Predicting landslides in hill country of Sri Lanka using data mining techniques

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A landslide is the movement of rock, debris or earth down a slope. They result from the failure of the materials which make up the hill slope and are driven by the force of gravity. When it refers to Sri Lankan context landslide is the major natural disaster in hill country of Sri Lanka, creating economical and ecological damage while endangering human lives. Therefore, the fast detection plays an important role in avoiding or minimizing the hazards. Currently in Sri Lanka National Building Research Organization (NBRO) under the Ministry of Disaster Management in Sri Lanka issue landslide early warning messages based on Landslide Hazard Zonation Map and readings of auto meter rain gauging.

However, a map is only covering a specific point in time, and do not take current weather and geographical conditions into account. Though they collect current rainfall using auto meter rain gauging this facility is not established in everywhere. As the hill country is a rapidly developing area some causative factors can be changed time to time due to human intervention or natural incidents. Therefore, it is understood that there has a problem in predicting landslide depending on current situation. On the other hand, to deal with the current approach there must have an expert.

The main objective of this study is to develop a model which can be embedded to develop an user friendly and efficient computer program which is usable by any ordinary person who is living in a landslide prone area to determine "am I safe in the current place with regards to current geological and weather condition?" by dealing with data of current situation rather than living blindly until NBRO issue warnings.

Most of the time landslides often occur at specific location under certain topographic and geologic conditions within the country and it is important to utilize existing data to predict landsides. Data mining techniques can be used to develop prediction models using existing data. Plan-Do-Check-Act data mining methodology has been selected for this study. Initially, study is limited to homogeneous areas of Badulla and Nuwara-Eliya districts which are already identified as landslide prone areas. Based on the homogeneity of these areas models will be developed by incorporating only three causative factors, slope, surface overburden, land use which are varying due to human intervention and natural incidents and triggering factor, rain fall. The historical data are collected using the contours, map of land use, map of overburden and map of landslides. The decision tree algorithm and the neural network technique will be used to develop prediction models out of predictive analysis data mining techniques. The cross validation evaluation technique will be used to test the models and ultimately select the best model out of decision tree algorithm model and neural network model.

Keywords: Landslide, Data mining, Predictive analysis, Plan-Do-Check-Act, Decision tree