An Optimized Parking Algorithm to Control Passenger Elevator Groups Using Artificial Neural Network

Harrison Thuku Ngetha

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ABSTRACT

Elevator group control systems (EGCSs) are the control systems that systematically manage three or more elevators in order to efficiently transport passengers. The optimal parking algorithm of EGCSs is made using the classification of the passenger traffic and system manager's requirements, and the cars are assigned to specific floors by the generated control strategy. Group elevator parking and scheduling is a well-known problem in industrial control and operations research with significant practical implications. The traffic pattern of elevator passengers in buildings, with multiple elevators varies considerably during certain periods of the day. These traffic patterns are known as up-peak and down-peak. Due to the rise in building occupancy, the traffic pattern is also varying. The up-peak and down-peak are occurring at the same time.

Up-peak and down-peak pose extraordinary demands on the parking and scheduling processes for the elevator group, because the passenger arrival rate is high, and the traffic pattern is non-uniform. At the same time, these patterns can have a regular probabilistic structure. Currently two methods are used for parking the lift cars, the basic parking and the dynamic assignment. During the dynamic assignment operation, the group of elevators keeps statistics of the number of calls and the mean waiting time for every floor. The two parameters keep on changing with time, within the day, and also due to significant change in building occupancy. Because of the dynamic behavior, there is need for a system of real time control.

This thesis presents an efficient approach that consists of an experimental design and an Artificial Neural Network (ANN) model to generate models for the simulation of

the parking control algorithm in Elevator group control systems (EGCSs).The system has then been trained to recognize passenger traffic patterns for the four lift cars using a pattern recognition neural network for random patterned inputs. After the training the system has gone through further training using back propagation to enable pre-distribution of lift cars evenly among the ten floors in a building. The system has been designed and trained using C++ and then simulated by MATLAB. The results show that, the parking algorithm adapts to the prevailing traffic pattern. Control actions, such as returning cars automatically to busy traffic floors, or parking cars during light traffic, follow from the forecast traffic pattern as compared to the existing methods.