LOCATING THE EARTHQUAKE EMERGENCY OPERATION CENTERS USING FUZZY INFERENCE SYSTEMS (CASE STUDY: TEHRAN MUNICIPALITY 5)

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Considering the seismic situation of Iran that is located on the global earthquake belt is essential. Tehran as the political, economic and social capital of Iran due to its unique geographical location with about 13 main faults has always been prone to destructive earthquakes. Factors such as high seismicity of faults, old structures, improper construction development, and lack of infrastructure to deal with the earthquake disaster have caused the city to have a high destructive potential. A powerful earthquake in the city can result in a catastrophic human tragedy. Therefore, providing an adequate infrastructure to manage the earthquake disaster in Tehran is of a great importance that recent activities carried out by the authorities demonstrate it. Despite the recent efforts in this field, due to the lack of updated method in the field of earthquake and earthquake management, earthquakes in the country have been accompanied by many human and financial losses.

This research is aimed to find optimal zones for the construction of Emergency Operation Centres (E.O.C). Then, the method is used to find appropriate E.O.C places for Tehran municipality 5. The structure of an E.O.C building needs to be resistant to different types of natural and unnatural threats, besides it is provided by essential and modern equipment. These buildings are made to provide a place for integrated disaster management with optimal utilization of urban infrastructure capacity.

In terms of geographical location, Tehran municipality 5 is located in the northwest of Tehran with the area of about 54.28 square km and the population of 856565, which have had the highest population growth and construction development in the last two decades. This zone is limited from the north to the north of Tehran, from the south to the Karaj special road, from the east to the Ayatollah Ashrafi Esfahani and Mohammad Ali Jenah Highways and from the west to the Kan creek and includes seven regions.

In the present study, a descriptive-analytical method is used for finding optimal E.O.C places. Since the locating process is affected by different factors, the optimization accompanied with difficulty. Despite the previous studies that frequently used the classic Multiple Criteria Decision Making methods (MCDM), in this study, fuzzy logic is utilized for considering uncertainty in selection of the optimum places. The accuracy and effectiveness of the two selected fuzzy methods, fuzzy inference systems and fuzzy analytic hierarchy process, has been compared by modeling. In the Fuzzy logic method, introduced by Professor Lotfi Asgar Zadeh for the first time in 1965, in contrast to the Binary logic method, the process of assigning the numerical input of a system to fuzzy sets with some degree of membership which may be anywhere within the interval [0,1]. If it is 0 then the value does not belong to the given fuzzy set, and if it is 1 then the value completely belongs within the fuzzy set. Any value between 0 and 1 represents the degree of uncertainty that the value belongs in the set.

The outcomes of this study indicate that the fuzzy inference system leads to more accurate results than fuzzy analytic hierarchy process. The research process is presented in Figure 1. At the end, the generated final maps with the specified methods are compared.
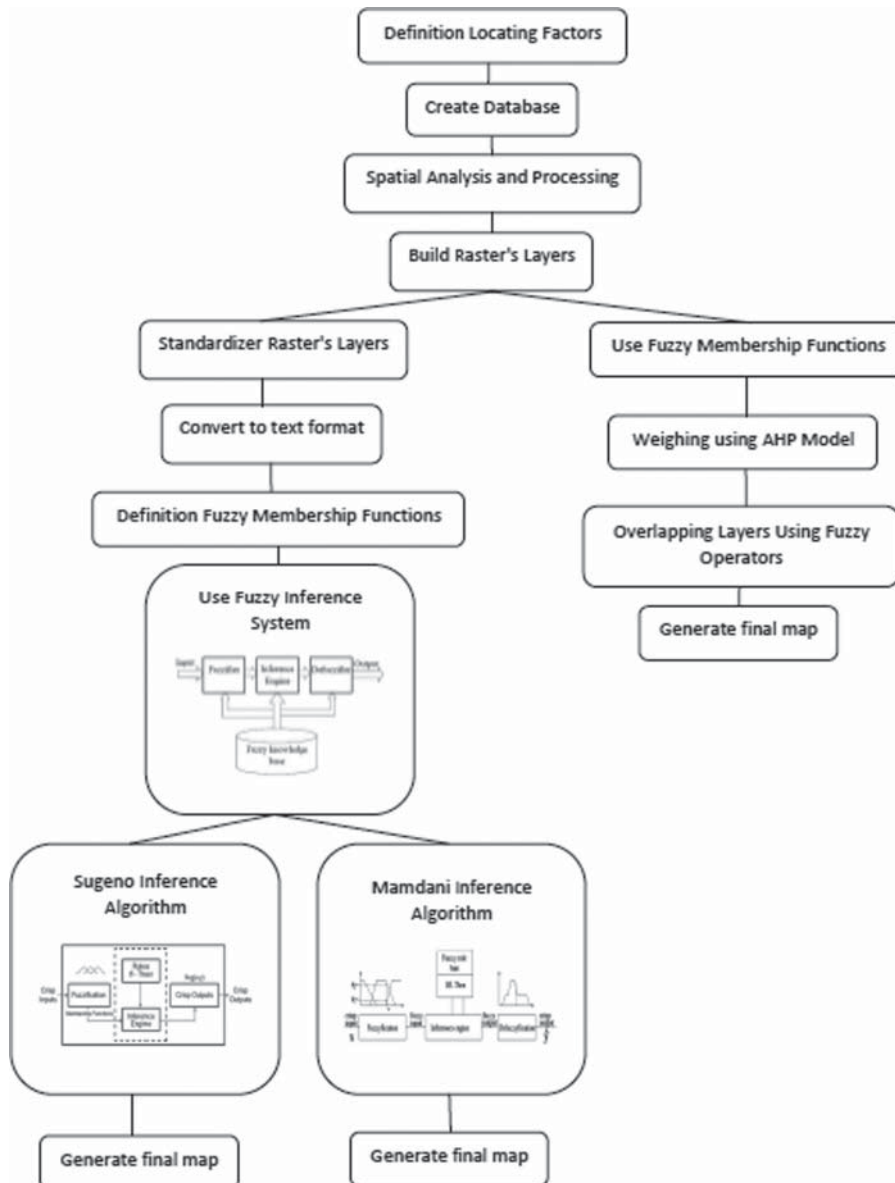
Figure 1. The process of doing research.

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