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ENGINEERING PROJECT MANAGEMENT PLANNING AND SCHEDULING

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ABSTRACT

Many problems and applications are complicated to solve in a traditional way. Software is the effective solution that addresses this type of problem. These problems widely exist within the engineering field. Scheduling and Planning problem is the one of this problem. This problems addressed in this research in another way that is easier, simpler, and cheaper than the available software. There are many manual methods for solving the problem of planning and scheduling. The Critical Path Method (CPM) is the most common used method for a project planning and scheduling. The working procedure of this method includes several sequences. The first step is identification for each activity within the project. After that, the sequences of the activities should be determined. In addition, the duration of each activity should be estimated. Finally, the network diagram should be drawn. Consequently, many parameters of Planning and Scheduling can be found. The earliest start is the early time in which activity can be started. The earliest finish is the early time in which activity can be finished, and the succeed activity is started. Latest finish is time at which activity can be completed without delaying the project. Latest start is the latest finish time minus the time required to complete the activity.

MATLAB software is utilized to develop a program that makes the essential computation of planning and scheduling process. Project management software model is built utilization software tools to solve Planning and Scheduling problem. In addition, GUI is designed to simplify using this software. Project management software is very simple to use within the graphical user interface. Any ordinary user could easily use the software without the need to understand, how it has been written or any another details.

This model clarifies the importance of the development software package for engineering project management. It explains in details how complex problems that are difficult to solve by traditional way would be easy, simple and quickly to solve by the software, such as planning and scheduling problems.

Key words: Management, Planning, Engineering, MATLAB

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1. INTRODUCTION

The Engineering Project Management is very critical and complex process. It includes many operations such as planning, scheduling, monitoring and controlling. These operations are complex and overlapping among each other [1]. When using traditional way to manage them, there is a high probability of falling into the wrong. In addition, it is time-consuming and needs significant efforts. The meaningful solutions to these challenges are project management software (PMS). It emphasizes on systemization of the problems in a programmed way to give optimal solutions by a click of a button.

Project management software is very simple to use within the graphical user interface. Any ordinary user could easily use the software without the need to understand, how it has been written or any another details. Most managers do not care about PMS because they do not know the potential benefits of it. There is a lack of understanding the importance and the impressive results when using software in the project management [2].Planning and Scheduling of a project is a very important phase for any work. It has a vital role for the success of projects. Any defect on planning or scheduling process will cause great losses in time and money [3] .There is many manual methods for solving the problem of planning and scheduling. The Critical Path Method (CPM) is the most common used method for a project planning and scheduling [4].The CPM can help to predict the time required to complete the project. In addition, it shows which activities are critical to maintaining the schedule and which is not. The working procedure of this method includes several sequences. The first step is identification for each activity within the project. After that, the sequences of the activities should be determined. In addition, the duration of each activity should be estimated. Finally, the network diagram should be drawn [5].

Consequently, many parameters of Planning and Scheduling can be found. The earliest start is the early time in which activity can be started. The earliest finish is the early time in which activity can be finished, and the succeed activity is started. Latest finish is time at which activity can be completed without delaying the project. Latest start is the latest finish time minus the time required to complete the activity.

MATLAB software is utilized to develop a program that makes the essential computation of planning and scheduling process.

2. SOFTWARE MODEL

PMS model is built utilization software tools to solve Planning and Scheduling. In addition, GUI is designed to simplify using this software.

This model clarifies the importance of the development software package for engineering project management. It explains in details how complex problems that are difficult to solve by traditional way would be easy, simple and quickly to solve by the software, such as planning and scheduling problems. The solutions results of this problem in the model are displayed.

2.1. Management of Planning and Scheduling Problem

MATLAB software is utilized to solve the planning and scheduling problem and GUI is designed to simplify using it. Figure (1) shows the main screen of the GUI of this program.

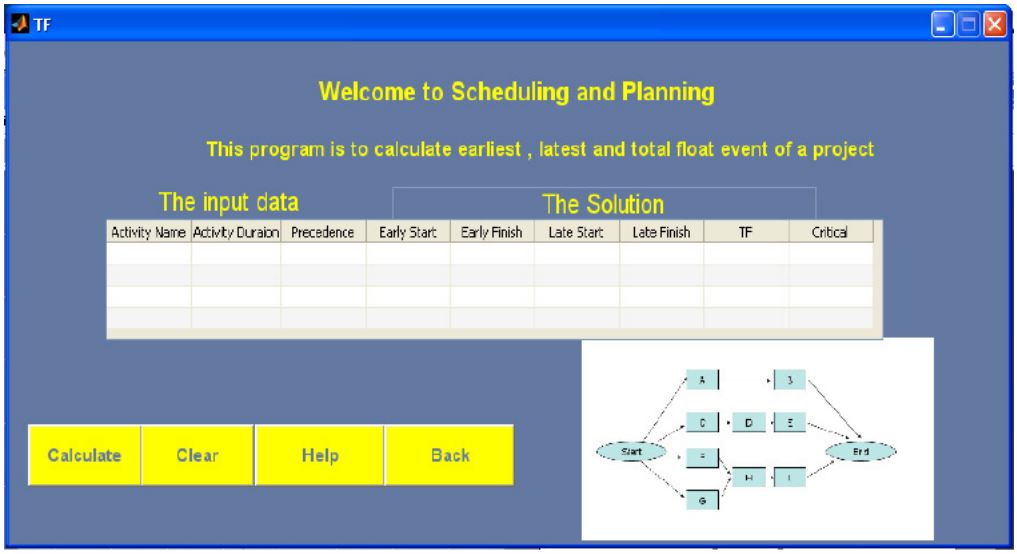

Figure 1 Main Screen of Planning and Scheduling Program

The validity of the proposed software will be shown for a hypothetical case-study as follows. Suppose that the manager needs to schedule a list of activities. Table (1) shows the list of activities entered by the manager. The immediate predecessors of an activity refer to those activities that must be completed prior to the starting time of a given activity. Similarly, immediate successors of an activity refer to those that follow the completion of a given activity. The "—" in this table indicates an activity without a predecessor.

This list is entered in the program via the GUI screen. The first step is to enter the number of activities that needed to be scheduled as shown in Figure (2).

Table 1 List of Activities Entered in Planning Program

Activity	Precede	Duration day
A	—	3
B	A	5
C	B	7
D	C	8
E	D	78
F	E	7
H	F	45
G	H	22
I	G	90

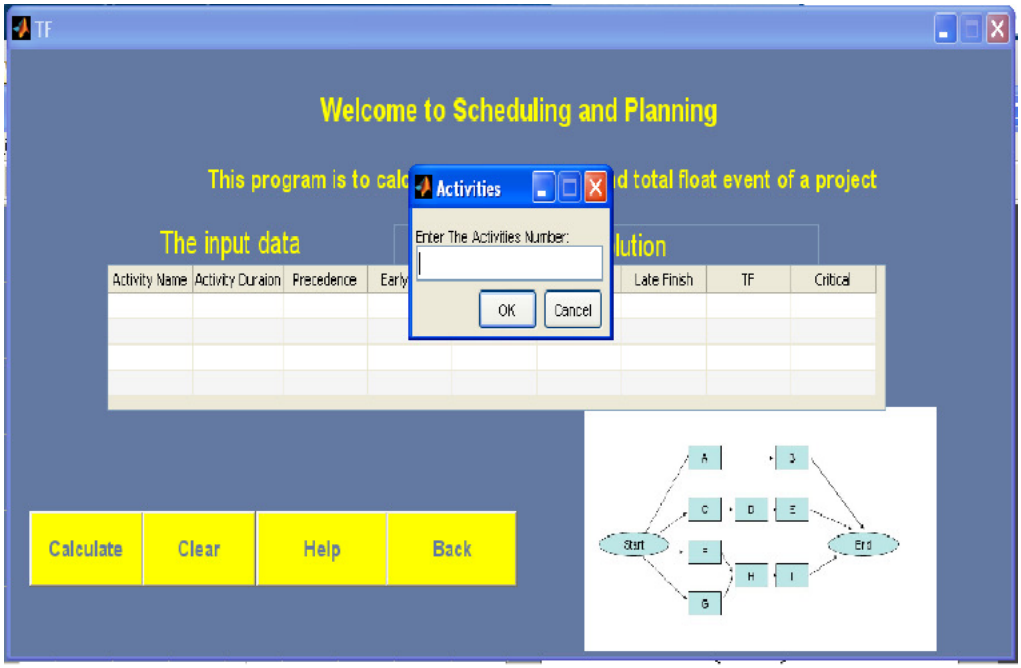

Figure 2 Propmt to Enter Activites Number

After that, manager should enter the name of each activity, its estimated duration, and its precedence as shown in Figure (3), Figure (4), and Figure (5) respectively.

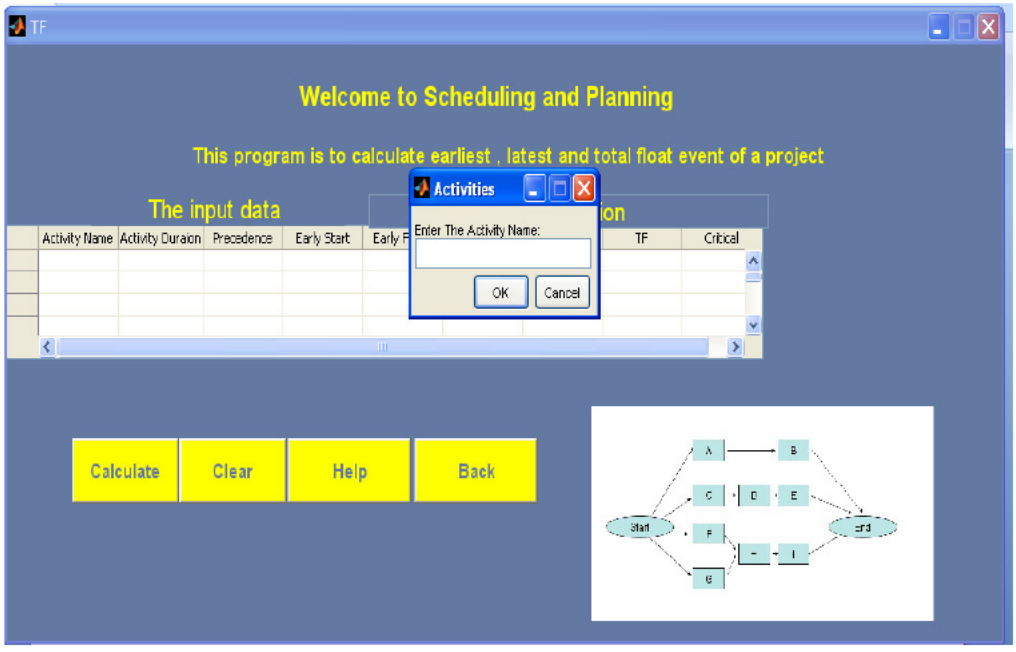

Figure 3 Propmt to Enter Activity Name

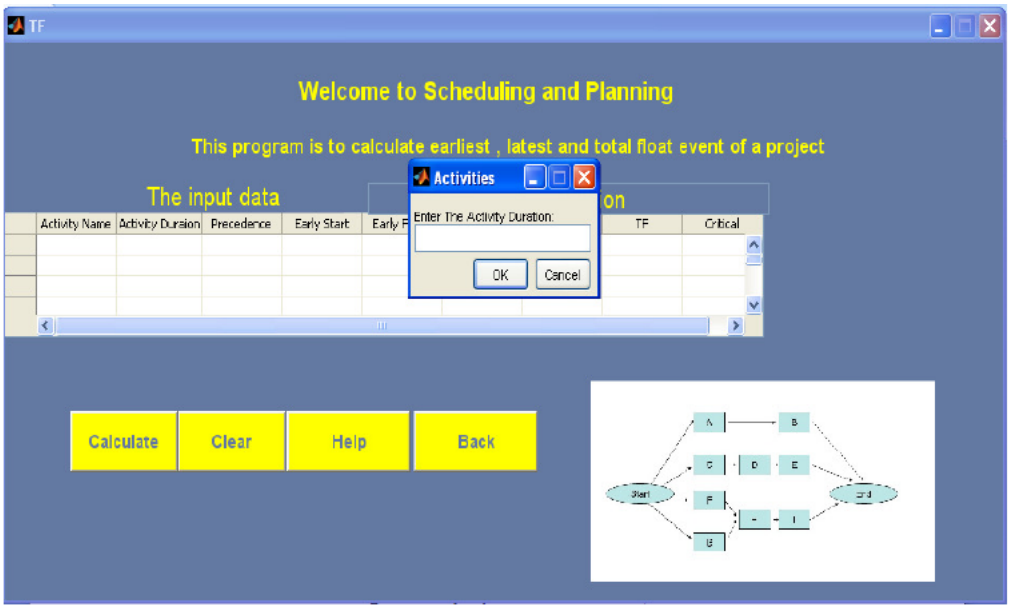

Figure 4 Propmt to Enter Activity Duration

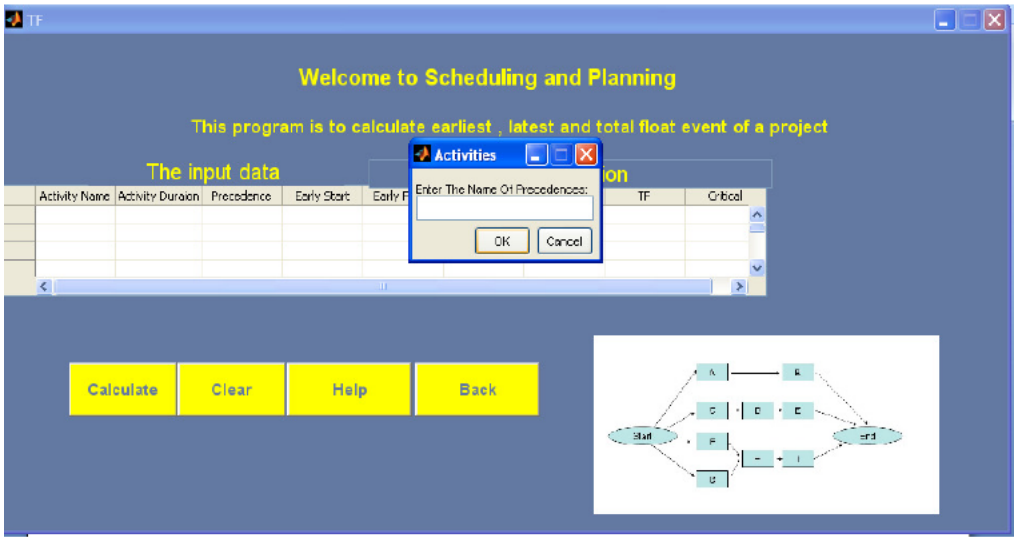

Figure 5 Propmt to Enter Activity Precedence

Thereafter, the result will be displayed by a click of the button "Calculate" as shown in Figure (6). The result shows every activity and the early start time that can be started and the late finish time that can be finished on. In addition, the late early and finish time of the activities, are displayed. Furthermore, the total float of each activity is displayed. It also displays the activities on the critical path by symbolizing to it by "C".

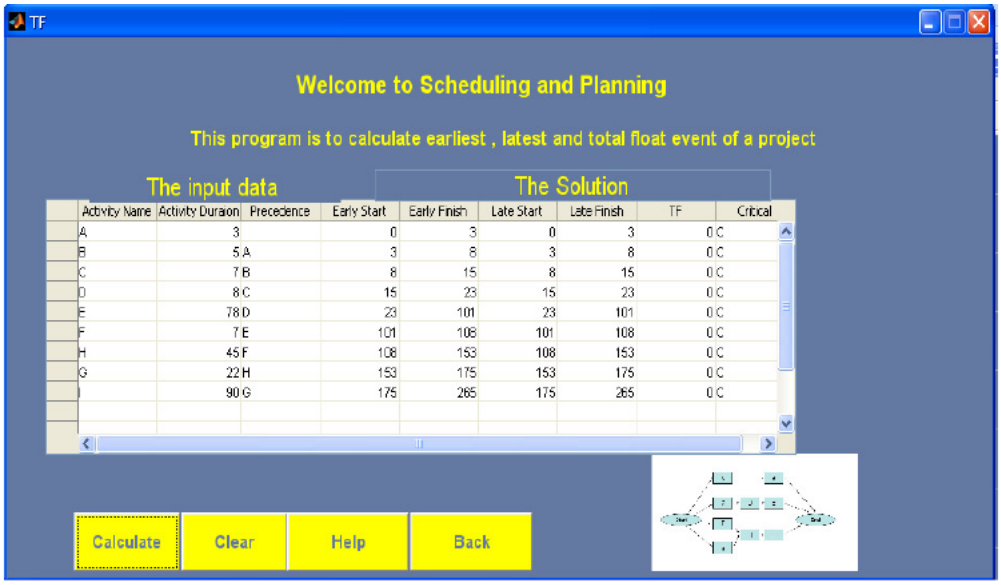

Figure 6 The Sheduled Activites and Its Parmeter.

For the manager, this result clierfies the over all duration of the project, and which activties are critcal. This explains in a simple and clear way that the software aids the manager to make a right decision in appropriate time, based on this accurate information and results.

This program also alerts the manager when input wrong data. Figure (7) shows that the manager inputs a wrong duration. Figure (8) shows the error message appeared to the manager in order to alert him. This result shows the ability of the developed software to discover the errors, which in turns ensures the obtaining of correct results.

The manager can adjust the scheduled automtically when any changes is done. suppose activity C you want to change its duration to becom 40 only change duration of this activity then press calculte the result will appered and all other scheduled parmeter will automatically changed as shown in Figure (10).

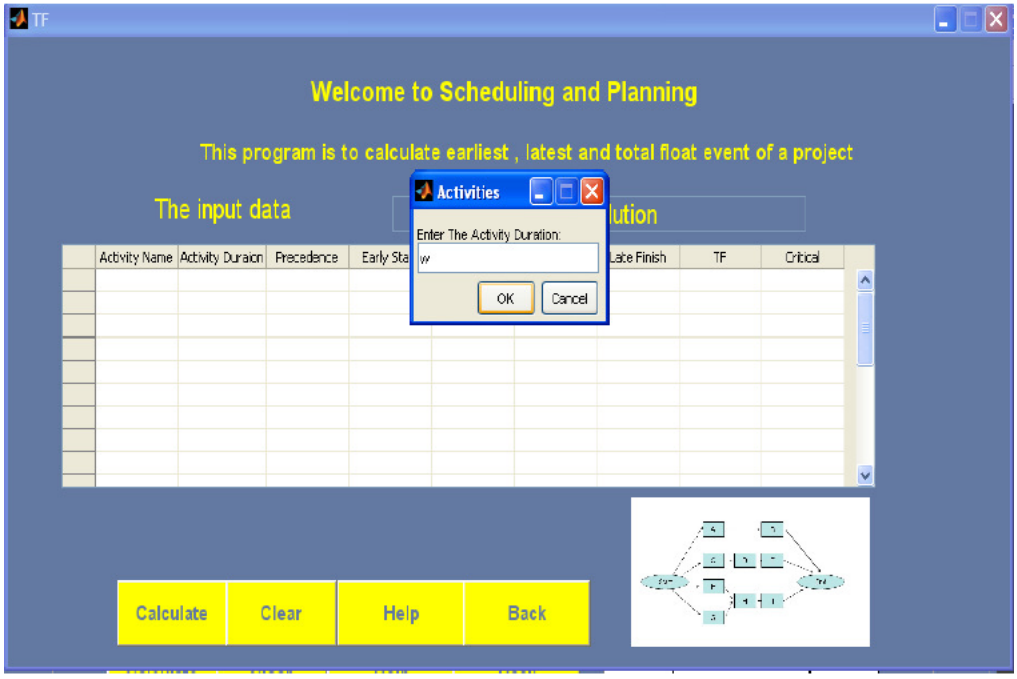

Figure 7 Input of Wrong Data.

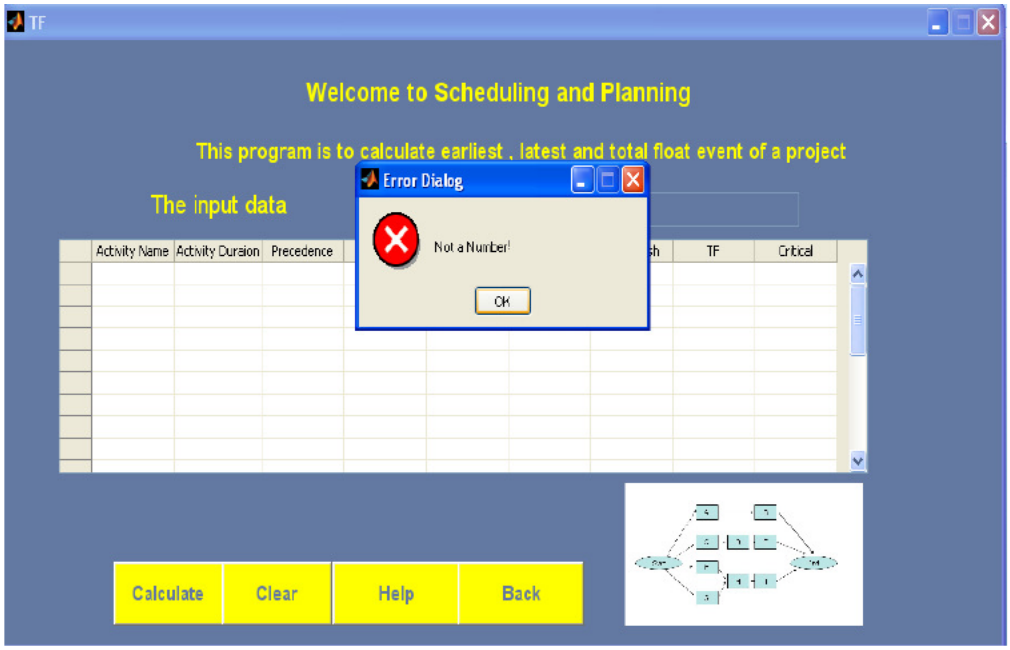

Figure 8 Error Message of Incorrect Input Data .

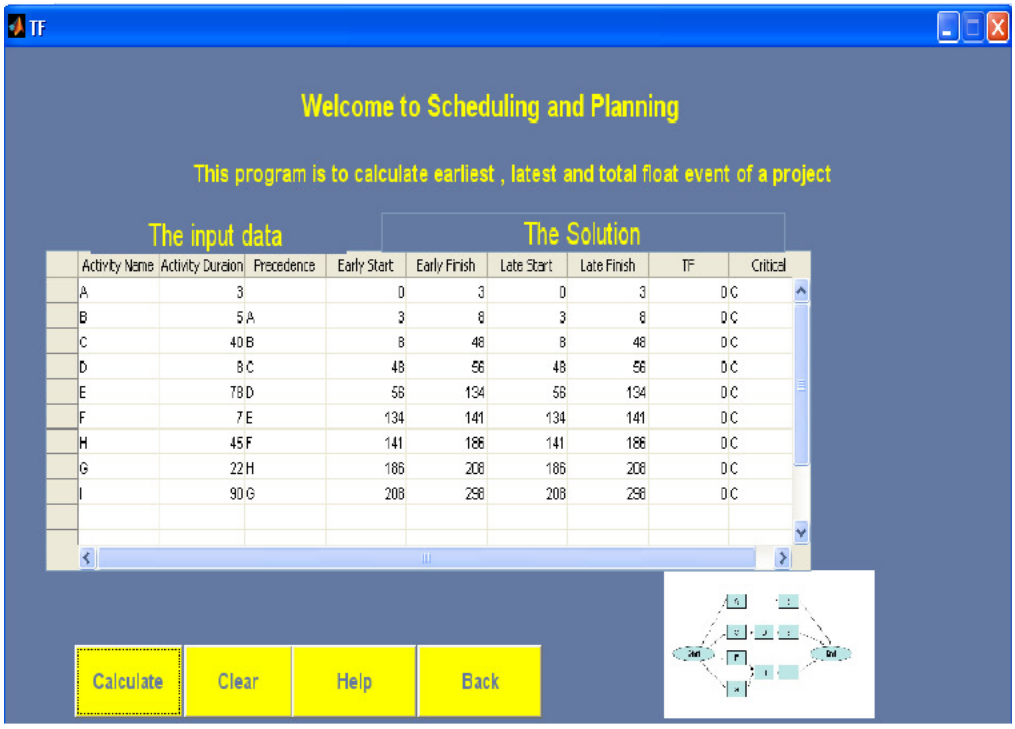

Figure 10 Data Automatically Adjusted as Chang is Done

The manager can use this program to solve problems that are more complex than the mentioned case. Figure (11) displays how the proposed program can handle a large number of activities where the result can be obtained simply by clicking one button. The desired results are immediately displayed on the interface screen.

Clearly, the proposed program is easy to use and understandable by any user. In addition, it is reliable for Planning and Scheduling problems, and the use of the MATLAB toolboxes provides a cheaper solution. Any small variations in the activities of the project are automatically adjusted by this program. All of these evidences demonstrate the importance of the development software as it is shown in the proposed program.

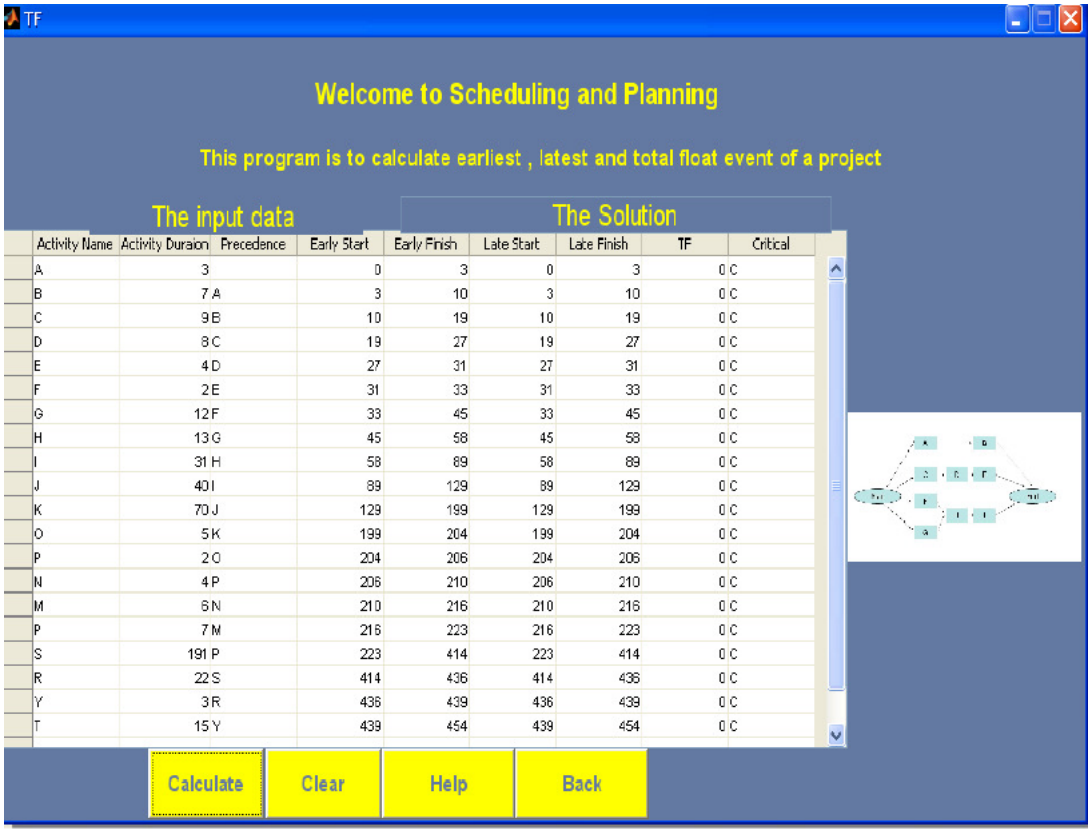

Figure 11 Planning of Larg Number of Activity

3. CONCLUSIONS

The work herein provides an evaluation and studies of the importance of the software in engineering management. In addition, it discusses the methodology for modelling and simulation of development software. The model of the PMS is built. It contains many application and problems that implemented and solved by MATLAB. These selected problems were not previously solved within a known software package. Consequently, optimum solutions are found for these problems to end up with the following conclusion:

- Planning and Scheduling is a key factor that affects the managerial process. It keeps the manager in tracking and monitoring, and more control. Also it is noted that any change done on schedule is adjusted automatically .Furthermore, software can handle huge inputs of date and by a click of one button, the result is appeared rapidly.
- Consequently, all projects need the software packages for efficient management. In order to develop these software packages, a computer engineering manager is needed to cooperate with other mangers from different engineering fields.

As our life improves, overwhelming demand of PMS is needed to cope with new life challenges in everywhere. The massive work is a result of hiring engineering computer tools in the management modules and trends.

3.1. Future Works

Recommendations for future works on the continuation of the thesis would include various possible directions, including the following issues:

- Research study and analysis for how the manager chooses the appropriate tools of the software to guarantee of the success of projects, and how to evaluate the used tools. Furthermore, how to prepare a project strategy more deliberately and how can carry out the project more efficiently.

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