

Fab Thesis 2017-2018 – Jari Pakarinen - Fablab Oulu @university of Oulu, Finland

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Theory and research

This chapter will talk about through hole plating (thp) machines available and in the market.

Overview of the PCB through hole plating machine (Walter Lemmen)

Overview of the machine used at university of Oulu is the machine to be automated.

What is through hole plating

Through hole plating process explained.

Purpose of this research – stating the problem

Manual machine uses too much time that can be easily fixed by automation.

Other PCB thp machines for small prototyping purposes

Overview of the machines available in the market today and if they is automation available.

Industry level machines – quick overview

Automation is commonplace in PCB industry. Quick overview and if there are any good solutions that could be taken into this work.

Research in Fablab network and Fab Academy automation projects

What type of automation projects have been done in Fab Academy and if found in Fab network in general that could be used in this work.

Benefits from this work for uni. Of Oulu and Fablab network

What are the benefits of this study and development work for university of Oulu, Fablab Oulu and Fab network in general.

Design and development

The actual development work is explained here.

Electronics

Stepper motor controllers

On the first prototype version done as Fab Academy 2017 Polulu type readymade stepper controllers were implemented on self-made specific control board to control stepper motors. There were a lot of issues with these polulu-boards. It is intention in this study to create stepper motor controllers using Fablab inventory.

Also goal is to make the controller modular and universal so it could be used in other projects as well if needed.

Stepper motors

Fab lab inventory stepper motors will be used.

Main control unit

Main control unit will be designed to connect the stepper motor controllers, user interface and sensors.

Sensing i.e. end switches etc.

End switches etc. will be used for a closed loop system.

Power

System has to be made so that it is easy to power from wall outlet. For this common pc power will be used to start with.

Software

Software will include embedded software and user interface software.

User interface for daily use (mechanic)

Hardware user interface will be used to control the ready machine in daily use.

User interface for development (app/UI for computer)

More advanced user interface will be developed for control and test use.

Using Arduino for the project

Arduino being a good low level entry tool for development, is being considered as a tool for embedded software development.

Mechanics

Suitable materials (PVC and PP)

Materials must handle the special corrosive environment. This is why PVC (Poly-vinyl-chloride) and PP (polypropylene) are materials that are commonly used in these environments. They are easy to machines compared to for example metals.

Static mechanics (support structure)

Fablab doable materials

Cheap materials

Guides

Dynamic mechanics (moving units)

Methods of moving

Different types of movement methods will be studied to select best one for this purpose.

Belt

Driving screw

Cable

Integration to PCB thp machine

Original machine runs solely on 220V. This is one big consideration to be solved. Automation must be connected to the high voltage system. This need special permits and qualifications from the developer.

High voltage system

Electrolysis used high voltage source for electrolytic process.

Water spraying system connection

This will be an issue with high voltage but some sort of automated valves must be used.

Air injection

Air pump is high voltage system. This needs to be connected to control hardware.