Voluntary Project

SyArm Mk1

A simple robotic arm

By

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# Credits

At this point I personally want to express my thanks to all people who made this thing possible. As a lot of time and effort of this project was spent during school, I want to thank all teachers who supported me actively or did not force me to fully participate in their lessons.

Special thanks belong to my teacher for machine elements Mr. Dipl.-Ing. Manuel Leibetseder, Mr. Dipl.-Ing. Gottfried Preuer and Mr. Dipl.-Ing. Peter Rachinger. First mentioned even answered calls on the weekend, even though he had way more important things to take care about and always had good advice for most of my problems.

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Second there is my long year best friend Fabio Muratore. He just knows how to make me laugh, have a good time and really get my head out of my projects from time to time, which is a very important thing as I learned in the process. Finally, my dear friend Laura Taubinger, who always cared for my health and reminded me when to take breaks.

# Abstract

Many manufacturing tasks require a series of complex work or transport processes, which can be difficult to build a machine for. Robotic arms are a very flexible type of robots that can perform a lot of those complex tasks and can be re-programmed for every new application needed.

The SyArm is a simple and compact version of such a robot, not built for heavy loads or accuracy, but for speed and the basic concept. Its materials are cheap, simple and were mainly chosen by the factor of how easy it is to acquire them.

The whole project can be seen as a kind of learning process, that is the reason why you will find version numbers of three and above. Many of the hand-drawn sketches have very only concepts drawn onto them.

Contents

[Credits 2](#_Toc119760111)

[Abstract 3](#_Toc119760112)

[1. Introduction 6](#_Toc119760113)

[1.1. Motivation 6](#_Toc119760114)

[1.2. Goals 6](#_Toc119760115)

[2. Basics 7](#_Toc119760116)

[2.1. Robotic Arms 7](#_Toc119760117)

[2.2. CNC Machines 7](#_Toc119760118)

[3. Construction 8](#_Toc119760119)

[3.1. Base 8](#_Toc119760120)

[3.2. Arm 8](#_Toc119760121)

[3.2.1. First Segment 8](#_Toc119760122)

[3.2.2. Second Segment 8](#_Toc119760123)

[3.3. Axial Bearing 8](#_Toc119760124)

[3.4. Tools 8](#_Toc119760125)

[4. Electronics 9](#_Toc119760126)

[4.1. Controller 9](#_Toc119760127)

[4.2. Measurements 9](#_Toc119760128)

[4.3. Tool supplies 9](#_Toc119760129)

[5. Software 10](#_Toc119760130)

[5.1. Stepper library 10](#_Toc119760131)

[5.1.1. Acceleration curves 10](#_Toc119760132)

[5.1.2. G-Code interpreter 10](#_Toc119760133)

[5.2. SyArm library 10](#_Toc119760134)

[5.2.1. Modelling 10](#_Toc119760135)

[5.2.2. Movements and actions 10](#_Toc119760136)

[5.3. Service 10](#_Toc119760137)

[6. Conclusion 11](#_Toc119760138)

[7. Appendix 12](#_Toc119760139)

[7.1. Technical drawings 12](#_Toc119760140)

[7.2. Articles and other self-made references 12](#_Toc119760141)

[7.3. Sketches and drawings 12](#_Toc119760142)

[8. Sources and references 13](#_Toc119760143)

# Introduction

## Motivation

Robots always fascinated me in many ways: The way they are built, the way the software is made or simply the enormous tasks they can complete nowadays. As I had almost no lessons in school attending robotics and other related topics, so I have decided to learn it myself by building one.

I personally believe automation and especially robots are one of the most effective ways to fight poverty. When used right, they can get people out of jobs with miserable working conditions and accelerate technical development especially in low-wage countries.

Building this robot was kind of a first step towards helping people with the field of research I like.

## Goals

The goal is to build a fully functional robotic arm (see section “Construction”) that can equip multiple different tools for tasks like drawing, lifting things around and so on. Other things a high value was put on are the stability against oscillations that will cause an inaccuracy in all movements and paths.

Flexibility is the overall term this construction was designed after, in terms of hardware and software as well.

# Basics

## Robotic Arms

## CNC Machines

# Construction

## Base

## Arm

### First Segment

### Second Segment

## Axial Bearing

## Tools

# Electronics

## Controller

## Measurements

## Tool supplies

# Software

## Stepper library

### Acceleration curves

### G-Code interpreter

## SyArm library

### Modelling

### Movements and actions

## Service

# Conclusion

# Appendix

## Technical drawings

## Articles and other self-made references

## Sketches and drawings

# Sources and references