



Compulsory Summer Internship Report

**Major : Industrial Computing and Automation
Level: 4th Year**

Subject :

Development of a Locking Mechanism module

Realized by : **Mariam BEJI**

Host Company:



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<p>Company's responsible Mrs. Rebekka Mirlach,</p> 	<p>Opinion of the internship commission</p>
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Academic year : 2021/2022

Thanks

I would like to thank all those who contributed to the success of my internship and who helped me during my stay in Germany and especially to my parents, my sponsors.

I address my deepest thanks to the company 'neurotrim Systems' and all its staff for the warm welcome and the good work atmosphere.

And I thank my managers at the company **Mr. Max Schiff** and **Mrs. Rebekka Mirlach**, for their help, their patience and for all the effort they have provided for the good course of this internship, as well as all the members of the R&D team who have dedicated time to integrating me into the team and who have not failed to clarify certain ambiguities in response to my questions.

Summary

Figures Table	7
1 Introduction	8
2 Presentation of the host company	9
1. Identification :	9
2. The business sector	10
3. Product	10
4. Method	11
5. The organization chart	11
3 Targeted objectives (specifications)	12
1. Introduction	12
2. Description of the internship	12
• Problem :	12
• Objectives :	12
• Missions:	13
4 Journal of Internship	13
5 Work Done	14
1. Developing a silent mechanism	14
2. Developing a controllable mechanism	15
• Method 1:	16
Electrical components used:	16
Solution Description:	17
• Method 2:	18
Electrical component used:	19
Solution Description:	19
3. Developing a test prototype	20
4. Developing the limit switch sensor	21
5. Developing a solid solution	22
• Mechanical Parts	22
• Mechanical details:	23
6. Implementing the module in the N1.System	24
• Software	24
• Hardware	24
• Wire Connections	24
• Code description	25
• Visualization and Diagrams	26
6 Consolidation of achievements	27
7 Conclusion	27
Webographies	28

Figures Table

Fig. 1 Logo of the company	7
Fig. 2 Funding and Partners of neurotrim Systems	7
Fig 3. The N1.System - Hardware	9
Fig 4. The N1.System - Software	9
Fig 5. The organization Chart	9
Fig 6. The degrees of rotation of the plate of N1.System	10
Fig 7. Journal of the first month of the internship	12
Fig 8. Journal of the second month of the internship	12
Fig 9. The linear Actuator used in the solution	13
Fig 10. A schematic diagram of how a linear actuator works	13
Fig 11. A schematic diagram of the rotation and translation directions	13
Fig 12. A schematic diagram of the stop positions of the sliding tube	14
Fig 13. A photo and a schematic diagram of the relay used in the solution	14
Fig 14. A photo and a schematic diagram of the MOSFET used in the solution	15
Fig 15. A schematic diagram of the electronic circuit to control the direction of the linear actuator	15
Fig 16. A schematic diagram of the electronic circuit as a switch for the linear actuator	16
Fig 17. An explanatory schematic diagram of the electronic circuit for the linear actuator	16
Fig 18. A schematic diagram of the complete electronic circuit for the linear actuator	16
Fig 19. A picture of the L293D H Driver used in the solution	17
Fig 20. L293D H driver pin	17
Fig 21. Schematic Diagram of the control module for the linear Actuator	18
Fig 22. A photo of the control module for the linear Actuator	18
Fig 23. A picture of the remote controller used in the solution	18
Fig 24. Schematic Diagram of the instructions buttons	19
Fig 25. A schematic diagram of the sensor system	19
Fig 26. How to connect the switch (in our case we connect it to normally open)	20
Fig 27. Schematic Diagram of the limit switch sensor	20
Fig 28. The sliding tube	20
Fig 29. The sliding tube positioner	21
Fig 30. The sensor slot in the sliding tube	21
Fig 31. The brucket	21
Fig 32. A PCB design for the control module used in the solution	22
Fig 33. A photo of the control module for the linear Actuator	23
Fig 34. Locking/Unlocking Setup Diagram	24
Fig 35. An overview on the implementation of the module in N1.System	25

1 Introduction

As a 4th year engineering student at the National Institute of Applied Sciences and Technology, Tunisia, I joined a German company active in Medical Equipment Manufacturing; neurotrim Systems, as an intern during the months of July and August 2022.

Being a student in Industrial Computing and Automation and an active member in a club university specializing in robotics and embedded systems, I looked for an internship that could help me put theory into practice. I have therefore joined neurotrim Systems as a mechatronics intern to improve their health care device.

A fairly complete overview of this mandatory summer internship will be included in this document. The subject being "Development of a Locking Mechanism Module ", it was about conceiving a module to be implemented in the final device named N1 systems. My role was to develop the mechanical solution, the electronic circuit and the code to be executed and to communicate with the main board. Two methods have been followed to finally proceed with the most suitable solution.

I have detailed all the stages of my internship in this report composed of 3 main chapters. In the first I presented the host company, its business sector, product and composition. In the second chapter, I highlighted the work that I have done during the internship period and the different techniques used. And finally, the third chapter contains the tasks carried out as well as a training diary.

2 Presentation of the host company

In the first part of this chapter, the identification of the host organization, its organization chart, its activities and its products.

1. Identification :

Name of the company : neurotrim Systems GmbH



Fig. 1 Logo of the company

Legal status : GmbH

Creation date : 2019

Incorporation date : 2021

Combined Funding : € 350k+

Founders : Mr. Maximilian Schiff (CEO AND FOUNDER)

Mrs. Rebekka Mirlach (COO AND FOUNDER)

Mr. David Hack (CPO AND FOUNDER)

Mission : Offering a simple and reliable approach for individual and effective therapy and training by combining and extending validated tests, exercises and 12 years of experience for a lifestyle with great health and maximum performance – whatever the status quo of the performer is.

Contact : Address: Lichtenbergstr. 8

D-85748 Garching b. München

phone : +49 (0)89 250 078 276

Email address : contact@neurotrim-systems.de

FUNDING & PARTNERS:



Fig. 2 Funding and Partners of neurotrim Systems

2. The business sector

neurotrim Systems is the company for high-tech hardware-software development for maximum performance in top-class sports and optimal injury rehabilitation.

- Sport : Increased performance, monitoring, return to play - through brain-centered proprioception training and machine learning, athletes noticeably improve their performance, they achieve training goals faster and are fit again sooner after injuries.
- MEDICINE : Assessment, therapy, documentation - neurotrim and the N1.System are of great benefit for rehabilitation clinics, in geriatrics or in the case of multiple sclerosis. The therapeutic measures are evidence-based, digitization is trend-setting.

3. Product

The N1.System is an innovative hardware-software solution for precisely measuring, analyzing and optimizing the proprioception of athletes and patients. The combination of high-quality hardware and future-oriented machine learning achieves results that fully meet the needs of the individual trainee.



Fig 3. The N1.System - Hardware

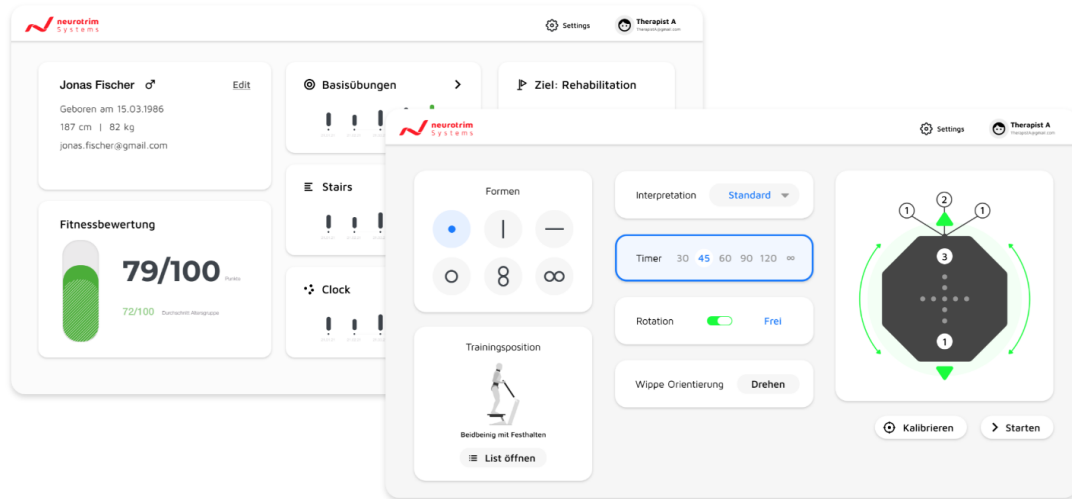


Fig 4. The N1.System - Software

4. Method

The innovative 360° solution for training and therapy in sports and medicine has been in use for 12 years. With measurable success. The neurotrim method goes beyond conventional strength and endurance training. It uses the potential of the brain for sporting and therapeutic success. The exercises strengthen the connection between the brain and movement - with amazing effects.

5. The organization chart

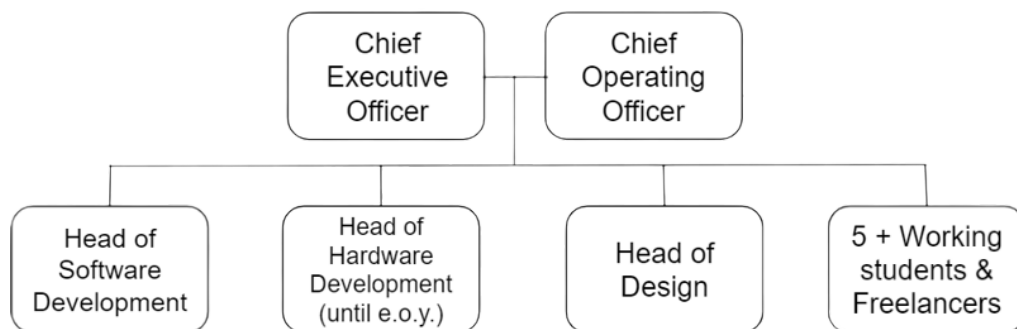


Fig 5. The organization Chart

3 Targeted objectives (specifications)

1. Introduction

In this chapter, I will initially present my mission and working conditions.

Next, I will describe my work, the difficulties I encountered and the solutions I found adopted and skills acquired.

2. Description of the internship

● Problem :

The N1.System is a sport device composed of a moving plate with 3 degrees of freedom (Rotation around Ox , Rotation around Oy , Rotation around Oz).

While the user is mounting or unmounting the device, the plate needs to be completely fixed for safety purposes. Whereas depending on the exercise, the plate should have at least one DoF.

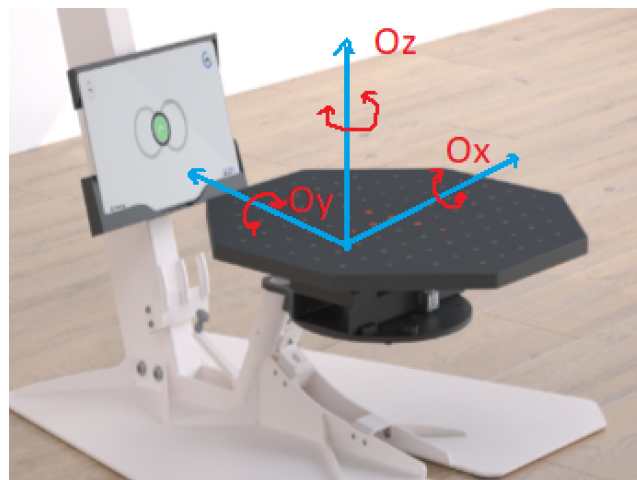


Fig 6. The degrees of rotation of the plate of N1.System

● Objectives :

The current functional solution based on solenoids, has disadvantages. For the N1.System we need to replace it with a :

- reliable,
- instant,
- solid
- and silent

locking/unlocking mechanism that will lock the plate rotation at first try.

● Missions:

My role was to test different techniques and elements in order to settle for the best functioning solution based on a linear actuator to lock the rotation around the Oz axis:

- set up the locking/unlocking module, with both axis Oz and Ox (reuse the old solution based on the solenoid) .
- set the mechanical components, electronic circuitry
- and then to integrate the module in the N1.System .

4 Journal of Internship

- The work in neurotrim Systems followed the Agile Scrum Methodology. Sprints last 3 weeks and by the beginning of each sprint we have a sprint planning meeting. I also took part in the daily meetings of the Research and Development team.

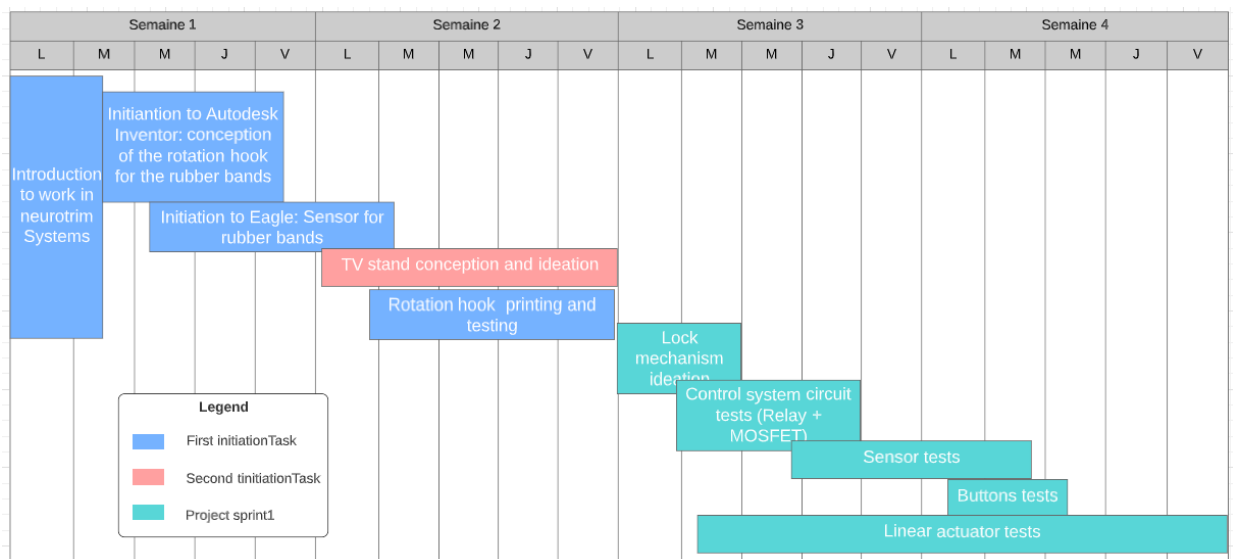


Fig 7. Journal of the first month of the internship

