

Software-Project 2017

Review Document

Real-Time Mesh Utilities

Petros Simidyan
Julius Lerm

Blerta Hamzallari
Lars Debor

Felix Griesau
Simon Heinke

Marco Klamke
Sugandha Sachdeva

last change: June 4, 2017



1 Introduction

The review document grants insight into the progress of the project and covers the decisions the team made during development.

It serves as an extension to the design and developer documents, which describe the structure and code of the software in more detail.

The document is divided into three segments, each representing a phase of the project. Each phase stands for specific tasks and gives a time frame for when they have to be finished.

Thus, after every phase progress gets documented and reflected and a lookout for further work on the project is provided.

Contents

1	Introduction	1
2	First Phase: Planning	3
2.1	Result of Planning	3
2.1.1	Software Development Model	3
2.1.1.1	Software Development Specific Content	3
2.1.2	Effort Estimate	4
2.1.3	Risk Estimate	5
2.1.3.1	Handling Risks	5
2.1.4	Milestones	7
2.1.4.1	Checklist	7
2.1.5	Organization	9
2.1.5.1	Ways of Communication	9
2.1.5.2	Additional Agreements	9
2.1.5.3	Role Assignment in SCRUM	9
2.1.5.4	Role Assignment Organization	9
2.2	Result of Design	10
2.2.1	Tools	10
2.2.1.1	Organization Tools	10
2.2.1.2	Development Tools	10
2.2.2	Results of first iteration design:	10
2.2.3	Tasks for next iteration	11
3	Second Phase: Implementation	12
3.1	Goals of Second Phase	13
3.1.1	Testing of SCDC	13
3.1.2	Testing of Projecting	13
3.1.3	Portation to MNE Scan	13
3.1.4	Optimization of Interpolation	13
3.2	Bugreview	14
3.2.1	Missing Feature	14
3.2.2	Missing Mandatory Functions	14
3.2.3	Missing Optional Functions	14

2 First Phase: Planning

This segment of the review document is divided into two parts.

The progress of the first phase of the project is described.

It contains the results of planning as well as the outcomes of the design process. Results of planning include development model, cost and risk estimation, milestones and organization. The design process contains the outcomes of the current iteration, arrangements for the next iteration and a list of tools.

2.1 Result of Planning

A large part of the first phase of the project (i.e. scheduling and draft) is reflected on the functional specification document. The requirement analysis is registered, the objectives are declared, whereas the decisions and the product information is written down.

2.1.1 Software Development Model

This section contains information about the software model chosen, based on the requirements of the project. The principals of the group, client requirement and knowledge about the project play an important role in choosing the development model. Based on the latter, the development team decides its work flow.

Agile Development Model: SCRUM The group chose SCRUM because it is an iterative and incremental agile software development framework for managing product development. The duration of each sprint was set to two weeks. Each phase of the software development has two sprints.

Every sprint ends with a presentation by the relevant working group about the developments and progress during the sprint. The end of the respective phase of the project is marked by a working prototype and a presentation which includes a summary of the work done by the entire team.

Projects specific adaptation to the model: Every person in the team has multiple roles. All group members work on both the document and the code.

2.1.1.1 Software Development Specific Content

Since the group decided for the agile development project, the milestones need to be stated and agreed upon by the team. Milestones are the aim or the expected output of each development phase. They help the team to specify what features should be completed by which deadline.

2.1.2 Effort Estimate

The main purpose in the effort estimation section is the categorization of the different parts of the project regarding their complexity and effort criteria. (see figure 1)

Total: 220 man days

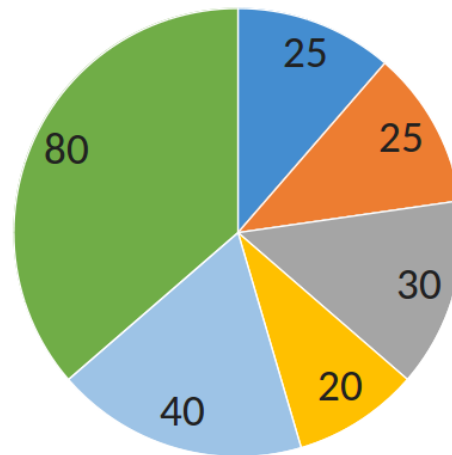
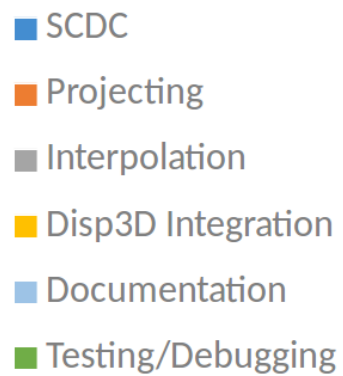


Figure 1: Effort estimate

2.1.3 Risk Estimate

In this section, the probabilities of the different risks involved in the project are listed. This will help the team to determine what aspects of the implementation should get a higher priority.

RE1: Communication problems in the team

RE2: Coverage is too extensive

RE3: Framework does not provide the needed functionality

RE4: Resource bottleneck derived from team members temporary absence

RE5: Change of the requirements due to miscommunication with the product owner

RE6: Hidden complexity

RE7: Acceptable computation time takes a lot more effort than expected

Impact ↑	catastrophic					
	crucial			RE2, RE6	RE7	
	moderate		RE3	RE5		
	minor				RE1, RE4	
	negligible					
		almost impossible	improbable	possible	likely	almost certain
Probability of problem →						

Figure 2: Risk estimate

2.1.3.1 Handling Risks

In case one of the risks occurs, certain strategies for solving the issue are provided. Only the ones having a crucial impact on the project are dealt with in the following section.

RE2: Optional requirements will only be addressed after every mandatory criteria is fulfilled.

RE6: The team communicates with the product owners to eradicate all ambiguities.

RE7: To keep the computation time as low as possible, changes to the software will be tested constantly to determine even minor impacts on efficiency.

2.1.4 Milestones

First Phase	03.05.2017	First Phase Finished
Second Phase	04.06.2017	Detailed Design and Features Implemented
	06.06.2017	Second Phase Finished
Third Phase	21.06.2017	Features Tested and Optimized
	02.07.2017	Portation to MNE Scan
	04.07.2017	End of Project

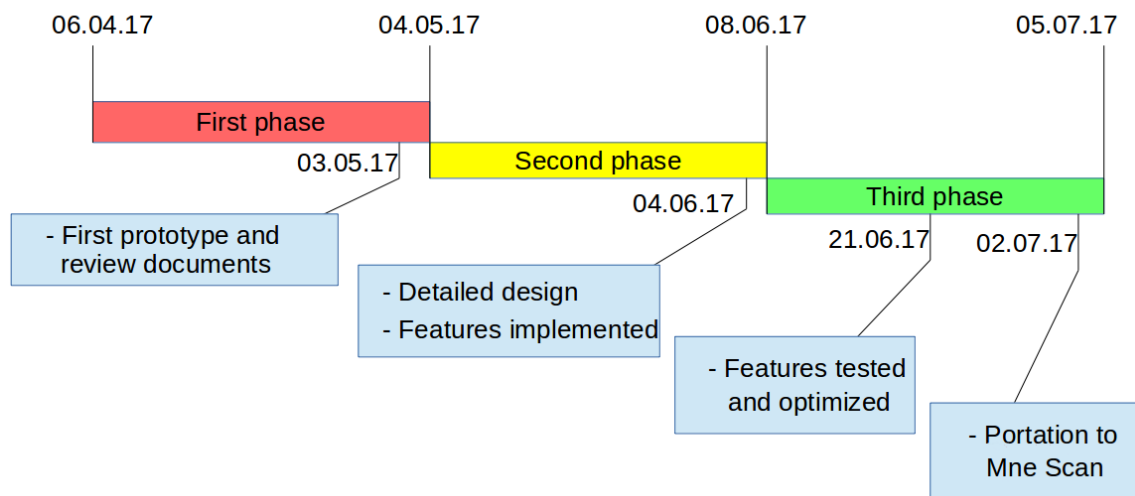


Figure 3: Timeline

2.1.4.1 Checklist

03.05.2017 First Phase Finished

1. Functional Specification
2. Preliminary Design
3. Review Document
4. First Prototype
5. Presentation

04.06.2017 Detailed Design and Features Implemented

1. Detailed Design
2. SCDC (operational)
3. Projecting Algorithm (operational)
4. Interpolation Algorithm (operational)

06.06.2017 Second Phase Finished

1. Presentation
2. Review Document
3. Integration into Disp3D

21.06.2017 Features Tested and Optimized

1. SCDC (tested)
2. Projecting Algorithm (tested)

02.07.2017 Portation to MNE Scan

04.07.2017 End of Project

1. Review Document
2. Presentation
3. Interpolation Optimized

2.1.5 Organization

This section concerns to the rules, agreements and the partitioning regarding the team-work in the project, so the work itself will be efficient and organized.

2.1.5.1 Ways of Communication

Telegram: Used for quick and direct team communication so that possible misunderstandings will be solved in no time.

E-mail distribution list: Used for scheduling the team meetings and communications with the extended team, including the product owners.

Team meetings: Used for the review and direct discussion of the encountered problems.

Skype: Used in the cases of the absence of a team member.

Jira: Used for scheduling tasks and keeping track of the progress done by each member of the team.

Dropbox: Used for exchanging documents and file sharing.

2.1.5.2 Additional Agreements

- Internal team meetings (without product owners): Tuesdays and Thursdays at 19:00
- External team meeting (with the product owners): Wednesdays at 17:00
- Meeting of subgroups : upon consultation and demand

2.1.5.3 Role Assignment in SCRUM

Product Owner: Thomas Jochmann, Lorenz Esch

Scrum Master: Simon Heinke

Development team: Blerta Hamzallari, Felix Griesau, Julius Lerm, Lars Debor, Marco Klamke, Simon Heinke, Sugandha Sachdeva, Petros Simidyan

Client, User: Participants of the MNE CPP project of Boston Children's Hospital

2.1.5.4 Role Assignment Organization

Advisor: Thomas Jochmann, Lorenz Esch

Team leader: Simon Heinke

Build master: Lars Debor

Version management: Felix Griesau

2.2 Result of Design

The results of design can be found in the preliminary design document. The connections between different packages, components and classes are explained and visualized using UML-diagrams.

2.2.1 Tools

The used tools are programs which facilitate the different aspects of the organization and development.

2.2.1.1 Organization Tools

Code versioning: The source code will be managed via *Git* to ensure a convenient exchange and tracking of code.

LaTeX: *LaTeX* is used for editing review documents and documentation.

Doxygen: This program will automatically document source code comments.

Visual Paradigm: Used for creating UML-diagrams and other aspects of visual documentation.

2.2.1.2 Development Tools

Development environment: Since it is already established within MNE-CPP, *QtCreator* will be used for code editing and compiling.

Program language: *C++* will be used hence it is the main language of MNE-CPP

Operating systems: The software will be developed on Linux and Microsoft Windows.

Libraries: Besides standard libraries from the *C++ 11* standard, the MNE-CPP framework is based on Eigen, OpenGL and Qt.

2.2.2 Results of first iteration design:

The results of the first iteration correlate with the respective milestone.

Functional specification: The requirements specification is transferred into the corresponding functional specification.

Preliminary design: The preliminary design includes a first overview of the main features and structure (see preliminary design document).

Implementation: A first executable prototype is created.

Planning: Milestones for the next iteration are declared.

2.2.3 Tasks for next iteration

Refining the preliminary design: The preliminary design is extended with diagrams and more detailed descriptions. This will be done according to milestones progress.

Further implementation: The mentioned features will be implemented and tested.

3 Second Phase: Implementation

This section of the document contains the outcome of the second phase of the project. Basic concepts and decisions of the final design are mentioned and looked upon. Further the final design and a corresponding developer documentation are available in separate documents.

Alongside the achievements, problems that arose during this iteration are covered and some issues have to be revisited throughout the third phase.

Lastly a prospect for the next phase is given, with all the tasks that have to be taken care until the end of the project.

3.1 Goals of Second Phase

In this section the goals for the following phase are outlined.

3.1.1 Testing of SCDC

The correctness of the SCDC-feature has to be tested in order to guarantee realistic results. Additionally if any possibility to optimize the speed of the SCDC comes up, the performance will be improved further.

3.1.2 Testing of Projecting

3.1.3 Portation to MNE Scan

3.1.4 Optimization of Interpolation

3.2 Bugreview

Due to encountering some problems during implementation, not all features are finished and ready for testing. Nevertheless we were able to fix the majority of the occurring issues.

The following aspects and features need further processing in phase three.

3.2.1 Missing Feature

Until the end of the project this feature has to be implemented and tested.

Integration into Disp3D

3.2.2 Missing Mandatory Functions

These functions are mandatory and thus have to be completed in the third phase.

Bad Channels Sometimes sensors do not deliver correct data and are marked as bad channels. These sensors should not have any impact on the weight matrix and the following interpolation.

Currently this information is not utilized during computation. Therefore misleading data is used and the results are not completely correct.

3.2.3 Missing Optional Functions

After finishing the implementation of all mandatory functions these extensions are to be considered.

Computation on GPU

Reconsider KD-Tree for Mapping

Portation to MNE Scan