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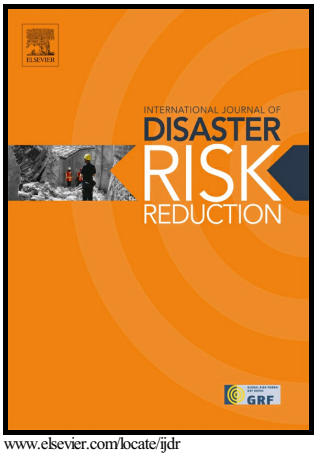

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Abstract. Examining the efficacy of natural disaster management readiness and response activities is challenging due to the involvement of many random and uncertain components. These uncertainties can be captured by stochastic models. The analysis of these models is carried out using Monte Carlo simulations to judge the effectiveness of natural disaster management solutions. However, this approach uses static estimators, which generally rely on sampled number of events taken from the random space. The safety-critical nature of disaster management requires a more quantifiable analysis. In order to overcome this challenge, we propose to use statistical model checking for relief supply location and distribution in natural disaster management. For illustration purposes, we use the PRISM model checker to model and analyze a real-world scenario of relief supply location and distribution while considering some key factors, like demand of medical supplies at hospitals, predestined routes from warehouses to hospitals, capacity of warehouses and transportation plans.

Keywords: Natural Disaster Management, PRISM Model Checker, Statistical Model Checking, Relief Supply Location and Distribution.

1 Introduction

Our lives are overwhelmed with adverse events, such as natural disasters that occur on specific spatial and temporal scales. Some typical examples of natural disaster include earthquakes, the outbreak of diseases, volcanic eruptions, cyclones, tornadoes, floods and bridge collapses [37]. All these sudden adverse events may lead to disastrous consequences. For example, the Pakistani earthquake (2005), registered 7.6 in the Richter scale, led to the death of 75,000 people while injuring another 106,000 [1]. Primarily, such multifaceted disasters are caused based on the interaction of countless components, which can be broadly categorized in three major entities, i.e., the physical environment [36]; the social and demographic characteristics of communities [35,17]; and the constructed environment, comprising of roads, bridges and buildings [24,26].