

An Application of Genetic Algorithms for Multiple Car Group Control in Elevator Systems

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Abstract

Due to rapid population growth in the modern cities, it has become inevitable to use the elevator in multi-stores buildings. The service given by the elevator car control system must be sufficient in terms of passenger's waiting time. In order to reduce passenger's waiting time, elevator call system must be optimum. Also, optimizing this minimizes the electrical energy of elevator motors. In this study, genetic algorithms (GAs) were used to reduce the passenger's waiting time in elevator group control systems. In particular, GAs can offer better solutions to the passenger call allocation process when compared to the conventional elevator traffic control methods.

1. Introduction

It has become a necessity to make use of elevator services in buildings which have three or more floors. The service given by the elevator system must be sufficient and elevator systems working slowly and inefficiently affect operations of the buildings negatively. The main target of present studies on elevator systems tends to provide comfort and most importantly security for people and besides it saves time.

The traditional traffic design and control ideas are currently valid and provide the foundation for modern computer aided traffic control systems. Elevator traffic control systems should provide efficient control for a group of elevators to offer an improved performance [1]. In offering a solution to elevator traffic problems, the traditional methods, however, often yield unsatisfactory results because they lack in considering number of technical

characteristic and possibilities to be taken in to account. Conventional algorithms also possess limitations and their flexibility is still restricted even if they are adapted to utilize computers. Nowadays, there are some advanced techniques, such as Genetic Algorithms, which exploit the abilities of computers to the extreme.

Genetic Algorithms are search algorithms which are based on natural selection and natural genetic mechanism. The basic principles of genetic algorithms were laid down by Holland in 1975 [2], and simulate those essential processes for the evolution of natural populations. Genetic Algorithms are not guaranteed to find the global optimum solution to a problem, but they are generally good at finding acceptably good solutions to problems acceptably and quickly [3].

In this study, Genetic Algorithms not necessitating any auxiliary information and starting to be an important tool for optimization problems has been suggested with controllers in elevator groups. Furthermore, to maximize the call allocation efficiency and to reduce the overall system waiting time Genetic Algorithms embedded elevator control system is developed.

2. Elevator control systems

Elevator control systems are based on two different engineering problems. The first one is moving cars in the vertical direction and stopping them at a certain floor. Elevator system low level control commands cars to move, stop, open and close the doors by themselves. The second one is ensuring their efficient functioning by them controlling the operation of cars by themselves. It is used to ensure coordination between cars and this