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Application of Genetic Algorithms to Optimize Heavy Earthquake Operations

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Abstract
Most of the major projects in the construction industry are faced with earthquake operations, so that one can rarely find a construction project that does not have such operations. For infrastructure projects, ground operations are one of the major areas of the project, and a wide range of construction machinery is used to carry out earthquake operations. Soil operations are one of the most important and costly parts of construction projects and projects for harvesting materials from surface mines. One of the important factors in the success of large projects and projects such as dam, road, tunnel and more is the role of machinery and, consequently, the way of selecting and managing it properly. Due to the large scale of construction projects, even a small improvement in operation operations can save a lot of work. One of the major costs of infrastructure is the cost of ground operations. Therefore, the purpose of this study is to use the genetic algorithm to optimize heavy soil operations for proposing a method for developing a method to optimize large-scale earth-borne operations for the lowest cost of land operations.

Keywords: genetic algorithm, Earthworks, optimization, road construction machinery

1. INTRODUCTION

With regard to the huge volume of development projects, the three categories of management, machinery, and implementation technology have progressed more and more and still require progress. In the meantime, with the expansion of the volume of projects, the category of management has been widespread, as each of the different sections of the project needs its own specialty. The management of engineering machinery requires the branches of management science that has found its place in construction projects. One of the capabilities of the science of machine management is that, given the needs, conditions, demands, constraints, costs and other factors that govern the project, the project manager can lead the selection of machines suitable for doing different jobs. Proper machine selection In addition to the correct implementation of the project, the project manager will help the project manager to have a simple management of both the project machinery and the whole project, and on the other hand incorrect selection of machinery will add to the project problems, because in land operations, machinery The most important and cost-effective sources are available [1,2]. In a land-based operation project, the main goal of the project is to implement the project with a minimum operating cost. The issue information includes the scope and operational information of the project, the time it takes for the project to be completed, as well as the number and characteristics of all machines that can be used in the project [3]. Hence, one of the important factors in successful projects and projects is the role of machinery and, consequently, the way of selecting and managing them correctly. In a machine planning, the ultimate goal is to minimize the overall cost of the operation, with the assumption that the selected fleet has the ability to perform the relevant operations at the scheduled time. Due to the high scale of construction projects, even a small improvement in operational efficiency can be very cost effective [4].

2. RESEARCH BACKGROUND

There has been a lot of research on the application of genetic algorithms in development projects. Parente and Gomez, in 2016, optimized an integrated system for earthwork. The system was validated using real-world data from a Portuguese construction site. The results show that the proposed system is much more convenient than the manual allocation methods currently used for the design and construction of ground operations [5]. In 2015, Aziz launched an optimization of land operations in Egypt's projects. Heavy construction equipment is commonly used in civil engineering projects, which includes land operations. The proper choice of equipment for civil engineering projects is inherently the process of evaluating their costs and their multiple benefits(Figure-1). This is due to the complexity of today's construction projects and the lack of systematic tools. Software selection factors for selecting equipment by optimizing the heavy operation of heavy operations is a key to the success of each one [6]. The conceptual model used in this study was as follows:

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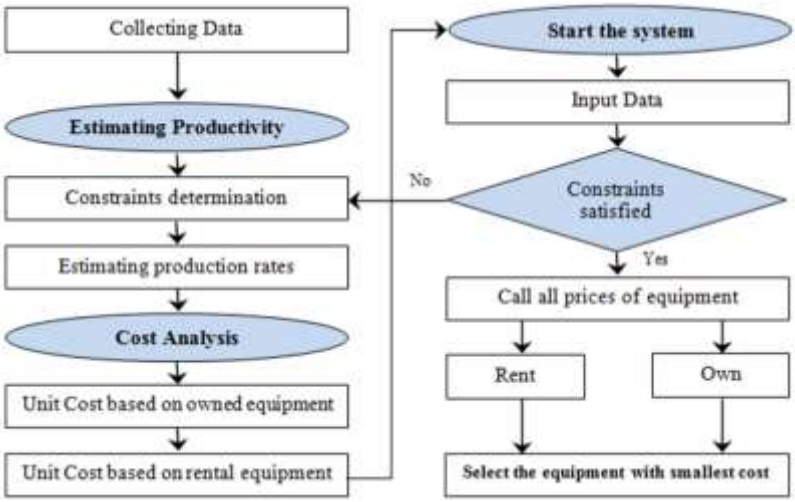

Figure-1: Conceptual Model of Research aziz [6]

Parente and Gomez, in 2016, undertook data mining operations and geographic systems for earthquake equipment and machinery. Different working conditions, such as the productivity of equipment, require a different approach [7]. In 2011, Wen attempted to optimize the fleet of cargo trucks in land projects. Most construction projects involve excavation operations. Truck fleet management is considered for this operation. This paper presents a hybrid mechanism for optimization. We use a discrete event simulation model to demonstrate ground motion, and these models are used to simulate programs for the dispatch of a truck fleet. Then we apply genetic algorithms for selecting optimal programs with minimal operating time. A theoretical example proves that the proposed mechanism can effectively determine near-optimal solutions. Finally, we develop a user-friendly relationship so that we develop land-based operations We propose contracting companies [8].

Parente and cortez in 2015 launched a multipurpose optimization system for land operations(Figure-2). They did several experiments. Their operational model was as follows [9]

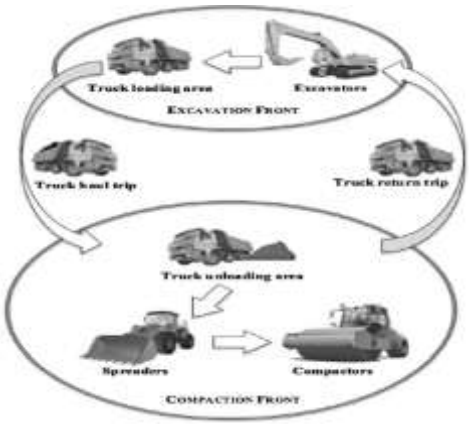

Figure-2: The Relationship between Ground Operation Equipment [9].

In 2015 Pan and Calejo sought to identify, design and analyze land projects. Limitations and activities in this research were modeled and reviewed. The third and last, kinematic simulations and optimization processes were conducted to assess the benefits of providing a parallel space mechanism. Simulation results showed that these mechanisms can show better kinematics performance [9].

In 2006, Kandil optimized the operation of enormous projects using genetic algorithms. His results showed:

1) Ability to optimize large projects.
2) Saves time.
3) It requires a lot of computational steps in the analysis.

The overall research algorithm was as follows [10].(Figure-3).

2) Project budget

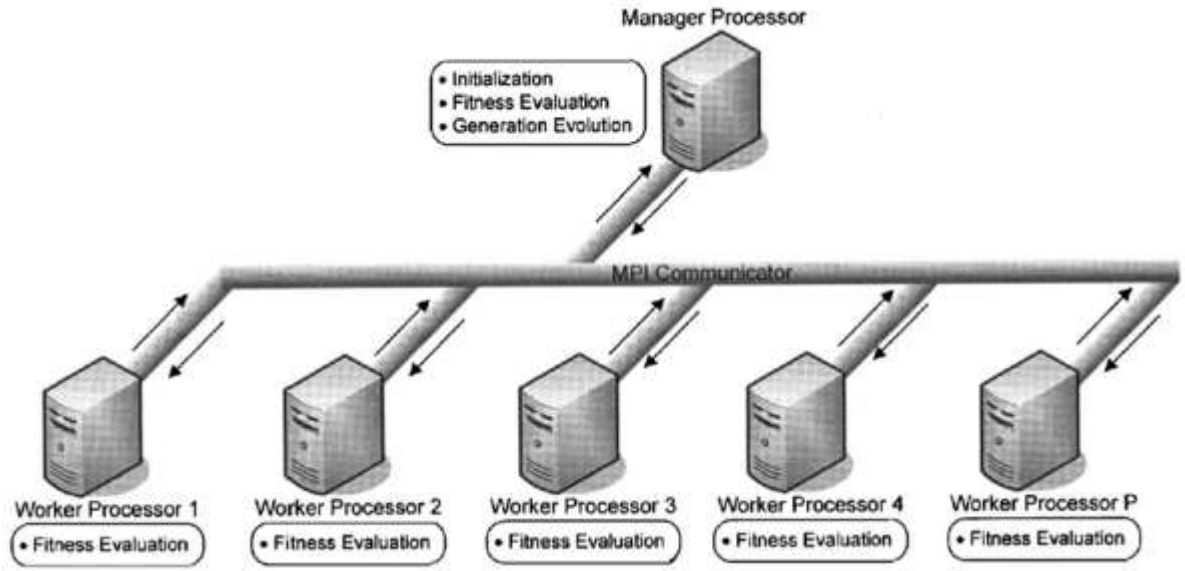

Figure-3: Research algorithm [10]

In 2007, Lee developed the use of genetic algorithms to optimize soil projects. Further development of recreational projects entails a continuous and larger investment of resources compared to typical real estate projects. This research prioritizes the values that each individual can bring to the project and develops its development program based on current net worth [12].
Burt in 2010 launched a model for optimizing the mineral equipment. In many industries and projects, the equipment and materials are the most important elements of it. Extensive research has been carried out on mining and construction projects(Figure-4). There is a lot of complexity in the relationship between these factors. The only method is a set that can accommodate small features [13].

Jang and Topal in 2014 launched software operations to optimize ground operations. This article provides an overview of the work published in the field of SC application in different regions. A brief introduction to mines and the general context of SC applications is presented in the first part of the paper[21]. The second part consists of four chapters. Selection of the mining method, the selection of equipment and their application in SC technology are presented in Chapters 1 and 2[20]. The third chapter discusses topics related to stone mechanics and some SC representatives in this area. The final chapter offers rock bombing SC programs that include explosion design and hazards. The final section of the paper discusses the use of SC applications in several mines and future applications of advanced SC technology [14].

Figure-4: Different items of land operations

In 2004, Moslehi attempted to optimize several elements of ground operations [15]. In 2009, Moslehi made a model for optimizing ground operations, including:
1) Sources of contractors
3) The purpose of the work
4) Project environment conditions
5) soil type
6) Project revenue

7) Work equipment [16].
In 2016, Naskodakis has been exploring issues related to ground-handling equipment in recent years. The result of this paper will enable future researchers to provide knowledge of progress in construction equipment and its potential capabilities and provide future research paths on this topic [17].
In this form, the process and the relationship are shown in the algorithm

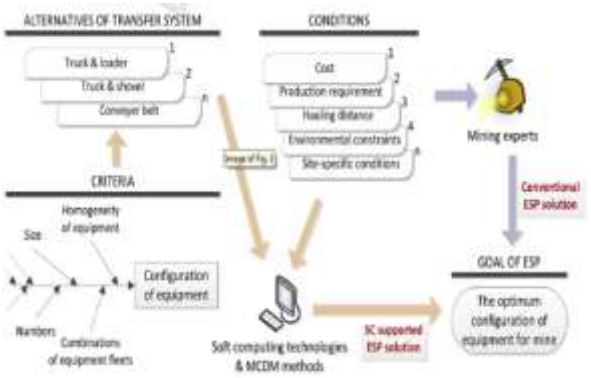

Figure-5: Comparison of the relationship between software solutions [19]

Ugwu began modeling and designing a genetic algorithm for development projects in 1998. In this research, he expanded the model of the classic land-based planetary program to a complex integer linear program that is considered for blocks[18]. However, the result model is far more difficult to solve than the original linear program. Based on the structure of the observations, he introduced a set of algorithms that theoretically reduce the time to solve the model(Figure-5). He confirmed this reduction at the time of resolution by numerical experiments [19].

3. CONSLUSION

The purpose of this study was to use the genetic algorithm to optimize heavy soil operations to propose a method for the optimization of high volume soil operations for the lowest cost of ground operations. In this research, by reviewing articles and studies in this field, we tried to study the application of genetic algorithm in development projects. The results of this study are that the use of genetic algorithms in development projects, especially in earthquake optimization, project scheduling control, machine planning, and other engineering engineering sections is very effective.

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AUTHORS CONTRIBUTION
This work was carried out in collaboration among all authors.

CONFLICT OF INTEREST
The author (s) declared no potential conflicts of interests with respect to the authorship and/or publication of this paper.

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