Linear Quadratic Regulator Design For Seismic Control System To Minimize Recovery Time Of Medical Facility

Masayuki KOHIYAMA

This study investigates parameter design of a linear quadratic regulator (LQR) for a seismic control device aiming at improving the resilience of a medical facility. First, the functionality of a medical facility is quantified based on fault tree, and a frame work to evaluate recovery curve of a medical facility is constructed based on the fault tree and recovery-time probability models for damaged medical devices. Then, a new approach to design parameters for an LQR control system is proposed, which minimize the time to recover up to the defined functional level after the arrival of an assumed earthquake ground motion. A case study is conducted using a model of a ten-story hospital building with a control device installed on its top floor and the expected recovery time is evaluated. It is confirmed that the proposed method can improve the resilience performance compared with a conventional method of control design that aims to reduce acceleration response of a building.