UNIVERSITY OF APPLIED SCIENCES
ASCHAFFENBURG

Software Project Development Plan

Project: BrainBodyComputerInterface

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Documentname: AB-BrainBodyComputerInterface-SPDP-1

Version: 1.0

Creation date: 06.06.2023

File: GitLab-BrainBodyComputerinterface-AB-BrainBodyComputerInterface-SPDP-1

Modifications – Document Status

Version	Status	Creation Date	Editor	Modifications
1.0	planned	06.06.2023	Julian Emrich	Initial Document

(Status := planned, under construction, presented, accepted)

TABLE OF CONTENTS

1 Introduction

This section of the SPMP provides an overview of the project BrainBodyComputerInterface.

1.1 Project Overview

The main project objective is to steer a Moving Head to a fixed point and check if the target is hit. The project is realized as a game and the user can choose between two options to steer the Moving Head. Option number one is to steer the Moving Head with the gyroscope of the Shimmersensor. The other solution is to steer the Moving Head via the EEG, but for this option the user needs to train the commands he wants to use in a separate software. The Player selects in the GUI the input he wants to use and does all necessary settings (e.g. Duration of the game, User profile) to be able to play. After the settings are done the game can be started and it increases the score with every target hit. The goal of this game is to hit as many targets as possible in time.

Main work activities:

- PoC DAQ
- GUI
- Hardware integration (e.g. EEG- Shimmersensor, Movinghead)
- Data exchange
- Implement game logic

Major milestones are:

- Documentation
    - Software Requirement Specification
    - Analysis Model
    - Software Design Description
    - Software Project Development Plan
- Receive data from the EEG (API)
- Exchange data from the sensors with the solver
- End of implementation
- Prototype present

1.2 Project Deliverables

The following deliverables will be provided:

- Complete documentation including AM, SDS, SRS, SPDP
- Executable game
- Complete source code

1.3 Evolution of the SPMP

Project Manager is responsible for completion, dissemination and change control of the SPMP.
Updates of any kind will be handled by project manager and noted on page 2 of this document including date, version number and short description.

1.4 Reference Materials

[SRS] Maximilian Spahn: Software Requirements Specification, Hochschule Aschaffenburg, Version 1.0, 2023-04-22

1.5 Definitions and Acronyms

AM	Analysis Model
SDS	Software Design Specification
SRS	Software Requirement Specification
PDP	Project Development Plan
GUI	Graphical User Interface
EEG	Electroencephalogram
PoC	Proof of Concept
DAQ	Data Acquisition
IDE	Integrated Development Environment

2 Project Organization.

This section specifies the process model for the project and its organizational structure.

2.1 Process Model.

An iterative model represents the best possibility to develop a software project for our team (see Figure 1: Iterative model):

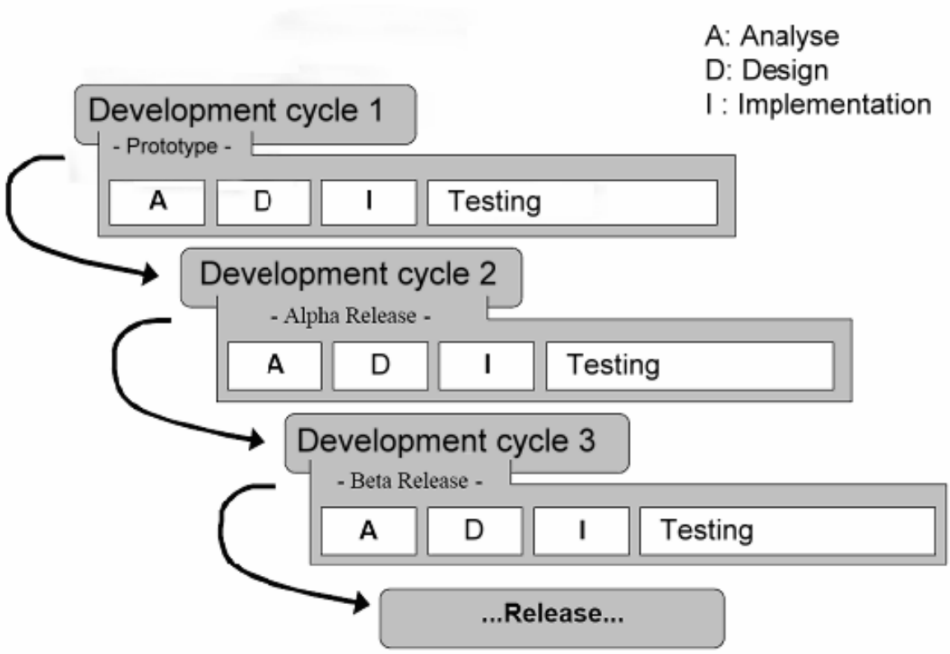
Development cycle 1:
Analyses, proof of concept for data acquisition and GUI

Development cycle 2:
Analyses, hardware integration (Shimmersensor, EEG, Moving Head)

Development cycle 3:
Analyses, data exchange (Shimmersensor, EEG, Moving Head)

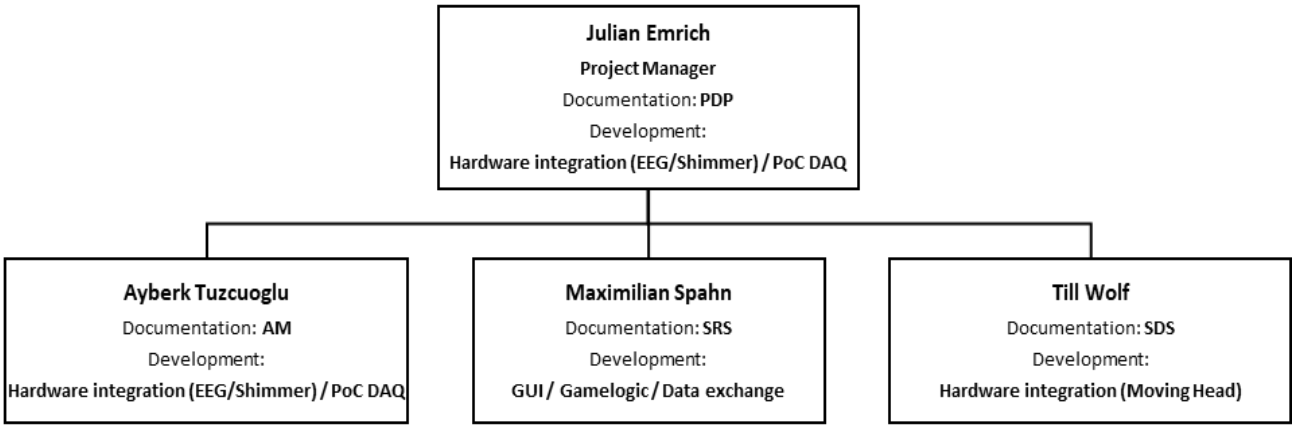
Development cycle 4:
Analyses, integration of Webcam and implementation of game logic

Figure 1: Iterative Model



2.2 Organizational Structure.

Figure 2: Organization Chart



2.3 Organizational Interfaces.

Table 1. Project Interfaces

Organization	**Liaison**	**Contact Information**
Costomer: Alexander Biedermann	Alexander Biedermann	Alexander.Biedermann @th-ab.de
Software Quality Assurance	Team Brain-Body-Computer-Interface & Prof. Biedermann	Alexander.Biedermann @th-ab.de s210675@th-ab.de
Project Manager	Julian Emrich	s210675@th-ab.de
Project Team	Ayberk Tuzcuoglu Maximilian Spahn Till Wolf	s210697@th-ab.de s210695@th-ab.de s210699@th-ab.de

2.4 Project Responsibilities.

Table 2. Project Responsibilities.

Role	Description	Person
Project Manager	Schedule Development: Hardwareintegration (EEG/Shimmer) PoC DAQ Documentation: Project Development Plan	Julian Emrich
Team Member	Development: Hardwareintegration (EEG/Shimmer) PoC DAQ Documentation: Analysis Model	Ayberk Tuzcuoglu
Team Member	Development: GUI / Gamelogic / Data exchange Documentation: Software Requirement Specification	Maximilian Spahn
Team Member	Development: Hardwareintegration (Moving Head) Documentation: Software Design Specification	Till Wolf

3 Managerial Process.

This section of the SPMP specifies the management process for this project.

3.1 Management Objectives and Priorities.

Table 3. Flexibility Matrix.

Project Dimension	Fixed	Constrained	Flexible
Cost	Does not apply		
Schedule	X		
Scope (functionality)	X		

3.2 Assumptions, Dependencies, and Constraints.

The project is to realize in Visual Studio. Further assumptions, dependencies and constraints are stated in the SRS.

3.3 Risk Management.

Data loss:
The project is saved with GitLab and a backup is restored every 2 weeks by the project manager.

Almost no team member has specific knowledge about Visual Studio, Shimmersensor, EEG and the Moving Head. If problems occur or a solution can't be found, Prof. Biedermann can be contacted.

Schedule:
If the project can't be fully realized (till the date of delivery) due to the tight schedule and enormous number of tasks, the project can be completed during the semester break.

3.4 Monitoring and Controlling Mechanisms.

The following table represents the communication plan of the project:

Table 4. Communication and Reporting Plan.

Information Communicated	From	To	Time Period
Status report	Project Team	Project Manager	Every 2-3 days
Project Review	Project Manager & Project Team	Procurer Prof. Biedermann	Every 2 weeks

3.5 Staffing Approach.

Required skills for the project are:

- Experience with
  - programming languages: C++, Python,
  - IDE, debugging, hardware integration
  - GitLab

Every team member studies electrical engineering. Three members need a training in Python, Visual Studio Code and GitLab.

4 Technical Process.

4.1 Methods, Tools, and Techniques.

Hardware:

- PC (capable of Windows 10/11)
- EEG Sensor
- Shimmersensor
- Moving Head
- Webcam

Software:

- Consensys (V1.6.0)
- EmotivBCI (V3.5.4.256)
- ArtNet (V14)
- Visual Studio Code (V5.1.3)

Language:

- C++
- Python

Standards:

- Programming guidelines for C/C++, [AB-INF-PRC-1]

4.2 Software Documentation.

The following subsections briefly describe the documents that are part of the project deliverables.

4.2.1 Software Requirements Specification (SRS)

The SRS clearly and precisely describes each of the essential requirements (functions, GUI design) the software.
Responsibility: Maximilian Spahn

4.2.2 Analysis Model (AM)

The Analysis is the approach to transform the requirements into models, on which the further development process is based on. It includes a static as well as a dynamic model of the involved software processes.
Responsibility: Ayberk Tuzcuoglu

4.2.3 Software Design Specification (SDS)

The SDS describes the major components of the software design including databases and internal interfaces. It includes detailed descriptions of all necessary components.
Responsibility: Till Wolf

4.3 Project Support Functions.

Does not apply

5 Work Packages, Schedule, and Budget.

5.1 Work Packages.

1. Software implementation
   - I PoC DAQ
   - II Design a GUI
   - III Hardware integration (EEG)
   - IV Hardware integration (Shimmersensor)
   - V Hardware integration (Moving Head)
   - VI Data exchange
   - VII Implement and test game logic

2. Documentation
   - I AM
   - II SRS
   - III SDS
   - IV SPDP

5.2 Resource Requirements.

Resources:

- Team consists of four members experienced in C, C++
- Every member uses his own private notebook
- MS Office for documentation
- Jira for project planning
- GitLab for version management
- Laboratory for Adaptive System Interaction (for EEG and Moving Head)

5.3 Budget and Resource Allocation.

Does not apply.

5.4 Schedule.

Tasks	**Duration [Week]**	21.3	28.3	04.4	11.4	18.4	25.4	02.5	09.5	16.5	23.5	30.5	06.6	13.6	20.6
SRS	5														
AM	5														
SDS	4														
PDP	4														
PoC DAQ	4														
GUI	13														
Hardware integration (EEG)	12														
Hardware integration (Shimmer)	7														
Data-exchange	6														
Game-logic	3														
Hardware integration (Moving Head)	8														

Milestones:

Documentation:

2023-04-18 Delivery of SRS
2023-06-06 Delivery of AM
2023-06-20 Delivery of SDS
2023-06-20 Delivery of SPDP

Project:

2023-05-03 Receive Data from the EEG
2023-06-22 Exchange data from EEG with solver
2023-06-25 End of implementation
2023-06-27 Prototype present

6 Additional Components.

6.1 Index.

See 1.5 Definitions and Acronyms

6.2 Appendices.

Does not apply.