Chapter 9

Meta–Heuristic Approach for Software Project Risk Schedule Analysis

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ABSTRACT

This chapter illustrates a technique to shorten the time duration using structured method. This is done by considering multiple resource constraints apart from time for the software project. The resource constraints are due to limited availability of resources (hardware, software, people, etc.). The difficulty is to locate minimal duration schedule. This is done by assigning the start time for each activity with the clear representation of precedence among them and resources available. There are various optimization approaches available but authors have selected a genetic algorithm. This method emulates the concept of biological evolution that is based on natural selection. This chapter concludes that additional research is needed in this area to provide better outcomes.

INTRODUCTION

Software business is a high-speed growing industry with deadline constraints and resource constraints issues. Resources available are not in abundance and for the success of software project the resources need to be allocated to reduce the probability...
of not meeting the deadline as per the total duration estimated for the completion (Singh, 2008).

Project management is a multifaceted choice making process that takes into consideration two domains i.e. time and cost. While managing the project decisions are to undertake related to planning and scheduling. While planning a project, planning for the requirements of several resources is to be carried out. Planning is a bit strategic process that usually makes use of Gantt Charts for generation of resource profile and allocation of the resources. It also helps in leveling the resources.

Scheduling on the other hand is the process of assigning resources to project. This helps in determining the begin and end times of the detailed activities. The process however becomes complex when a large number of process are competing for limited projects. The major goal is the assignment of limited resources to solve the problem optimally. A large number of tools exits that will help in project scheduling the only prerequisite is the knowledge about the duration for activities, their precedence order and number of resources required (Buriol, 2005). The two important techniques however are Critical Path Method (CPM) and Program Evaluation and review Technique (PERT) (Singh, 2008).

The problem with these two methods is that they do not consider the resource constraints during scheduling. For these two methods there are unlimited resources available for the project i.e. not a valid assumption for practical situations (Charette, 2005; Deepti, 2004). Moreover, they are applicable to only one project at one time. But the reality is that we have less of resources in number and multiple projects are running at one time in practical.

Both of these methods do not consider the constraints related to resources and hence are not enough for scheduling projects in software industry. There is a need of such an algorithm that would be resolving recourse related constraints that will balance between time and cost tradeoffs. For that purpose, Genetic Algorithm is to be used that will help in solving optimization problems based on natural selection. The main aim of this chapter is to develop such an algorithm using the concept of GA that helps in minimizing the total duration of the projects and in solving the Resource Constrained Multi-Project Scheduling Problem (RCMPSP) (Hartmann, 2008).

**PROJECT SCHEDULING UNDER RESOURCE CONSTRAINTS**

In practical the development of projects is done by dividing the work into number of activities. Each activity is assigned a time frame in which the task is to be completed. In order to complete one or more activities a large number of resources are required. Each resource has limited capacity and an activity can’t be started until and unless
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