PROJECT PLAN

Editor: Claes Arvidson

Version 0.1

Status

Controlled		
Approved		

Project identity

TATA62, CDIO project 2015 (autumn), Optimore
Linköpings tekniska högskola, MAI

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OPTIMORE

Document history

Version	Date	Modifications	Made by	Revised by
0.1	2015-09-24	First draft	Everyone	

1 Project overview

A significant problem today in avionics is to schedule tasks on modern airplane electronic components. The problems occur when a large number of tasks need to be scheduled in a short period of time. These tasks can also be dependent on each other and therefore need to be placed in a certain order. The avionics scheduling problem is a very fundamental problem in airplanes with advanced technology, such as modern fighter planes, as their sensors are constantly sampling data that needs to be processed.

The customer of this project wishes to research different methods in optimization heuristics to schedule these tasks. There is already a module available to the customer which states whether it is possible to schedule the tasks or not, given a specific set of data. Therefore, the goal of the project is for the group to find a feasible solution in the case when it is possible to schedule the tasks.

1.1 Purpose and goal of the project

The purpose of the project is to examine a few carefully selected heuristics in order to evaluate their time effectiveness. The heuristics will be tested using sets of data that contain information about a large quantity of tasks. The data will be generated and will vary in parameters such as sample size and probability distributions.

The aim is not to necessarily find heuristics which outperforms the current methods but to test a few selected heuristics and thereby investigate their potential.

1.2 Deliveries

The group, Optimore, will make deliveries according to the requirement specification. The deliveries consists of a set of documents to the customer and the examiner of the course and a final presentation of the work. The dates of the deliveries are set by the group and approved of by the customer.

1.3 Restrictions

Due to the fact that the members only have a limited number of hours to spend on the project, see section 10.4 for details, restrictions exist specifying how many heuristics and how many cases can be investigated. The group has therefore set higher priority on examining only two heuristics, namely tabu search and large neighbourhood search. Other heuristics will be examined only if there is enough time remaining after examining these two heuristics.

2 Phases of the project

The project is done according the the LIPS-model which divides any project into three phases. One phase before the project starts, one during the project and one after finishing the project. Below are short descriptions of each phase for this project.

2.1 Before starting the project

The first phase of the project is the phase where the group comes up with ideas about how to deliver a product according to the customers needs and according to the directives given. The requirements on the product are documented in the Requirement specification and a plan on how to satisfy these requirements is devised. Activities are identified and a plan for how much time should be spent on each activity is documented.

The activities should also include what documents need to be written. Also, during the first phase, deadlines are set up to create an outline of how the project will be carried out.

2.2 During the project

A Design specification is created during this phase, which specifies how the product will be designed. This document will guide the group when creating the product. Milestones are to be placed at a few points in this part of the project in order to be able to present the partial results to the customer. It is during this phase ideas are being implemented and tested in a systematic manner. About halfway through this phase the coding of the product should be finished so that there is time for testing and documenting.

2.3 After finishing the project

After the coding is completely finished, the project enters a last phase. During this phase, the project will be presented and demonstrated to the customer. All the documentation should be finished up and a project review should be written to evaluate the project.

3 Organization of the project

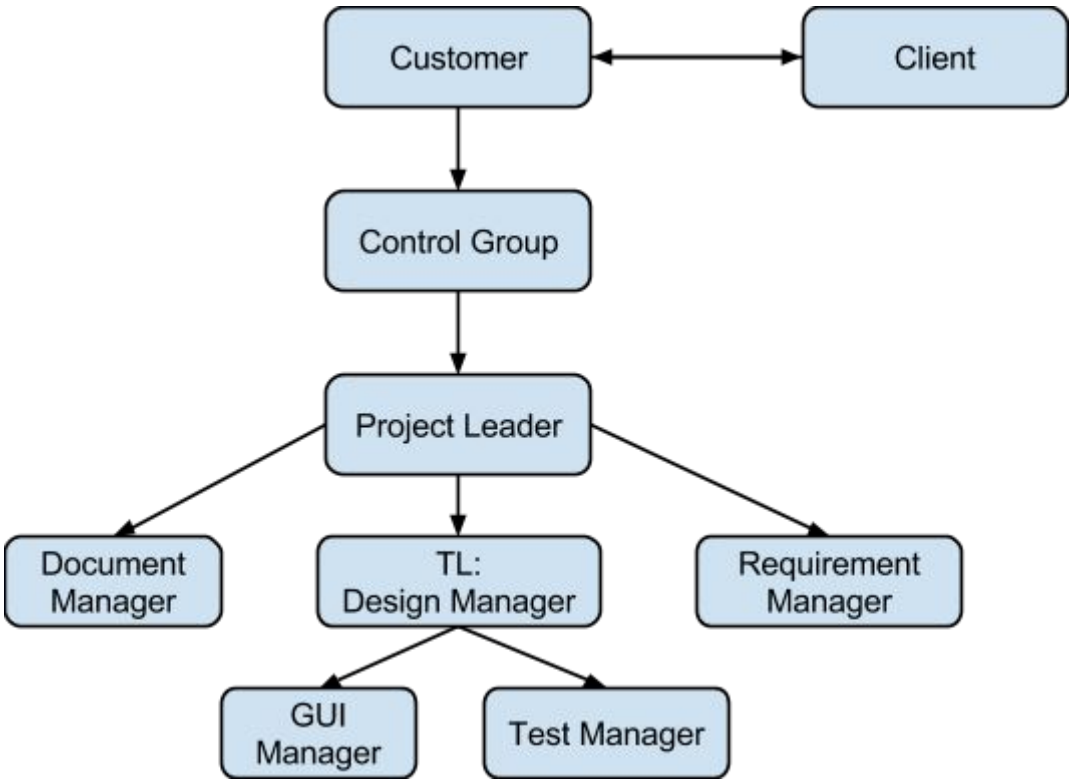

Figure 1: Organisation of the project. TL = Team Leader.

3.1 Organization during each phase of the project

During the first phase, all group members will be equally active in producing the necessary documents. The group will work together to identify the project requirements and plan the different activities. This is because it will be necessary for all the group members to agree on what the goals of the project are.

In the project phase, the work will be more divided. All the subsystems will be developed simultaneously, which means the group will have to be divided into subgroups. A few members will

also have to be more responsible for making sure that the necessary documentation (user manual, testing protocols etc) is produced.

During the last phase of the project, the members will work together, like in the first phase, to write the documentation. Also, the group will prepare and hold the demonstration for the customer together.

3.2 Terms within the group

A group contract has been written and signed by all members of the group. The group contract contains a set of terms on how and what the members of the group can expect from each other.

3.3 Responsibilities within the group

The roles in the project are distributed according to figure 1. These roles entail the following responsibilities:

- Project Leader (Emelie)
  - Manages official contact with customer
  - Manages official contact with supervisor
  - Manages official contact with course manager
  - Calls for meetings and sets meeting agenda
  - Responsible for the delivery of necessary documentation
  - Responsible for that the final product is delivered
  - Keeps the group on track and resolves conflicts
- Document Manager (Akdas)
  - Organizes the documents
  - Makes sure the documents keep the same standard
  - Makes sure the documentation follows the LIPS model
- Test Manager (Jonathan)
  - Responsible for creating test data
  - Resonsible for designing test for the system
- Design Manager (Victor)
  - Responsible for the basic design structure of the system
  - Organizes the management of code versions
  - Makes sure the subsystems work well together
- GUI Manager (Hendric)

    - Responsible for the quality of the graphical interface of the product
- Requirement Manager (Claes)
    - Manages contact with the customer about requirements
    - Makes sure that the group has access to necessary documents
    - Makes sure the requirements in the Requirements Specification are fulfilled

4 Document plan

During the project a number of documents will be written and submitted. In the following table names, descriptions and deadlines can be found for each document.

Document	Approved by	Description	For	Deadline 1	Deadline 2 etc
Requirement specification		Specification containing all requirements on the project	Customer	2015-09-18	2015-09-25
Project plan		Document outlining the plan of execution for the project	Customer	2015-09-24	2015-10-02
System sketch		Overview of the system	Customer	2015-09-30	2015-10-02
Test plan		Plan for how to test the system.	Customer	2015-10-09	2015-10-16
Design specification		General design of the system	Customer	2015-10-09	2015-10-16
Test protocol		Results and conclusions of the testing. Written continuously.	Customer	2015-12-18	
Final report		Final report, containing results of the project	Customer	2015-12-18	
Project review		Feedback on the course	Course organiser	2015-12-18	
Technical documentation		Document on how the system works	Customer	2015-12-18	
User manual		Details how to use the system	Customer	2015-12-18	
Program code		All code for the project	Customer/ Course organiser	2015-12-11	

5 Education plan

In order to know what the requirements of the project are, the project group will need to get some form of education. This was done at the initial meeting with the customer when the group was given information about avionics scheduling and literature about search heuristics. The group members will increase their knowledge about different search heuristics as well as avionics in general as the project proceeds.

5.1 Individual education

Since the main goal of the project is to design and evaluate two different heuristics, all members in the project group will have to learn these in an early stage of the project. Furthermore, all information regarding how to solve both the optimization problem as well as the graphical problem will have to be gathered in a suitable way.

5.2 Customer education

Throughout the project the customer will regularly meet the group, both to give feedback, but also decide whether the customer want to continue moving forward with the project or not at the specified decision points. These meetings will be used to continuously make sure that the group possesses the knowledge to finish the project.

6 Report plan

The group will continuously send reports to the project examinator with the amount of time each member has worked with the project. This will either be done by uploading the time plan/time report to SVN or by mail once either every week or every two weeks. The purpose for this is to show whether some member is not putting in the effort required to successfully deliver the product.

7 Meetings

The group has decided that group meetings will be held once a week on Thursdays at 10:15. Meetings with the customer will also be held when needed. The group has also the opportunity to book meetings with the supervisor of the project, this is also done based on the discretion of the group.

8 Resources

8.1 Members of Optimore

The group, Optimore, consists of six students. All students are studying applied mathematics and have similar academic background. The members and their areas of responsibility can be found on page 1 in the table under the ‘Project identity’.

8.2 Premises

The group has gained access to a room at MAI which will function as their primary office. The room also contains computers which will be used during the project.

8.3 Economy

The economy for this project consists of the time spent by the members of Optimore, each member will spend about 240h each totalling in 1440h spent by the entire group.

9 Milestones and decision points

The project is outlined by milestones and decision points. The milestones divide the project into different phases and the decision points are breakpoints for the project at which the group and the customer have to decide whether the project should proceed to the next phase or not.

9.1 Milestones

The milestones in the project represent an important event. The results should be measurable and will be used as checkpoints for assessing the progress of the project.

Nr	Description	Deadline
1.	Preliminary Requirement Specification, Project Plan and System Sketch	2015-09-25
2.	Final version of Requirement Specification, Project Plan and System Sketch	2015-10-02
3.	First submission of Design Specification, Test Plan and, if needed, a revised Project Plan	2015-10-16
4.	• Simple test data is generated[1] • A basic version of tabu search is implemented • A basic version of LNS is implemented • A simple GUI is developed and result from the heuristics can be presented graphically • Successful tests are done and the test are analyzed in the test protocol	2015-11-06
5.	• More realistic test data is generated[2] • The tabu search algorithm is adapted to work for this data • The LNS algorithm is adapted to work for this data • A more advanced GUI is developed according to requirement 1 • Successful tests are done and the tests are analyzed in the test protocol	2015-11-20
6.	• High difficulty level data is generated[3] • The tabu search is tested and evaluated through testing on this data • The LNS is tested and evaluated through testing on this data	2015-11-27
7.	A final version of the heuristics is implemented and the results are well documented in the test protocol. The results are presented to the customer and to the client.	2015-12-11
8.	First submission of final report and all the technical documentation.	2015-12-18

[1] Level A data: See Requirement specification
[2] Level B data: See Requirement specification
[3] Level C data: See Requirement specification

9.2 Decision points

Decision points are points in time where a decision will be made whether or not the project will continue. If a decision point is not fulfilled by the deadline a meeting will be held between all parties involved where it will be decided whether or not the group are allowed to continue or not.

Nr	Description	Date
0	Approval of project directives, decision to start a pre-study	2015-09-07
1	Approval of Requirements Specification, decision to start the preparation phase	2015-09-25
2	Approval of Project Plan, decision to start the implementation phase	2015-10-02
3	Approval of Design Specificaiton and Test plan, decision to continue the implementation phase	2015-10-16
4	Approval of the quality of the product, decision to deliver	2015-12-04
5	Approval of delivery, decision to dissolve the group	2015-12-21

10 Activities

The activities are the different parts of the project over which the group will distribute their time.

Nr	Activity	Description	Estimated time (hours)
1.	Requirement specification	Write Requirement specification	30
2.	Project plan with time plan	Write Project plan with time plan	24
3.	System sketch	Write System sketch	18
4.	Design specification	Write Design specification	28
5.	Test plan	Write Test plan	30
6.	GUI simple	Create simple GUI and analysis tools	8
7.	Test data level A	Generate level A test data according to test plan	10
8.	Mathematical model	Implement the mathematical model in AMPL and run on CPLEX. Evaluate results in test protocol	20
9.	Tabu search implementation 1	Implement first version of tabu search algorithm which can handle the level 1 test data	20
10.	LNS implementation 1	Implement first version of LNS algorithm which can handle the level 1 data	40
11.	Tabu search evaluation 1	Test and evaluate the efficiency of the tabu search algorithm	40
12.	LNS evaluation 1	Test and evaluate the efficieny of the LNS algorithm	40
13.	GUI finalized	Create GUI according to all priority 1 requirements	20
14.	Test data level B	Create level B test data according to test plan	40
15.	Mathematical model 2	Test the mathematical model with level 2 test data in CPLEX and analyze in test protocol	40
16.	Tabu search implementation 2	Implement tabu search algorithm according to priority 1 requirements	40

17.	LNS implementation 2	Implement LNS algorithm according to priority 1 requirements	40
18.	Tabu search evaluation 2	Test and evaluate the efficiency of the tabu search algorithm a second time	40
19.	LNS evaluation 2	Test and evaluate the efficieny of the LNS algorithm a second time	40
20.	Test data level C	Create level C test data according to test plan	20
21.	Mathematical model 3	Test the mathematical model with level 2 test data in CPLEX and analyze in test protocol	40
22.	Tabu search implementation 3	Implement final version of tabu search algorithm	40
23.	LNS implementation 3	Implement final version of LNS algorithm	40
24.	Tabu search evaluation 3	Test and evaluate final tabu search algorithm	54
25.	LNS evaluation 3	Test and evaluate final LNS algorithm a second time	54
26.	Project meetings	Hold project meetings	180
27.	Customer and supervisor meetings	Hold customer and supervisor meetings	90
28.	User manual	Write User manual	36
29.	Technical documentation	Write Technical documentation	42
30.	Final report	Write Final report	42
31.	Project review	Write Project review	36
32.	Final presentation	Preparing and presenting the project for the customer and the client	48

11 Time plan

The purpose of the time plan is for the parties involved to easily see when as well as which week, each activity is planned to be carried out. This will give the group an idea on when to work on what. The time plan will be written in google excel. Each member will also have to report their time spent on each activity. This will be done within the same document. By the end of the project the group will be able to compare if their proposed time plan, written before the work started, matches with the actual hours spent.

12 Changing plan

If difficulties occur during the project, it will be possible to negotiate some requirements with the customer in order to make it possible to deliver the product. If, for example, a group member decides to take the course in the upcoming year instead, then the group have to decide whether the time still will be sufficient to meet all the requirements of priority 1 or not.

13 Quality plan

The software in the form of the components GUI, test generator, heuristics and analytical tools will be produced in small measurable steps in order to test the progress. To test each of the component a working version of the other components must exist. Therefore it is vital for the group to create at least a basic test platform as early as possible. The software will then be improved step by step. Each small improvement in a component will then be tested in order to the minimize time spent on error searching the code.

14 Risk analysis

The event that someone gets ill for a longer period or has to go away are examples of unpredictable risks that have to be taken into consideration by the project group. Mostly, these disturbances will not affect the project. However, in some cases it might lead to negotiations between the group and the customer whether we can change a few priorities of the requirements due to lack of time.

15 Priorities

The highest priority in this project will be to successfully meet the requirements with priority 1. After that, if more time is available, the project will be further developed by trying to meet the requirements with priority 2, 3 and 4 respectively.

16 End of project

The customer will at the end of the project receive the code, project review as well as the final report. These are the key documents that the customer has paid the group to produce. The rest of the documents was produced mostly in order to help the group design and deliver the product.

REFERENSER

Text

Publicerade källor

Svenska skrivreger (2000), Svenska språknämnden. 2 uppl, Liber AB, Stockholm. ISBN47-04974-X

Elektroniska källor

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Opublicerade källor

Text

Personlig kommunikation

Text