Path Planning in Face of Uncertainty

Potkuri-group

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Software Engineering Project

UNIVERSITY OF HELSINKI
Department of Computer Science

Course
  581260 Software Engineering Project (6 cr)

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Client
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  `http://www.cs.helsinki.fi/group/potkuri`

Change Log

Version	Date	Modifications
1.2	22.9.2008	Fixed spelling mistakes. Altered size/cost expenses
1.1	16.9.2008	Updated the project plan
1.0	5.9.2008	First draft

Contents

1 Introduction

There's a need to design a program to help air traffic management guide multiple airplains safely to ground in presense of hazardous weather systems. The purpose of the project is to produce program which can be used to simulate airplane landings with real or simulated forecasts.

Calculating the routes will be a challenge since the routes must be planned ahead and there is a certain probablity involved with different forecasts which must be taken into account. In the core of the program is the "Shortest path problem"-calculation for the plaines moving from one merge point to the other before landing the plane. The goal is to avoid the different hazardous weather systems.

This project will also give hands-on experince to the project group. The purpose of the course is to learn about project work and learning about different roles present in the software project. The project group will do all the work involved in software project as assigned by the project manager. Weekly meetings will be held twice a week controlling and checking the schedule and resources of the project.

2   Glossary

Glossary of the terminology

Merge point A point where two different airplain paths combine into one or separate into two different ones

3 Project Organization

3.1 Memebers and roles

Jesse Paakkari	Project manager
Mikko Kuusinen	Requirements manager
Timo Juhani Tonteri	Design manager
Veera Hoppula	Document manager
Eero Antero Vehmanen	Code manager
Tobias Matias rask	Testing manager

3.2 Instructor

Sampo Lehtinen works as project instructor

3.3 Customer

Valentin Polishchuk from the University of Helsinki Computer Science Department.

4 Risk Analysis

The purpose of risk analysis is to foresee possible threats about the development of the product, wheather the question is about personal, project, complexity of the program or some other external risks.

Risk probability is measured with the scale of 1 - 3. 1 having the least risk. The severity of the risk is measured with the scale of 1 - 3 as well. 1 having the least impact to the project schedule and to functioning of the program itself.

4.1 Risks

Sickess of person

Probablity	2
Severity	2
Impact	The work will be halted for the period of sickness
Preventive measures	Eat C-vitamin
Corrective action	The person being sick must notify project group about the situation. The work must be divided and reassigned, if the sickness will last a long time. Project schedule or requirements must be adjusted in the worst case

Lose of interest

Probablity	1
Severity	3
Impact	The work will be halted
Preventive measures	Keep in ouch with the project personell
Corrective action	Motivate the person in question to continue to work

People will run out of time

Probablity	2
Severity	3
Impact	The work will be halted or at least delayed
Preventive measures	Follow the agreed schedule and inform project group of any delays. Reserve enough time in project to diffeerebt tasks. Schedule all exams and vacations beforehand
Corrective action	Check the individual schedules and find the spirit of teamwork again. Remeber that this project will over just in few weeks

Somebody will quit the project

Probablity	1
Severity	3
Impact	Fatal
Preventive measures	Have good spirit and team effort, help each other and have distinct work assignments. Leave space for innovation and peronal ideas
Corrective action	Rearrange project responsibilities

Narrow area of expertise

Probablity	1
Severity	2
Impact	Work cannot continue because there is no knowledge how to proceed
Preventive measures	Allow asking of questions, helping each other. Have meaningful meetings where all the problems will be notified and handled
Corrective action	More communication. Search for experts

Customer does not know or cannot describe what he/she wants

Probablity	1
Severity	2
Impact	The end result will not satisfy the customer
Preventive measures	Meet with the customer and review the progress of the work. Simulate the program and its user interface to customer
Corrective action	Communicate more with the customer

Failure in documentation

Probablity	2
Severity	3
Impact	The program will not be something the customer has wanted
Preventive measures	Document everything in orderly manner. Have regular time to inspect the work which has been done
Corrective action	Correct the documentation

Resources of the equipment is insufficient

Probablity	1
Severity	3
Impact	The program wil not be able to run in real-time
Preventive measures	Stress test the equipment with the program as early as possible
Corrective action	Faster computer, more memory, close other programs

All the material gets lost

Probablity	1
Severity	3
Impact	Fatal
Preventive measures	Use of version control helps to save several copies of the work. Make backups regulary
Corrective action	Begin to follow preventive measures if not doing so already

Some phase of work will take longer that anticipated

Probablity	3
Severity	2
Impact	The project will not be final in time
Preventive measures	Closely follow the work in progress and reach after agreed delay
Corrective action	Several project members will help to solve the problem

The project is too large to be completed in time

Probablity	2
Severity	2
Impact	The project will not get finalized
Preventive measures	Consider all the resources carefully, being a bit pessimistic
Corrective action	Project plan must be reevaluated and changed, contact the customer and project management

5 Hardware and software requirements

The program will be run on the customers personal computer using Java-language. There will be conenction to the data source using TCP/IP (Weather information). Eclipse is used to develop the program. The source code, as well as the documentation, will be stored in version control system.

6   Size (and cost) estimates

There will be no direct expenses nor salary involved for the project group. Salaries of the other persons involved in the project (as well as the customers) are not accounted for in the calculations.

The program has 4 major parts (Weather data, plane position, calculation and graphics displayed) and some general functions (ie. setting the starting values, handling messages...). The size estima for each is as follows:

Part	Estimated lines of code
Graphics	1500
Fetching the weather data	500
Plane position	1000
Calculation	2000
General	500

Estimates are based on experience and quesswork. The estimates have been exaggrerated so that project can be finalized by the agreed time and so that any surprices are not fatal to the project schedule.

7 Distribution of work

All the members have assigned responsibilities. As a team effort all the members of the project will participate in all the phases of the project. At the minimum commenting of the work done, is the least any one can do. In coding the program has eben divided into different classes and objects. In project plan each member has been assigned to one of the different sections of the program but the code manager has the main responsibility.

Project manager will conduct all the general meetings and in case of any specific meetings or inspections, the person responsible will conduct the meeting in question.

8 Project Schedule

In the project we will have general inspections for the Requirements, Design and Test plan documents. Inspections will be held one week before the document is due and documents will be frozen one week after the due date. There will be one formal inspection of code in schedule.
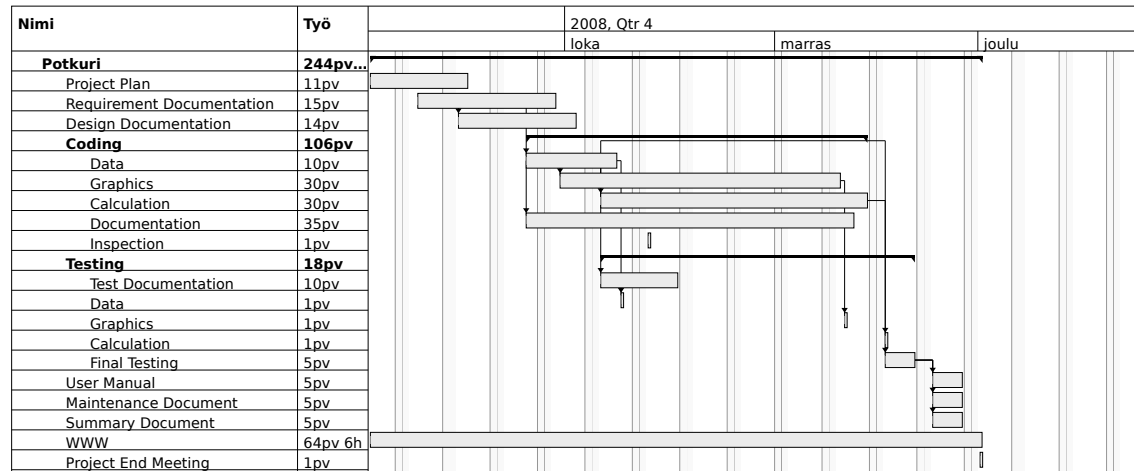
8.1 General timetible - Important dates

Project start	2.9.2008
Preliminary project plan	8.9.2008
Requirements document start	9.9.2008
Requirements document inspection	29.9.2008
Design document starts	15.9.2008
Requirements document frozen	29.9.2008
Design document inspection	6.10.2008
Design document frozen	9.10.2008
Coding begins	29.9.2008
1st code testing	9.10.2008
Formal inspection of code	13.10.2008
Coding ends	10.11.2008
All documents are ready excl. summary	17.11.2008
Summary document	24.11.2008
Project end meeting	1.12.2008

8.2 Detail project schedule

WBS	Nimi	Aloitus	Päättyminen	Työ	Kesto	Liikkumavara	Kulut	Annettu tehtäväksi
1	**Potkuri**	**2. syyskuuta**	**1. joulukuuta**	**244pv 6h**	**65pv**		**0**	
1.1	Project Plan	2. syyskuuta	16. syyskuuta	11pv	11pv	54pv	0	
1.2	Requirement Documentation	9. syyskuuta	29. syyskuuta	15pv	15pv		0	
1.3	Design Documentation	15. syyskuuta	2. lokakuuta	14pv	14pv	42pv	0	
1.4	**Coding**	**25. syyskuuta**	**14. marraskuuta**	**106pv**	**37pv**		**0**	
1.4.1	Data	25. syyskuuta	8. lokakuuta	10pv	10pv		0	
1.4.2	Graphics	30. syyskuuta	10. marraskuuta	30pv	30pv		0	
1.4.3	Calculation	6. lokakuuta	14. marraskuuta	30pv	30pv		0	
1.4.4	Documentation	25. syyskuuta	12. marraskuuta	35pv	35pv		0	
1.4.5	Inspection	13. lokakuuta	13. lokakuuta	1pv	1pv	19pv	0	
1.5	**Testing**	**6. lokakuuta**	**21. marraskuuta**	**18pv**	**35pv**	**6pv**	**0**	
1.5.1	Test Documentation	6. lokakuuta	17. lokakuuta	10pv	10pv	31pv	0	
1.5.2	Data	9. lokakuuta	9. lokakuuta	1pv	1pv	37pv	0	
1.5.3	Graphics	11. marraskuuta	11. marraskuuta	1pv	1pv	14pv	0	
1.5.4	Calculation	17. marraskuuta	17. marraskuuta	1pv	1pv	10pv	0	
1.5.5	Final Testing	17. marraskuuta	21. marraskuuta	5pv	5pv	1pv	0	
1.6	User Manual	24. marraskuuta	28. marraskuuta	5pv	5pv	1pv	0	
1.7	Maintenance Document	24. marraskuuta	28. marraskuuta	5pv	5pv	1pv	0	
1.8	Summary Document	24. marraskuuta	28. marraskuuta	5pv	5pv	1pv	0	
1.9	WWW	2. syyskuuta	1. joulukuuta	64pv 6h	64pv 6h	2h	0	
1.10	Project End Meeting	1. joulukuuta	1. joulukuuta	1pv	1pv		0	

8.3   Gantt chart

Nimi	Työ
Potkuri	**244pv...**
Project Plan	11pv
Requirement Documentation	15pv
Design Documentation	14pv
Coding	**106pv**
Data	10pv
Graphics	30pv
Calculation	30pv
Documentation	35pv
Inspection	1pv
Testing	**18pv**
Test Documentation	10pv
Data	1pv
Graphics	1pv
Calculation	1pv
Final Testing	5pv
User Manual	5pv
Maintenance Document	5pv
Summary Document	5pv
WWW	64pv 6h
Project End Meeting	1pv

2008, Qtr 4 — loka, marras, joulu

9 Follow-up and reporting methods

All the work of the project group will be individually entered in to the system maintained by the University of Helsinki Computer Science Department. All the inforamtion has to be enetered by the end of the week so it can be reviewed by project manager prior to the first weekly meeting.

Project schedule will be checked every week on Monday.

Bugs reports and other reports should be kept in a spreadsheet and include date, reporting person, responsible person, error / notes, severiry of the item, what and if something was done.