

## The Use of Fractional Brownian Motion in the Generation of Bed Topography for Bodies of Water Coupled with the Lattice Boltzmann Method

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**Abstract :** A method of modelling topography used in the simulation of riverbeds is proposed in this paper, which removes the need for datapoints and measurements of physical terrain. While complex scans of the contours of a surface can be achieved with other methods, this requires specialised tools, which the proposed method overcomes by using fractional Brownian motion (FBM) as a basis to estimate the real surface within a 15% margin of error while attempting to optimise algorithmic efficiency. This removes the need for complex, expensive equipment and reduces resources spent modelling bed topography. This method also accounts for the change in topography over time due to erosion, sediment transport, and other external factors which could affect the topography of the ground by updating its parameters and generating a new bed. The lattice Boltzmann method (LBM) is used to simulate both stationary and steady flow cases in a side-by-side comparison over the generated bed topography using the proposed method and a test case taken from an external source. The method, if successful, will be incorporated into the current LBM program used in the testing phase, which will allow an automatic generation of topography for the given situation in future research, removing the need for bed data to be specified.

**Keywords :** bed topography, FBM, LBM, shallow water, simulations

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