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EXTENDED ABSTRACT

The problem of Resource Leveling in Multi-Project Mode by Cuckoo Optimization Algorithm

Elham Shadkam *

Department of Industrial Engineering, Faculty of Engineering, Khayyam University, Mashhad, Iran

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1. Introduction

Resource leveling is very important in projects and project managers always need a schedule based on the optimal use of resources needed to complete their projects. Most resource leveling research has been done in a single project, while in many organizations several projects are done simultaneously. For this purpose, a mathematical model is presented by all projects with the aim of minimizing changes in the level of different resources. Leveling and allocating resources is one of the most basic tasks of project management. Typically, project management uses specific methods such as GERT and PERT to plan and control the project (Boctor, 1990). Because the problem of resource leveling is an NP-complete problem and it is not possible to achieve the optimal solution in the general case (Guo et al., 2012), the cuckoo optimization algorithm has been used, which is one of the newest and most efficient evolutionary optimization methods.

2. Methodology

In all previous studies, although the goal is to level the efficiency and effectiveness of more available resources and the problem has always been formulated due to the limited time of the project, but in none of the work done external factors that affect the time of activities there has been no attention. The problem of resource leveling is an NP-hard problem and it is not possible to achieve the optimal solution in the general case and to solve it approximately, innovative methods or meta-innovative methods should be used. In this paper, a solution method based on the meta-heuristic method of the cuckoo algorithm is presented, because the cuckoo algorithm, although it is an approximate method, gives us the optimal answer in a shorter time, which has not been done in the case of several projects.

3. Results and discussion

Comparison of the results obtained from problem-solving with the cuckoo algorithm, which is an approximate method with the exact branch and boundary method, indicates that it is more appropriate to use the exact method in small dimensions, and as the dimensions of the problem expand, the cuckoo algorithm It will provide the right answer more quickly.

* Corresponding Author
E-mail addresses: e.shadkam@khayyam.ac.ir (Elham Shadkam).

4. Conclusions

In this paper, the problem of leveling resources in multi-project mode using the cuckoo algorithm was investigated. This problem is known as NP-complete problem and cannot be solved by conventional optimization methods. Therefore, in this paper, to solve this problem, the cuckoo meta-heuristic algorithm was used for the first time. After examining the general concept of resource leveling, this issue was investigated in the case of a single project, several projects-one resource and several projects-several resources. After presenting different leveling models, they have been solved using a precise and approximate approach. In order to implement the approximate approach, the cuckoo optimization algorithm has been used. Accordingly, although the cuckoo optimization algorithm does not provide a completely optimal answer, but in a short time it reaches the appropriate answer. Also, in order to implement the exact approach, the branch method was used and then the times obtained from the cuckoo algorithm and the branch and boundary method were compared, and finally the error of the two methods was measured by the expressed relation. The overall result shows that in low dimensions the branch and boundary method is much better for the resource leveling problem and the wider the problem dimensions, the closer the TSD value obtained from the cuckoo algorithm to the TSD obtained from the branch and boundary method. Becomes. Therefore, in large dimensions, it is better to use the cuckoo optimization algorithm. It is suggested that for future research, the parameters in the model can be considered as probabilistic and the cuckoo algorithm can be used to solve them. Other meta-heuristic algorithms can also be used for the mathematical models presented in this paper and the results can be compared with the cuckoo algorithm.

5. References

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