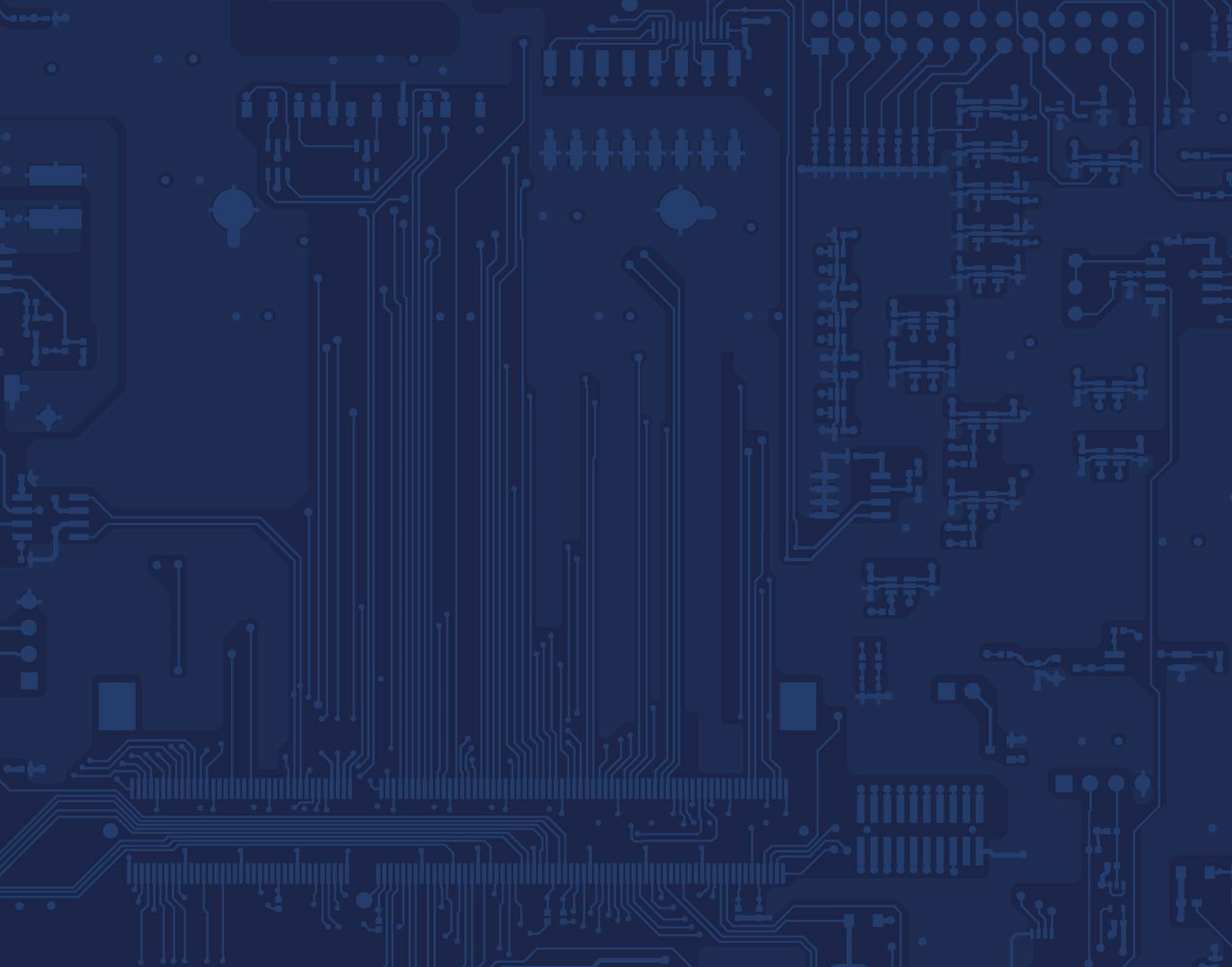
**Ein Bild, das Grafiken, Kreis, Schrift, Logo enthält.

Automatisch generierte Beschreibung**

Hardware Report

Cable-Monitor

Ein Bild, das Schaltung, Elektronik, Screenshot, Text enthält.

Automatisch generierte Beschreibung Ein Bild, das Text, Screenshot, Rechteck, Schaltung enthält.

Automatisch generierte Beschreibung

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Institute: ZHAW  
Lecturers: Andreas Ehrensperger & Igor Matic

Subject: Project Module 3

Date: 20 October 2023

# Abstract

As part of the Project Module 3 in the 5th Semester, the objective was to develop a Cable-Monitor. This device should be able to find hidden cables in walls, floors and ceilings by measuring the electromagnetic- and electrostatic fields of the cable. By making use of the display from the provided development Kit, the user is guided to the approximate location of the cable. Furthermore, useful information such as the current and voltage, is showed on the display. To be able to measure such small signal, an amplifier had to be used. The amplification was also paired with a Multi-Feedback-Bandpass-Filter (MFB) to eliminate unnecessary frequencies and filter out the wanted 50Hz signal. Subsequently, the signal is fed into an Analog-to-Digital- Converter (ADC) and read by the Microcontroller. The final product aimed to detect various types of cables, including one- or two-phased cables, and featured an intuitive touch interface. The challenge extended beyond the realms of hardware and software to effective teamwork, as the project was a collaborative effort between two individuals. Successful completion required meticulous planning and coordination between team members.

Done

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# Introduction

The purpose of this hardware report is to comprehensively detail the Cable-Monitor project, encompassing specification, evaluation, development/Implementation, testing and project management. The initiation of the project was facilitated by the provision of several documents, including documentation templates, circuit designs, layouts, and program code frameworks. The primary objective is the successful creation of a functional device capable of sensing a power cable through both electrostatic and electromagnetic fields. The device is designed to measure the distance to the cable and accurately gauge the current flowing through it. The acquired data is then presented on a touch display. Ultimately, the report aims to capture the entire lifecycle of the Cable-Monitor project, from conceptualization to realization, ensuring a clear understanding of the processes involved in achieving a fully operational and effective device.

Done

# Specifications

The subject is the final Cable-Monitor prototype AND the development process.

Before starting to write, the audience should be considered and defined. A report is useless if it is incomprehensible to the intended reader. For the Cable-Monitor an audience with technical background can be assumed. The report should be written such that no particular knowledge on involved technologies and on the Cable-Monitor project is necessary. A good approach is to have an electrical engineering student in mind who has never heard of the Cable-Monitor.

# Evaluation

The abstract is a means of advertising one’s work. Online search databases usually only contain the abstracts.

After skimming an abstract, the reader decides if the content seems relevant or not.

The abstract is a concise and short description of the complete work. The content is thus similar to that of the report and includes

* Motivation for and context of the project
* Problem statement
* Solution approach
* Achieved results

The abstract is formatted as one single paragraph. It is a third to a half page long. Shorter is better, as long as the essential information is included.

# Development

* Title page with authors, date, company, etc.
* Abstract
* Table of contents
* Introduction  
  with subject, circumstances, conditions, expectations, ...
* Specifications, functionality and block diagrams  
  Aspects may be purpose, primary (and secondary) functions, parameters (ranges, limits), interfaces, HW and SW requirements, user interface, time, cost, ...

This must be well defined before the development starts!

* Evaluation of different solution possibilities  
  Summarize each possibility in terms of the specifications and the functionality.  
  Extract what is specific to each solution.  
  Justify and explain the decision for a particular solution.
* Development  
  Document circuit design, formulas, simulation, dimensioning of component values.
* Implementation  
  Schematics with description of inputs, outputs, special components  
  PCB layout with explanation of the layout concepts (analog, digital, power, EMI, ESD)
* Document the tests  
  Testplan with description, test conditions, expected results and acceptable tolerances, measured results, comparison and verdict, discussion and remarks  
  More about testing is in the file **HW\_ Testing.docx**.
* Project management  
  Timeline with milestones  
  Definition of work packages and assignment to team members  
  Comparison of planned and real workload
* Conclusion  
  Achieved results  
  Outlook and reflection
* Appendix with  
  References or bibliography  
  Schematics, PCB layouts, calculations, tables with test data, code snippets  
  Folder structure with explanation for digital documentation on USB stick or cloud.  
  **The appendix contains all the information that is not needed for fluent reading.  
  As a rule, diagrams go in the main text, data tables in the appendix**.

# Implementation

Form and style of the HW report must follow the customary practice for academic writing as presented in the file **Academic Writing\_summary.docx** in the folder **Writing HW Report**.

Read that summary carefully before starting to write and read it again after writing a first draft.

# Testing

# Project Management

# Conclusion

# Source list

# Figure list

# Appendix