Project Plan

Editor: Rasmus Vilhelmsson

Version 1.0

Status

Reviewed	Pontus Erlesand	2016-10-04
Approved	Danyo Danev	2016-10-07

PROJECT IDENTITY

2016/HT, TSKS05-POZYX
Linköping University, (ISY)

Group members

Name	**Responsibility**	**Phone**	**Email**
Rasmus Vilhelmsson(RV)	Project Leader (PL)	0700423400	rasvi146@student.liu.se
Pontus Erlesand(PE)	Head of documentation (DOC)	0707 964 955	poner538@student.liu.se
Markus Petersson(MP)	Head of sensor fusion	0703 823 630	marpe163@student.liu.se
Ching-Hsiang Yang(CY)	Head of hardware	0737 227 489	chiya469@student.liu.se
Susmita Saha(SS)	Head of testing	0720 451 029	sussa301@student.liu.se

Group e-mail: pozyx.cdio@gmail.com
Customer: ISY, Linköping University, 581 83 Linköping
Customer contact: Danyo Danev, 013-281335, danyo.danev@liu.se
Course leader: Danyo Danev, 013-281335, danyo.danev@liu.se
Supervisor: Trinh Van Chien, 013-282643, trinh.van.chien@liu.se

Contents

Document history

Version	Date	Changes	Sign	Reviewed
0.1	2016-09-28	First draft		PE
0.2	2016-10-04	Revised version		PE

1 Client

The customer for this project is Danyo Danev, associate professor at Linköping University. Danyo can be contacted through his email, danyo.danev@liu.se, or phone, 013-281335. His office is located in the Communication division's corridor in the B house at Linköping University.

2 Overall description of the project

For this project, the group is to make a system that allows the user to localize and continuously track a tag, using the Pozyx platform.

2.1 Purpose and goal

The main purpose of this project is to build a system to enable a user to position and track a tag, using the Pozyx platform. The goal is to make a system that is easy to initiate and run, with an informative GUI to visualize the results.

The group is divided into smaller sub groups to work with modules, these are described in the Design Sketch, where the group members for each group will get better understanding of their assigned tasks. Where, for example, the sub group working with data processing will use and accomplish their knowledge about actual usage of Kalman filtering. This corresponds to personal goals for the group members in this project.

2.2 Deliveries

Type of delivery	**When**	**How**
Passed Requirement Specification	07/10/2016	Email
Passed Design Sketch	07/10/2016	Email
Passed Project Plan	07/10/2016	Email
Passed Time Plan	07/10/2016	Email
Final Product	*To be determined*	Demonstration
Technical Documentation	*To be determined*	Email
User manual	*To be determined*	Email
After Study	*To be determined*	Email

2.3 Limitations

The group will not conduct an investigation about components for optimal use, mainly because all hardware is already assigned and the idea behind the project is to use existing hardware and the Pozyx platform. For this project the tag will be connected to the computer with all software through USB, one could say this is unfortunate since the computer's GUI is supposed to see the tag and the tag is connected to this computer. But the project will be a good base for further development. No investigation will be conducted for alternative programming languages either.

3 Phase plan

The first phase of the project is to make all documents required to know what the project is about and all functionality of the final system. This also includes this document, which will declare how the project as a whole will be carried out.

3.1 During the project

After completing the documents, i.e. the Project Plan, Design Sketch and the Requirements Specification and passing these the actual project will begin. Note that these initial documents are also part of the whole project. During the process of making the final system, testing will be defined and conducted continuously. Some of these tests will be reported if the group decides it's of interest for the customer and supervisor. Time status will be reported at least once a week to both the customer and the supervisor, this report will consist of the number of hours spent and a few sentences about the ongoing process.

3.2 After the project

When the actual project, the final system, is finished the product will be delivered to the customer along with a technical documentation and a user manual. The group will also do an after study, where the working process will be evaluated and discussed.

4 Organisation plan for the whole project

In this section the organisation plan will be brought up. This involves the roles for this project.

4.1 Organisation plan per phase

The organisation for the project group internally and the organisation between the project group and customer is visualized in figure 1.

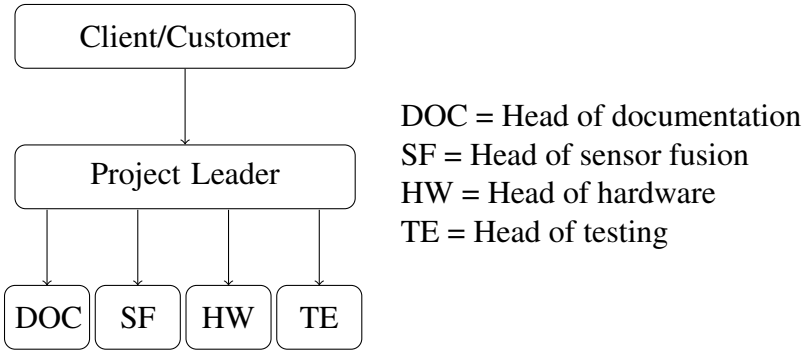

Figure 1: Organisation between parties.

4.2 Organisation plan of the customer

As mentioned earlier in this document, the client and the customer is the same person. The contact between the client/customer will mainly go through the project leader.

4.3 Conditions for cooperation within the project group

All the group members have agreed and signed on a group contract, which specifies the meeting protocols and personal responsibilities. This will work as the basis of the cooperation within the group throughout the entire project.

4.4 Definition of job content and responsibility

For this project the group member have the following roles:

- Project leader
  - Will call to and lead meetings
  - Will distribute work tasks
  - Will follow up the time plan
  - Will compile the time reports
  - Will make sure the project model is followed
- Head of documentation
  - Will make sure all documents are of uniform structure
  - Will make sure all documents are proofread
- Head of sensor fusion
  - Is responsible for the Data Processing sub module
- Head of hardware
  - Is responsible for all hardware
  - Is responsible for any possible component purchase
- Head of testing
  - Is responsible for planing and carrying out testing

5 Documentation plan

The documents that will be made in this project, along with some useful information, is found in the table below.

Document	Author/ approved by	Purpose	Distribution	Ready
Req. Spec.	PE/DD	Definition of all requirements	Client/ project group	07/10/2016
Des. Sketch	PE/DD	Detailed description of the design	Client/ project group	07/10/2016
Project Plan	RV/DD	Detailed description of how the project will be carried out	Client/ project group	07/10/2016
Time Plan	RV/DD	Detailed schedule of planned hours for all activities	Client/ project group	07/10/2016
Technical Documentation	PE/DD	Detailed description of how the final product is built	Client/ project group	05/12/2016
User manual	PE/DD	Complete user manual for the final product	Client/ project group	05/12/2016
Weekly time report	RV/DD	Weekly report of what the group have done in the last week and how many hours the group put	Client/ project group/ supervisor	Every Monday, except 17/10 and 24/10
Meeting protocol	PE	Take minutes of recaps from the previous week and of the activities the upcoming week	Project group	-
After Study	PE/DD	The group will make a discussion about the final result as opposed to the time plan and the project as a whole	Project group	-

6 Development methodology

For this project the group has divided the project into smaller modules and sub modules, the idea for this is to be able to work virtually in parallel. This will not only contribute to efficiency but also ease testing for the different modules, it will also make it easier to integrate the modules to a final product.

7 Training plan

The training for this project will only consist of personal training, as no lectures or tutorials are given in this course, TSKS05, except an introductory lecture that was about using a Pozyx platform.

7.1 Training of the project members

All group members will read through all the documentation about the Pozyx platform, these are found on the Pozyx website. Group members responsible for data processing will read up on

sensor fusion, group members for the GUI will read up on how to make a GUI using Matlab and finally the group members responsible for the hardware will read up on Arduino usage and functionality.

8 Report plan

For this project an elaborate time plan will be made, which will include every conceivable sub task in the development for every module. The time it takes for each sub task will be estimated roughly in the time plan and the time it actually takes for each task will be filled in during the project. Every Monday the project leader will send an email of the past week's work on the project, this will be sent after the groups weekly meeting at lunch.

9 Meeting plan

As mentioned above at least one meeting will be held every week, at Monday lunch. The project leader is responsible for booking a room for these meetings and the head of documents is responsible for assigning a keeper of minutes and the protocols will be saved in the group's Google drive.

10 Resource plan

In this section all resources available for this project is declared.

10.1 Persons

As can be seen in the project identity there are five people in the project group. The group members have almost equal knowledge needed for this project, except in some areas. The group members assigned to work with hardware have had earlier experience with Arduinos, the group members assigned to work with data processing have taken a course in sensor fusion and finally the project member assigned to work with GUI have some basic understanding of object oriented programming but will educate himself on Matlab GUI programming.

10.2 Material

The hardware needed for the project is provided by the client, this consists of the Pozyx equipment, Arduino boards and a computer. If the group have a proper reason for a possible purchase, this can be arranged.

10.3 Facilities

A lab located in the Communication division's corridor is provided for the group. In this lab the group have access to a locker, to store the computer and the Pozyx equipment.

10.4 Economy

The group members have been assigned 240 hours each to put on this project.

11 Milestones and tollgates

In this section the milestones and tollgates will be brought up, such as what and when.

11.1 Milestones

Nr	Description	Date
1	Receive sensor data on the computer	24/10/2016
2	Receive all sensor data and input them to Matlab	31/10/2016
3	Data processing module able to do tracking and positioning using dummy data	07/11/2016
4	Display estimated path and position on GUI	14/11/2016
5	Data processing module able to communicate with GUI and do tracking and positioning using real data in real time	01/12/2016
6	Complete system integration	05/12/2016
7	Complete all documentation	12/12/2016

11.2 Tollgates

Nr	Description	Date
1	Requrement Specification, System Design Sketch, Project Plan	07/10/2016
2	Design Specification, Test Plan	31/10/2016
3	Test Protocols, User Manuals	05/12/2016
4	Technical Report, Afterstudy, Poster, Project Web Page	12/12/2016
5	Presentation of the Final Product	19/12/2016

12 Activities

The activities for the modules are listed in this section, also other activities, such as documentation, is presented in this section. The tables listing these activities are structured like below.

Nr	Activities	Description	Dependant activity	Estimated time [h]

12.1 Hardware

1	Setup Hardware	Connect devices and install drivers on computer		5
2	Verify System	Run the official positioning program from the Pozyx platform	1	12
3	Arduino Development	Develop and deploy the Arduino program used to control the tags	1	20
4	Evaluate Performance	Test and measure the performance of the Pozyx components under LOS and NLOS environments	3	30
5	Anchor Placement	Deploy the Pozyx anchors to suitable positions	4	30
6	Hardware interfacing	Design and implement the interface between hardware and Matlab	17	25

12.2 Software

12.2.1 Data processing

7	Collect data	Learning how to collect proper data from the tag	1	12
8	Positioning	Implementing localization of the tag	7	10
9	Measuring certainty	Estimating the certainty of the position estimates	8	16
10	Simple tracking	Implementing simple tracking using the estimates obtained from the position estimates	8	10
11	Kalman filter	Implementing a Kalman filter for tracking	10	30
12	Velocity estimation	Implementing velocity estimation of a moving tag	10	10
13	Weight with signal strength	Implementing weighting of the variances of each anchor based on the received signal's strength	9	8
14	Alternative filtering	Comparison of different filtering algorithms for tracking	11	30
15	Determining direction	Generate data able to indicate the moving direction of the tag	10,12	15
16	Further development	Implementation of additional features	All in Data Processing	15

12.2.2 GUI

17	Map of corridor	Edit a picture of the communication system corridor to work as a map for the GUI		2
18	Functions and Classes	Write the code for the Classes and functions needed for the GUI		25
19	GUI	Create a Matlab GUI to represent sensor data, the positioning and tracking	17,18	35
20	Matlab seminar	Attend a seminar about Matlab programming		9
21	Comment code	Write descriptions and comments for the code	18,19	20
22	Testing of GUI	Test the code and find bugs	18,19	30
23	Optimization and bug fixing	optimize the code for speed and fix bugs	18,19,22	30

12.3 Other activities

24	Integration	Integration of all the sub modules	Sub modules	60
25	Technical Documentation (Continuous)	Continuous documentation of the Technical Documentation		100
26	Technical Documentation (Finalizing)	Completion of the Technical Documentation	25	60
27	Before phase documentation	Write the documents that belong to the Lips before phase		100
28	System testing	Testing of requirements and full system tests		70
29	Project leading	Planing for meetings and weekly work and compile the time reports		10
30	Meetings	Project meetings, once a week		70
31	Completing the project	Finalizing the complete system	24	30
32	Project conference preparation	Preparation for the project conference	31	10
33	User manual	Writing the user manual	31	40
34	Reviews	Reviewing and revising documentation		10
35	Time buffer	Extra time to put where it's needed		200

13 Time plan

The Time Plan is worked out of the activities and milestones and will be handed in to the client/customer and the supervisor.

14 Plan for changes

If a change is needed in the Requirements Specification this must be negotiated with the client. In the event of changes that only concerns the group the change will be brought up in a a group meeting. In the case of group members being absent for these meetings they will be properly informed about the issue.

15 Quality plan

The purpose of having a quality plan is to ensure the quality of all deliveries this project group will provide. This concerns not only the final product but also all documentation before, during and after the actual project.

15.1 Reviews

All documents will be proof read before delivery. The client will after this review all documents. And finally the supervisor will also review the documents.

A coding standard will be set for the group members, this will be done internally and followed throughout the project. When code is written at least one more group member will look through the code, similar to proof reading.

15.2 Test plan

The group will hold responsibility for minor tests being performed to ensure functionality and quality. The group has also assigned a head of testing that will more or less participate in every test, and will keep a general track of all tests. More substantial tests are linked to the milestones, these will be more detailed and reported to the client and supervisor in the weekly report.

16 Risk analysis

The risk is considered to be low for this project. The hardware will not be heavily stressed and the computer should be able to handle the required usage without a problem. In the event of a Pozyx anchor breaking down a new will need to be bought. However, in the lab a total of six Pozyx shields and two Arduinos can be found, which means if one of these things breaks down it's easily replaced.

17 Priorities

In the event of delays in the project, the importance of this delay will be considered before handling the delay. If an activity is delayed that many later activities is depending on, much focus will be put to fix the delay. The Time Plan will contain time only devoted to delays and unplanned events.

18 Project closing

When the project is finished a technical documentation and a user manual will be provided along with the final product. After this an after study for the project as a whole will be worked out.