface roughness coefficient.

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