Particle Swarm Optimization in Training Management of Construction Projects

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Abstract: The process of mining the necessary information from the database the previously exist called data mining, also it was given different name as extraction of knowledge, detection of information, harvesting of information, data archeology, and processing of data pattern. The author gather these data from the papers and projects and form a mathematical model to solve training problems. 41 project taken and every project contain 10 problem contain 3 conceivable solutions, the PSO attempts to determine the best solution. The results show that most of the engineers are not multidiscipline and even if they work on the other discipline, the lack the principle of it. The nature of the construction industry in Iraq tends to use the traditional methods in the construction and refuse to use the modern techniques. PSO algorithm used to determine the optimal result for each training problem. PSO technique displays operative method in determining the greatest solution in terms of velocity and way of examining.

KEYWORDS: Optimization, training Problems, PSO, Solutions

1. INTRODUCTION

The process of mining the necessary information from the database the previously exist is called data mining, also it was given a different name as extraction of knowledge, detection of information, harvesting of information, data archeology, and processing of data pattern.[1]

There is a gap between the construction Industry and data mining when it compare with other industries. This could be return to the reason that the construction process is an impermanent and specific action that means the one project data can rarely be used for an alternative project. But one can ask it's not maybe all the time true, as though products of the construction are exceptional but some resemblances can be exist among them and processes of construction and management skills are typically common to all projects.[2]

Ma, T., Luong,[3] Define the present managers construction and their level of skills, restraints and their requirements for training and how they differ from the certificated training engineers in managing the projects as it was found that a skilled engineer is much more productive and less problems generate, Alkinani[4]clarifies the problems concerning training system in rapports of how is piloted, and how valuation is delivered and explores experiments that face training system actions.

Jia Liu, and other (2018) [5]: Introduce (GA) for the RCPSP. The suggested algorithm provides a number of variations in the paradigm of the GA, as an innovative selection operator to choose parents to rebound; an improved two-point operator of crossover with a
precise crossover imperative; The suggested algorithm was verified by problems of standard level of size J30, J60, and J120 from "Project Scheduling Problem Library" (PSPLIB) and associated with 19 research in the met heuristics in the previous studies. The finding validate that the proposed algorithm is an inexpensive algorithm for RCPSP solving.

The goal of this paper is to develop an integrating a training system to form multidiscipline engineers in construction projects and consider an operative to accomplish the construction projects issues in regarding both duration, cost. Attaining current goal, there are some purposes should be found as follows:

1-Assess the awareness in training level in construction projects
2-Find the resolutions for these problems with effect on both cost, time, and quality using particle swarm optimization.

2. METHODOLOGY

PSO was to use to optimize the solution for the problem related to the training and multidiscipline in the construction industry, its consists of the following steps:

The first step is to develop a mathematical model to solve the problems relate to the training and the multidiscipline as follow:

\[
\begin{align*}
\text{MAX } Z_2(1) &= (W_{ij}^j) * W(0)^j * x_{ij}(0) \\
\text{SK(i)} &= \text{Q(i)} - 0.5 * Q(i) \\
\text{TS} &= S * (1/DEM^1) * SK + (1 - S) * (1/DEM^1) * SK \\
\text{WD} &= \text{MT} * (TP + TS + 1 - TP + TS) + (1 - MT) \\
\text{Cmij(i)} &= E(i) * max(x_{ij}) * W_{ij}(i) \\
\text{Smiij(i)} &= J(i) - (t_{ij}(i) * x_{ij}(i)) \\
\text{xij} &= \text{Xi}(i, j) \\
\text{TP} &= \text{rand}(1) \\
\text{MT} &= \text{rand}(1) \\
S &= \text{rand}(1) \\
DEM &= \text{rand}(1) \\
\end{align*}
\]

The variables in each equation as follow:

| variables | Description         |
|-----------|---------------------|
| Wij       | Work accomplish     |
| WD        | Work to do          |
| SK        | Skill               |
| TS        | Total scrap         |
| MT        | Miss in training    |
The next step is to formulate an interface to provide information about the type of engineering regarding his expertise, discipline, and skill, also information regard type of project, whether it's building, housing, road, and others.

![User Interface](image)

**Fig1. User Interface**

The type of each node that used as follow
Table 2. Nods Description

| Node      | Description                        |
|-----------|------------------------------------|
| Edit      | Its use to add a description       |
| Pop – up Manu | Its use to describe more than one option |
| Posh bottom | It’s used to call command         |

The right side is used to describe general information regarding engineering as type, skill, discipline, and others and the left side represents the problems and their solutions according to each type of building.

After selection of the project and problem, let’s say problem 1 the following appear

![Figure 2](image1.png)

**Fig. 2** Show the Problem 1 for the Project of Type Building

![Figure 3](image2.png)

**Fig. 3** Show the Problem 2 for the Project of Type Building
Fig. 4 Show the Problem 3 for the Project of Type Building

3. Conclusions

1- The training system in the Iraqi construction are very weak and very negligible and doesn't contain any supervision
2- Most of the engineers are not multidiscipline and even if they work on the other discipline, the lack the principle of it.
3- The nature of the construction industry in Iraq tends to use the traditional methods in the construction and refuse to use the modern techniques.
4- PSO algorithm used to determine the optimal result for each training problem
5- PSO technique displays operative method in determining the greatest solution in term of velocity and way of examining

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