IMPROVING PLAYERS' CONTROL OVER THE NEUROSKY BRAIN-COMPUTER INTERFACE

Final Report
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1. Introduction

This report contains information about what well and what went badly in my project, 'Improving users' control over the NeuroSky brain-computer interface' . First the risk analysis, done at the beginning of the semester, is discussed in regards to whether the estimates were correct and what the reality of the situation came to be during work on the project. It then discusses any added complications in the project.

2. Risk Analysis – Estimates and Reality

At the present time the biggest source of risk lies in how hard determining the correct mapping for the intended function will be. As the Neurosky system is very new, information about its output and use thereof is scarce. Therefore the work on getting everything ready has taken much longer than anticipated. This has directly affected the aforementioned mapping of the function.

No.	Name	Probability	Seriousness	Áhættustuðull
1	Problems determining the mapping	4	5	20
2	Technology problems	3	3	15
3	Health related issues	3	3	15
4	Ineffective 'tips'	2	1	5

2. 1 Problems determining the mapping of the function – Estimated Risk

Description: The main risk connected to the mapping is, that the suggested mapping turns out to be erroneous when tested.
Reaction: If that were to happen I will simply have to start again from square one, and device a new mapping for the function.
Probability: 4
Seriousness: 5

2. 2 Problems determining the mapping of the function – The Reality

The project evolved so that it contained three investigation tracks, described in detail in the research paper. This issue was part of Track 3 and results from data analysis for that track gave the results that finding this mapping by using this method is not possible.

2. 3 Technology problems – Estimated Risk

Description: My laptop is getting older and slower. Therefore it is more likely to crash and give me other problems.
Reaction: I have another computer on standby, with the system already installed in case of any problems.

Probability: 3
Seriousness: 3

2. 4 Technology problems – The Reality

My computer is getting old as I related in the estimate. It didn't have enough power for the intensive data handling that this project demanded. I did try my back-up computer as well as all types of student access computers at HR, but none of them could handle the data. I ended up having to buy a new computer, which I would not have needed otherwise, just to be able to finish graphing and analyzing the data. That was not a foreseeable event.

2.5 Health related issues – Estimated Risk

Description: I have a chronic illness and so am more likely than others to contract any bugs that are going around.
Reaction: I have had this condition for many years, so the solutions to most problems have already been optimized. Everything I'm working on is mobile so working from home/the hospital should be no problem.
Probability: 3
Seriousness: 3

2.6 Health related issues – The Reality

Although I have had rheumatoid arthritis for over a decade I haven't experienced such a bad semester, health-wise, in over six years. Because of my immunosuppressant drugs I am more susceptible to whatever bug is going around than normal people. However, I've never before managed to catch what seemed like every single cold, flu, or stomach bug that journeyed to our country.

To better show the amount of time lost, not just to illness, I gathered my log for each week into this table.

Dates	What happened this week?
11/1 - 18/1	Final exams in Denmark
19/1 - 25/1	Final exams in Denmark
26/1 - 2/2	Sick
3/2 - 9/2	Worked on project
10/2 - 16/2	Worked on project
17/2 - 23/2	Worked on project
24/2 - 2/3	Final exams
3/3 - 9/3	Final exams
10/3 - 16/3	Worked on project/Sick second half of week
17/3 - 23/3	Worked on project
24/3 - 30/3	Worked on project
31/3 - 6/4	Worked on project
7/4 - 13/4	Worked on project/Sick second half of week
14/4 - 20/4	Sick first half of week/Worked on

	project
21/4 - 27/4	Sick
28/4 - 4/5	Sick several days in week/Worked on project
5/5 - 11/5	Worked on project
12/5 - 18/5	Worked on project while sick

Table 1 - Weekly Status

The following is calculated for your convenience:
- Four weeks total in final exams
- Five weeks total being sick (loosely calculated, if I was sick for a single day in the week I didn't always log it)
- Ten weeks working on the project

2.7 Ineffectiveness of proposed 'tips' – Estimated Risk

Description: The suggested 'tips' for players, to improve their control of the system prove ineffective.
Reaction: This is a very real possibility, but the solution to this problem is out of scope for this project. If this happens, then the outcome of the project will most likely be that it showed what does not work, rather than what does work.
Probability: 2
Seriousness: 1

2.8 Ineffectiveness of proposed 'tips' – The Reality

This was not one of the problems we encountered. Some hints that we proposed did not work as we had expected, but the number of test subjects is not large enough to discount any of the hints out of hand.

3. Added Complications

3.1 Complexity of Project

The complexity of the project was always something I was aware of. However, the more I worked on the project, the more complex it seemed to get. This can in part be explained by the lack of research into the subjects this project attempts to address. Although research into brainwaves and their recording is well documented and easy to access, it is not so with research into the effect meditative techniques have on brainwaves or mental state. Also, only three papers were found pertaining to the NeuroSky MindSet itself, and one of them was published by NeuroSky in order to support their assertions on the MindSets abilities. Therefore, the information therein must be somewhat suspect until proven otherwise.

3.2 Data Analysis Intensive
This project was much more data connected than I believed in the beginning. All data had to undergo cleaning, categorizing, and several different types of statistical analyses. Some of those analyses were performed only to find out that their use was not optimal or even possible in some cases.

This would not have caused any problems if the statistical know-how needed to do this data justice wasn't miles away from what we were taught at HR. In fact, data analysis or handling of any kind is scarcely seen in this department, at least at the undergraduate level. This is valuable knowledge to have and I am convinced that the skills I learnt while working on this project will help me immensely in my future studies.

5. Conclusion
All in all I would say that most things that could go wrong with the project, did go wrong. That is not to say that I did not enjoy working on the project. I truly did enjoy it and I learned an incredible amount of new things that I would not have learned in my studies here at HR if I had not been a part of this project.

I think these final projects are an important part of the School of Computer Science at HR, and I am glad that I had the chance to participate in a research based project, rather than the conventional programming ones. It was completely new experience and well worth all the hassle.

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