

**SCHEDULING A PROJECT – POTENTIALS OF TIME AND SPACE
PERSPECTIVE**

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ABSTRACT

Effective project planning is important in software development. Failure to plan and / or poor management can lead to delays and costs that, given time constraints and budget constraints, are often unacceptable, leading to a critical business crisis. Software development organizations often struggle for the timely delivery of projects, within the budget and with the required quality. One of the possible reasons for this problem is the poor management of software projects and, in particular, inadequate project planning and inefficient command staffing. The problem of software project planning (SPSP) is one of the important and complex problems faced by software managers in a highly competitive software industry. Since the problem becomes more difficult with the increase in the number of employees and tasks, there are only a few algorithms, and performance still does not satisfy. To develop a flexible and efficient software planning model in this article, we attempted to review several methods and methodologies, and the results obtained were developed.

Keywords:

Software engineering, project management, software project resources, project scheduling, RCPSP, SPSP, ACO

INTRODUCTION

Project management is the application of knowledge, skills, tools and techniques to solve the problem of project planning. It is important to study the development of effective methods of computerization for the planning of program projects challenging the development of software. Unlike projects in other areas, software development is a person-centered activity. Software development organizations often struggle for the timely delivery of projects, within the budget and with the required quality [1]. One of the possible reasons for this problem is the poor management of software projects and, in particular, inadequate project planning and inefficient command staffing. Manning the software project is a tedious activity [2]. The manager must choose from the team of employees, there may be the possibility of many combinations. Thus, staff distribution or staff planning is an important factor when software development is seen as a value-oriented business.

PROJECT MANAGEMEN COMPONENTS*A. Resources*

For each activity, some resources are required to process it. Examples of resources are: machines and tools, people and their skills, raw materials and semi-finished products, natural resources (energy, water, land, etc.), information, money, etc [3].

B. Activities

Usually, each activity is characterized by: a resource Requirements, processing model and priority restrictions with other activities, but other parameters may arise in the formulation of the problem.

C. Objectives

In real conditions, the literature has studied many of the objectives of project planning[4].Let's just mention that of all of them, some of the goals may be time-related, as they relate to the temporary use of renewable and doubly limited resources, while others to value, as they relate to consumption of non-renewable and doubly limited resources[5]. These two types usually represent conflicting goals, since the reduction in processing time leads to an increase in resource consumption, and vice versa, to a decrease in the cost of execution (in terms of consumed resources) increases the duration of the project.

D. Schedules

The schedule is determined by the sequence of activity startup (completion), but this is not enough for problems when actions can be performed in several modes[6]. Thus, in these cases, additional information is needed on

the processing modes. The schedule is time-sensitive if it meets all the priorities and time constraints defined for the project, and is available for resources if all resource constraints are satisfied. A schedule is considered feasible if it is both a time and a resource. The optimal schedule is a possible schedule, for which the given efficiency rating is optimized.

E. Stake holders

In each project there are interested parties. Stakeholders are people who are interested in the successful completion of the project. There are many different types of stakeholders, and stakeholders depend on the project[7]. But it is important to remember that stakeholders need to have a role in setting project goals, because they are people who will be affected by the result. When you identify project stakeholders, the project manager and members of his or her team must carefully consider who will be the end-users of the product, whether services or goods, and whether the product will have an apostate effect and how it can be obtained. Some of the stakeholders are clients / clients, sponsors, company, team members and project manager. The software project suffers from a number of problems, such as high computational cost, a higher delay in the development of projects, rather than meeting the actual needs of the user and many systems are not being used[8]. These problems are solved through software risk management, which helps the software developer to identify, analyze and, accordingly, process the elements of the software. Program Risk Management is also an attempt to define and formulate a risk-oriented relationship of success with a certain set of methods and methods. Software development is developing a very complex environment in the software markets. Therefore, companies are under tremendous pressure to structure and ensure competitive provision by reducing the complexity of the project and the wait time of the software while maintaining the quality of the software that very much requires that the software industry more focus on the complexity of the project. Various strategic management decisions create different sets of risks with different cost commitments. Thus, each strategic decision requires a project management plan with its own unique budget and software development schedule.

SOFTWARE PROJECT SCHEDULING PROBLEM (SPSP)

SPSP is the problem of finding the optimal schedule for a software project, so that priorities and resource constraints are met, and the final cost of the project, consisting of personal salaries and duration of the project, is minimized[9]. In addition to reviewing staff salaries and skills, SPSP also takes into account the workload and the skills required for each task, so SPSP is suitable and able to describe a real software project planning. Although SPSP is close to RCPSP, there are several differences between SPSP and RCPSP. First, the objective objective (ie, costs associated with employees) is optimized in the SPSP in addition to the goal of minimizing the project in RCPSP. Secondly, employees with several possible skills are the main resource in SPSP, although there are several types of resources in RCPSP. SPSP is associated with resource constrained resource planning (RCPSP), which aims to find an abnormal schedule that matches priorities and resources, while minimizing the duration of the project[10].

METHODOLOGIES FOR SOLVING SPSP

A. GENETIC ALGORITHM

The genetic algorithm is one of the stochastic searches methods and it is successfully applied in many problems of search, optimization and machine learning. Optimized planning tasks can be solved using the GA[6].Based on the simplifications of natural evolutionary processes, genetic algorithms work on a set of solutions, rather than on one solution, and use a heuristic such as choice, crossover and mutation to develop better solutions. GA supports a population of a certain size. Everyone who is a preliminary solving the problem, is subject to competitive influence, applying some variation operators to search for a global optimum. To achieve the goal of searching for a global optimum, task variables are encoded by so-called chromosomes. Thus, one person is associated not only with one encoded solution (chromosome), but also with his corresponding suitability, corresponding to the solution. Gas improves individual fitness, which means the level of solution optimization, using the types of competitive operations. And with an increase the quality of generation, the suitability of chromosomes is getting better. When applying GA tasks to SPSP, there are two main tasks. Coding. The solution of the SPSP problem is represented by a negative matrix. Function of fitness. The following expression is used to calculate the suitability of the solution

B. ANT COLONY OPTIMIZATION

Unlike GA and TS approaches developed in existing studies, another approach to attracting attention is the ACO approach. It can be applied to various combinatorial optimization problems. The ACO algorithms use simple agents, called ants, which iteratively build candidate solutions for the combinatorial optimization problem[7].

The construction of the ant solution is guided by (artificial) pheromone traces and problem-dependent heuristic information. In principle, ACO algorithms can be applied to any combinatorial optimization problem by determining the solution components that ants use to iteratively construct potential solutions and to which they can precipitate pheromone. An individual ant creates solutions for candidates, starting with an empty solution, and then iteratively adding the components of the solution until a complete candidate solution is created.

PREEMPTABILITY

In many models of project planning tasks, it is assumed that the actions are not precautionary, but in some projects this assumption is weakened and it is allowed to preempt actions. In general, each of the projects can be either preventive or not preventive [11,]. However, it is usually assumed that (not) the Prefecture concerns all actions at once. In accordance with this assumption, we are talking about a set of non-preventive actions, if none of them can be but we are talking about a lot of preventive actions if each action can be unloaded at any time and restarted later at no cost [12]. Prevention can be either discrete, if the suspension of activities is allowed only at the end of time periods, or continuous, if there can be a prevention at any time.

CONCLUSION

Software development involves time, talent and money. In the competitive market, the main goal of the software development organization is to maximize the creation of value for this investment. Therefore, it is very important to correctly use every available resource in a software project.

Although SPSP is close to RCPSP, there are several differences between SPSP and RCPSP. First, there are several goals

- [1] The cost associated with employees should be optimized in order to minimize the duration of the project in RCPSP.
- [2] Employees with several possible skills are main resource in SPSP, although there are several types of resources in RCPSP.

Among several methodologies, ACO sounds better because it builds solutions step by step and iteratively, allowing you to use heuristics based on problems to guide the search for ants, you can develop a useful heuristic to direct the ants to planning as early as possible, and assign project tasks to suitable employees with the necessary skills. This review of the various methods will be useful to better study and develop new ideas for improving planning methods.

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