Applications of Information Technology to treatment of field data in Korea

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Abstract: *The availability of Information Technology in geological and engineering geological fields is rapidly increasing in Korea. Especially GIS-based hazard mapping is the most distinctive part to predict a possibility of landslide occurrence. Integrated expert system for tunnel construction is also practically used to manage investigated or designed data and to predict un-known underground geological condition. Computer-based field data acquisition tools are also one of the typical part using information technology including GIS combined with mobile phone in geological field.*
Keywords: *Information technology; GIS; Landslide; Construction; Geological data*

1. Introduction

The availability of information technology (IT) continues to expand at an ever-increasing rate in the geological and geotechnical field of Korea. It seems to have resulted from an effectiveness of solving spatial problems related to managing and controlling geological and engineering natural phenomena. The information technology is now one of the most important tools for solving geological problems not only for natural hazards but also for construction industries.

This paper writes to introduce some of the case studies of geological and geotechnical problems using the information technology.

2. Prediction of landslide occurrence

Landslide prediction technology is one of the most distinctive areas using information technology. Engineering geological evaluations should be practiced to predict a possibility of landslide occurrence and to predict the run-out distance of debris in a study area. A series of hazard maps was developed to provide an effective solution for determining dangerous residential areas (Chae et al., 2005). For preparation of hazard map, an enormous amount of field data was required which must be related to each other. Therefore, detailed field survey was performed in a study area. Laboratory soil tests also conducted to get physical and mechanical properties of soil samples. Engineering geological evaluation and mapping are time-consuming tasks because the large amount of time and effort are required for the handling and processing of the spatial and tested data. For solving these problems, they have used Geographic Information System (GIS) that enables extraction of geographic data, modeling and analysis of geologically related data. Figure 1 is an example of landslide hazard map showing the probability of landslide occurrence in north-east area of Korea.

Assessment of run-out distance of debris is also the critical point for hazard mapping of landslide occurrence. An artificial intelligence method was used to predict

run-out distance of debris flow that is a major type of landslides in Korea (Seo et al., 2005). The input data for the analysis are slope angle, permeability of in-situ soil, density, void ratio, volume of debris and the measured run-out distance of pre-occurred site.

3. Tunnel project

Many tunneling projects have been performed in Korea. During geological and engineering geological investigations prior to the construction phase, many type of data are collected such as rocks, joints, faults, characteristics of discontinuities and groundwater, etc. It is difficult to find and manage pre-investigated data after some years. And the content of such data is heterogeneous with regard to different investigators or projects. In these reasons, the need of standardization is recently increased in Korea. Intelligent tunneling information system is one of the most advanced systems that consists of visualization for ground data and structure, analysis for ground stability, prediction for ground surface settlement, selection for tunnel reinforcement, prediction for face failure, and virtual reality for visualization of tunnel construction (Hong et al., 2002). The system is now up-grading to integrate geotechnical site investigation, tunnel design and construction data in Korea.

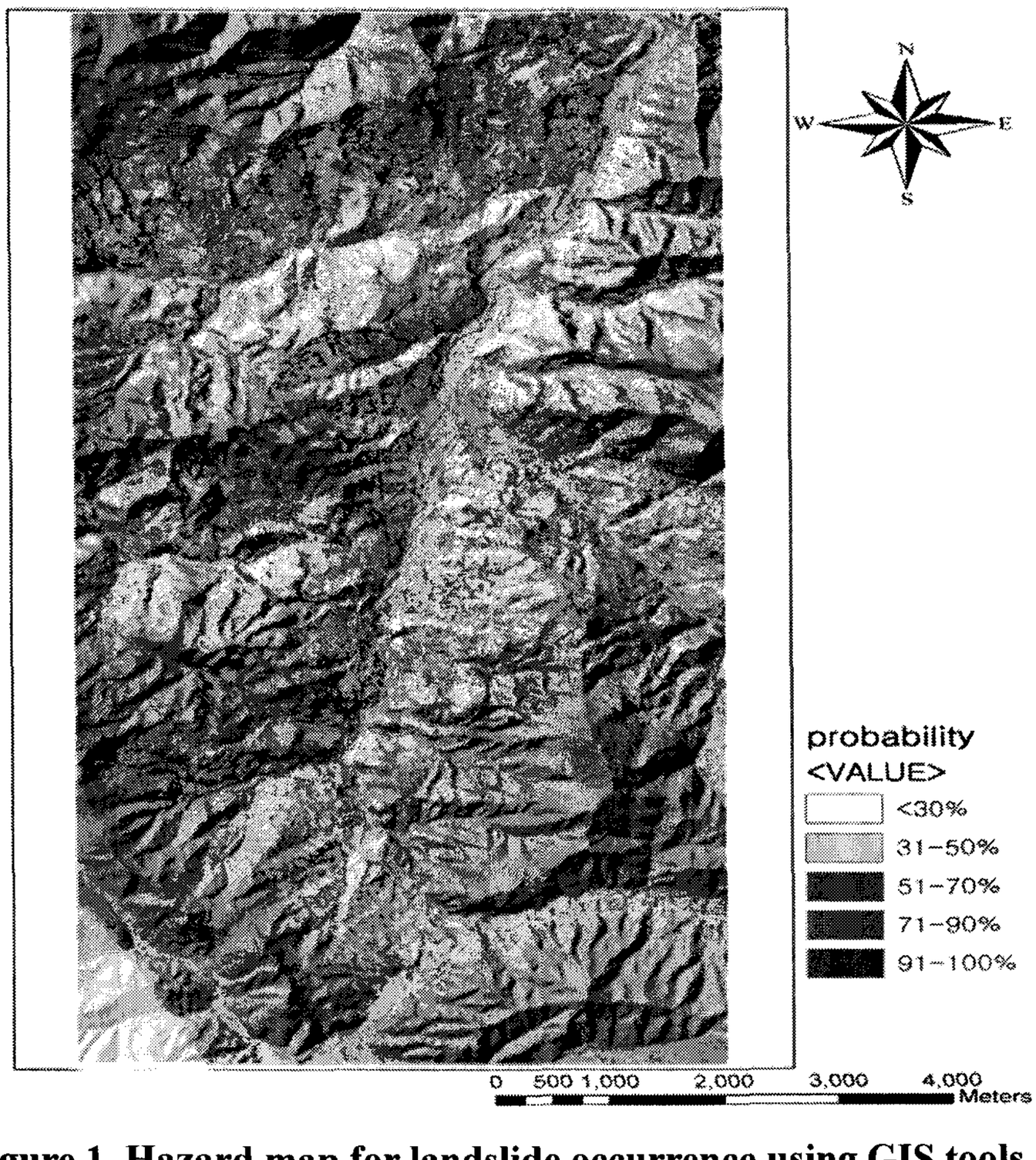

Figure 1. Hazard map for landslide occurrence using GIS tools.

4. Field data acquisition tools

Computer-based data acquisition tools for investigating landslide or slope are developing by several research groups in Korea. They will have functions of web-based database server and mobile network. Engineering geological data collected at the field, including documentation, drawing and pictures can be saved in the mobile notebook or PDA devices on site. They could be communicated with a data-server by telephone.

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