

# A RANDOM SEARCH ALGORITHM FOR CYCLIC DELIVERY SYNCHRONIZATION PROBLEM

## ABSTRACT

**Background:** The paper is devoted to the cyclic delivery synchronization problem with vehicles serving fixed routes. Each vehicle is assigned to a fixed route: the series of supplier's and logistic centers to be visited one after another. For each route the service frequency is fixed and known in advance. A vehicle loads at a supplier's, then it delivers goods to a logistic center and either loads other goods there and delivers them to the next logistic center along the route or goes to another logistic center. Each logistic center can belong to several routes, so goods are delivered there with one vehicle and then they departure for the further journey with another truck. The objective of this cyclic delivery synchronization problem is to maximize the total number of synchronizations of vehicles arrivals in logistic centers and their load times, so that it is possible to organize their arrivals in repeatable blocks.

**Methods:** Basing on the previously developed mathematical model for this problem we built a random search algorithm for cyclic delivery synchronization problem. The random heuristic search utilizes objective-oriented randomizing. In the paper the newly-developed random search algorithm for cyclic delivery synchronization problem is presented.

**Results:** A computational experiment consisted of employing the newly-developed random search algorithm for solving a series of cyclic delivery synchronization problems. Results obtained with the algorithm were compared with solutions computed with the exact method.

**Conclusions:** The newly-developed random search algorithm for cyclic delivery synchronization problem gives results which are considerably close to the ones obtained with mixed-integer programming. The main advantage of the algorithm is reduction of computing time; it is relevant for utilization of this method in practice, especially for large-sized problems.

**Keywords:** cyclic delivery synchronization n problem, mixed-integer programming, optimization, heuristic algorithms, random search