Abstract

Frequent fire disasters in crowded urban business and market structures have become a major concern to Nigerian urban planners. Urban renewal schemes are being initiated to minimize the occurrence of fire accidents and other associated problems by various levels of government in Nigeria. However there is need for a systematic approach and tools predict the performance of potential intervention schemes and policies and also to ensure that the resources deployed for these schemes achieve the highest possible impact. This study was therefore aimed at developing a soft computing based tool for analyzing fire accident occurrence and prevention systems for commercial complexes. The relevant quantities, key accident causative factors, and their relevant interactions in a fire accident occurrence system were identified through literature search and interview with fire experts. Appropriate linguistic variables and their equivalent term sets were developed for these factors. Using the Matlab fuzzy logic toolbox various possible membership functions were numerically tested to identify the most suitable function for each linguistic variable. A fuzzy inference system of the commercial building fire accidents model was then developed. Model validation was carried out based on data obtained for some randomly selected markets within Ibadan city using structured checklists and expect rating format. Fire risk indexing was used to carry out evaluation by ranking the factors. Four key input factors, namely Users' Safety Culture, Incipient fire Likelihood, Building
resistant to fire spread and potential damage level, were identified. The Gaussian and Trapezoidal membership functions were the most suitable. The resulting model was a two stage Mamdani type Fuzzy Inference system using sixteen and twenty-five rule knowledge bases respectively. The checklist and rating format was found easy to use. The performance of the model compared well with results from the literature. It is concluded that Fuzzy logic inference system can serve as a decision support system for fire safety management commercial complexes.

References

1975.

Index Terms

Computer Science  Fuzzy Systems

Keywords

Fire Accident  Fuzzy Logic  Fuzzy inference  Risk Analysis  Safety.