

Shahar Chay Dam-Break simulation using OpenFOAM

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Abstract

Dams have some potential risks that dam-break is one of them. Dam-break can cause a significant disaster in the downstream. Hence, the main purpose of this paper is to modeling and simulating dam failure, and determination of the hazard regions by flood. In order to simulate the dam-break problem, OpenFOAM software is applied. OpenFOAM is a framework for developing application executables that use packaged functionality contained within a collection of approximately 100 C++ libraries. Shahar Chay Dam, in West Azarbayjan province of Iran, is selected as the case study. A 2-D model for the dam-break flow with the two-phase algorithm, based on the volume of fluid (VOF) method, has been established; in which a specie transport equation is used to determine the relative volume fraction of the two phases, or phase fraction α , in each computational cell. This model is employed to simulate the release of dam-bursting flood of reservoir and its advance towards downstream. In simulation, different dam-break durations, upstream flows, and water levels in front of dam are considered, and these influencing factors of dam-break flow are analyzed. Finally, the accuracy of the model is demonstrated through several test cases.

Key words: Dam-Break, OpenFOAM, Shahar Chay Dam, Influencing Factors

1. INTRODUCTION AND LITERATURE

The failure of dams and the resulting flows would occur with little warning and may result in a substantial damage to life and property [1]. Understanding flow characteristics such as maximum water level and flood arrival time is fundamental to engineering design and safety [2]. The velocity and the depth of the dam-break flood wave usually decrease along a river