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Evaluating earthquake vulnerability with the help of fuzzy logic and GIS (Case study : Tehran, District 16)

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Abstract

Earthquake as a natural disaster can danger the life of numerous people all over the world every year. It can also impose huge economical burden on societies. Even though earthquake may be unpredictable, proper planning can significantly reduce the damages. A viable remedy is to identify the vulnerable regions and equip them in order to reduce the damage .

Fuzzy logic is a theory for an action in uncertainty conditions , in particular related to human language and thinking . It is an indication to what degree something belongs to a class. This theory is able to form mathematical view to many concepts and systems that are not accurate and are vague . It also provides a suitable framework for reasoning , deduction and decision making in uncertainty conditions . Nowadays fuzzy systems have been widely used in different fields of science because of it's simplicity and efficiency .

In this paper , with the use of fuzzy logics , we examine the rate of damage in the sixteenth region of Tehran . For this reason, two reasoning engine i.e. Sugeno and Mamdani , have been used . Our data are distance to fault, main roads, support centers, clinics, fire stations, gas stations, timeworn areas and population. The analysis performed in MATLAB fuzzy toolbox and ArcGIS software. Final results of Sugeno and Mamdani reasoning engine were similar and show that southern part of this district are more exposed to danger .

Key words : Earth quake, Fuzzy logic, GIS, Vulnerability