Portfolio Reading Guide

Introduction

This is my portfolio for the Signals & Embedded Systems minor at Fontys ICT. This collection showcases the progress and development of my skills and knowledge throughout the semester. The portfolio includes pictures, videos, text documents, and source code that highlight my ability to work with signals, from their basic principles to advanced applications in digital and analog electronics. It demonstrates my competency in designing and building hardware devices, processing and analyzing digital signals, and implementing complex digital techniques and mathematical solutions.

Section Introductions

The portfolio is organized into several subjects: triangular robot platform, creative filter uses, synth design hackathon, digital signal processing, digital techniques, mathematics, and analog electronics.

Triangular Robot Platform

This section of the portfolio showcases the work done by me on the group project for this semester. The goal of the project is to develop a robust navigation, orientation and drive control over a kiwi drive robot platform developed by students from previous semesters. It should be noted that the work done by the group will be provided in the GitLab repository created by the teachers.

Creative Filter Uses

This section showcases my independent research and practical examples demonstrating my understanding of signal processing, particularly filters and their diverse applications. Through these examples, I illustrate how filters can be effectively used to manipulate and extract valuable information from signals in different domains.

Synth Design Hackathon

This section encompasses all the research and source code from the digital synth hackathon conducted during the first week of the semester. The objective of this project was to introduce the concept of signals, their functionality, and how they can be modified. This was achieved by building a hardware device capable of receiving and producing signals.

Digital Signal Processing

In this section, you will find the challenges related to the digital signal processing workshops held throughout the semester, organized by workshop. These challenges demonstrate my understanding of the core principles of signal processing and my ability to work with signals by filtering, analyzing, and modifying them.

Digital Techniques

This section includes the challenges from the digital techniques workshops throughout the semester, organized by workshop. These challenges showcase my understanding of various topics, including digital logic (logic gates and other digital circuits), circuit simplification using Karnaugh maps, soldering, and PCB design with KiCAD.

Math & Analog Electronics

Here, you will find the challenges related to analog electronics and solutions to complex mathematics problems. This section is divided into math and analog electronics. These deliverables demonstrate my understanding of complex numbers and their applications, as well as the fundamentals of analog electronics, including resistors, capacitors, inductors, and op-amps, and their roles in signal filtering.

Learning Outcomes

Analysis & Advice

Description:

You show insight into the behavior of different kinds of signals from the physical world, and you give recommendations how they can be used in an application.

Self Evaluation: Proficient

In the "Creative Filter Uses" report, I provided an in-depth analysis of various filter types, including MATLAB code examples, demonstrating my understanding of signal behavior and practical applications. Additionally, I successfully identified and resolved the opto-coupler issue in the "Triangular Robot Platform" project, showcasing my ability to analyze and provide solutions to real-world signal-related problems.

Design & realization

Description:

Starting with a concrete application in mind, you provide a design for handling input signals and applying output signals, and you implement such a design in an actual proof-of-concept.

Self Evaluation: Proficient

The "Synth Design Hackathon" project exemplifies my ability to design and implement a hardware device for signal processing. The report details the entire process, from conceptualization to the creation of a functional digital synthesizer. The "Triangular Robot Platform" project further demonstrates this proficiency through my contributions to the redesign and manufacturing of a physical robot platform.

Manage & Control

Description:

You set up and make use of a well-managed development environment. You provide a thorough transfer of knowledge and work-products.

Self Evaluation: Proficient

I consistently used version control (Git) and collaboration tools (Teams) throughout the semester, highlighting my ability to maintain a well-managed development environment. The clear documentation and presentation of work products in the various reports further demonstrate my proficiency in knowledge transfer.

Future Orientated Organization

Description:

You cooperate with stakeholders to reach an optimal fit for their needs. While cooperating, you recognize opportunities and risks and you actively take them into account.

Self Evaluation: Proficient

I actively collaborated with teammates and the Product Owner (PO) in the "Triangular Robot Platform" project, incorporating their feedback and suggestions (e.g., opto-board addition, motor mount redesign). This demonstrates my ability to cooperate with stakeholders and consider their needs.

Personal Leadership & Targeted Interaction

Description:

You work together in teams, and you motivate not only yourself but also your team. You reflect on and evaluate your own actions.

Self Evaluation: Proficient

In the "Digital Techniques" section, I took the initiative to create and complete a self-imposed challenge (assembly language coding), showcasing my personal leadership and motivation. I also maintained proactive communication and collaboration with my teammates throughout the semester, as evidenced by the various project reports.

Investigated Problem Solving

Description:

You identify practical problems, and you resolve them in a structured manner. You transfer gathered knowledge in a clear and transparent way.

Self Evaluation: Proficient

My portfolio consistently demonstrates a structured approach to problem-solving. For instance, in the "Digital Signal Processing" section, I systematically addressed challenges and clearly explained solutions. The "Triangular Robot Platform" project also highlights my ability to identify and resolve practical

problems in a methodical manner, such as the issues encountered during the hardware redesign and software validation phases.

Conclusion

Reflecting on this semester, I realize it has been extremely beneficial for a technology student like me. It introduced me to new topics that are often overlooked in my chosen study profile and are difficult to find elsewhere. Despite the substantial learning curve, the insights and knowledge I gained were invaluable.

Maintaining motivation was challenging, yet the progress I achieved surpassed my expectations. My primary objectives for the semester - enjoying the learning process and expanding my understanding of embedded systems - were not only met but exceeded.

While I have some unfinished business, such as my personal project and still need to improve my understanding of the underlying math and its applications, I'm not disheartened. Instead, I am pleased to have expanded my skill set in ways I hadn't anticipated.