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| http://4vector.com/i/free-vector-uppsala-universitet_061927_uppsala-universitet.png |
| Electron gun vacuum system control |
| Project in Embedded Systems |
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| **2017-03-09** |

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# Abstract

Short summary of the project, communicating the most important results.

Contents

[Abstract 2](#_Toc476739879)

[1. Introduction 2](#_Toc476739880)

[1.1. Background 2](#_Toc476739881)

[1.2. Purpose of the project 2](#_Toc476739882)

[1.3. Project specifications 2](#_Toc476739883)

[1.4. Project planning 2](#_Toc476739884)

[2. Working principles 3](#_Toc476739885)

[3. Implementation 4](#_Toc476739886)

[3.1. Overview of the system 4](#_Toc476739887)

[3.2. Hardware and components 4](#_Toc476739888)

[3.3. Integrated Development Environment (IDE) 4](#_Toc476739889)

[3.4. Development tools 4](#_Toc476739890)

[3.5. Implementation 4](#_Toc476739891)

[4. Results and discussion 5](#_Toc476739892)

[5. Conclusions 6](#_Toc476739893)

[6. References 7](#_Toc476739894)

[7. Appendix 8](#_Toc476739895)

# Introduction

## Background

Some background for the project

Electron gun vacuum system, 5 kW, 10 kV, accelerate electrons and bend path to heat metal to be deposited onto substrate

## Purpose of the project

The purpose of the project

Upgrade control system for vacuum system, design from scratch using microcontroller and touch screen

Also implement PID-controller

## Project specifications

Specifications for the project

Graphical user interface for controlling the various valves and pumps in the system, interfacing the microcontroller with the industrial grade electronics, system logic to disallow or warn user when action taken is not appropriate (opening a bad combination of valves for example)

Universal PID-controller, customizable gains

## Project planning

Planning for the work to be performed

Get software, microcontroller programming

Get the screen to draw stuff

Get the touch interface to output values and correct these to get accurate screen coordinates as compared to the drawing of the graphics

Mechanical relays for digital outputs and optocouplers for digital inputs to interface with industrial grade electronics

Draw PCB, order and hand solder components

Test PCB

# Working principles

How the touch screen works

How the microcontroller works

How the vacuum system + electron gun works

How the PID-controller works

# Implementation

## Overview of the system

Overview of the system

Touch screen

Microcontroller

MC to industrial grade electronics interface

PID-regulator

## Hardware and components

Microcontroller

PCB

Relays

Optocouplers

Touch screen

## Integrated Development Environment (IDE)

AtmelStudio

## Development tools

Sublime text

Git

USBasp programmer

AVRDUDESS

## Implementation

Present setups and source codes, discuss problems faced and how they were solved

# Results and discussion

Present the results with specific parameters and performance values associated with the specifications and discuss how well the results fulfill the specifications, what problems you encountered and how you found solutions and solved the problems.

# Conclusions

Conclude how well the project has been done and how well the system/project performs (in other words how well the finished system/project performs fulfill the specification). Summarize how the knowledge you’ve learned is applied to the project.

# References

References to code that was used as inspiration

# Appendix

Perhaps some code can be put here