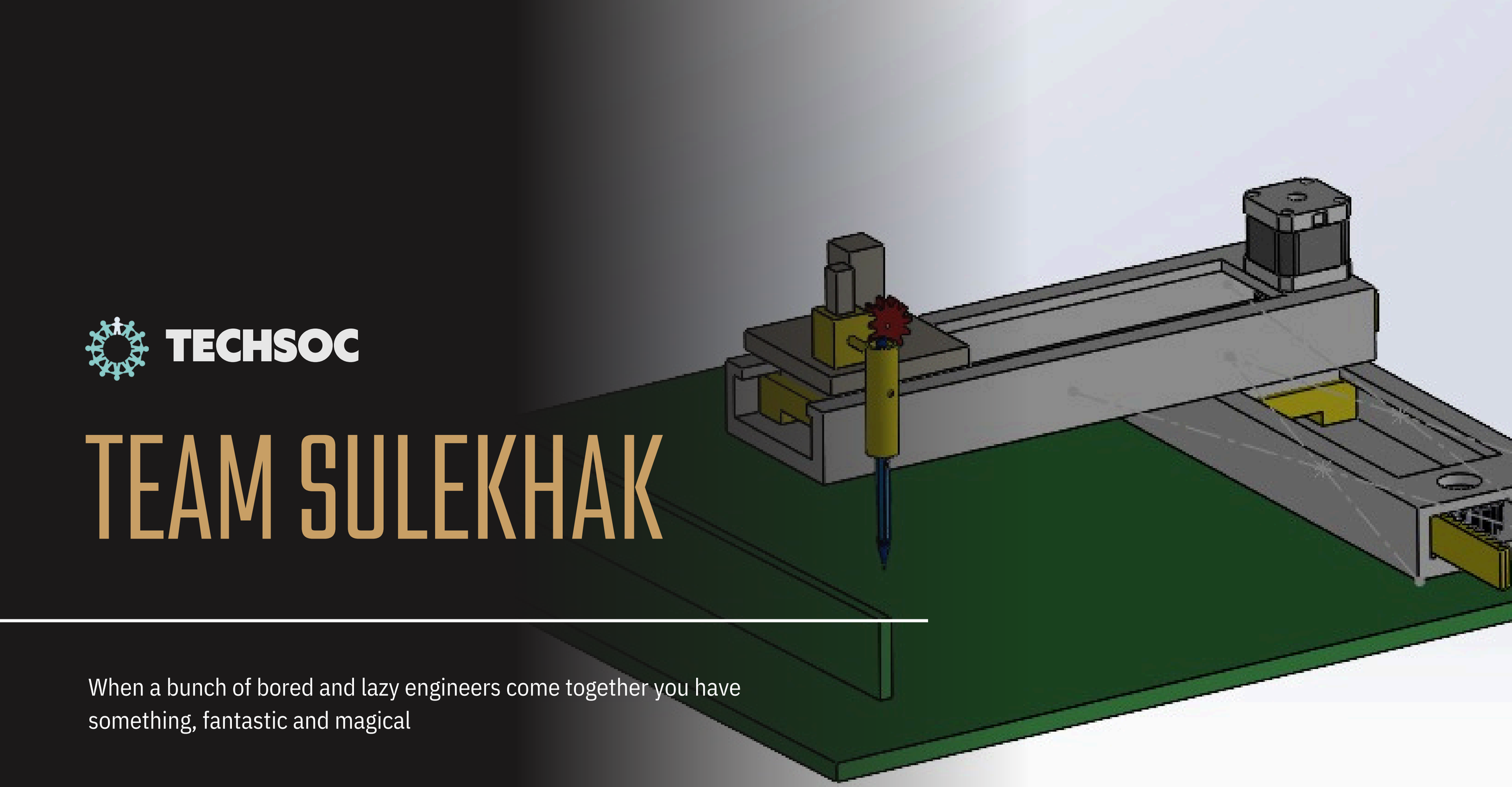
TECHSOC

TEAM SULEKHAK

When a bunch of bored and lazy engineers come together you have something, fantastic and magical



SULEKHAK

We are team Sulekhak(literary meaning: good writer).

SULEKHAK is a groundbreaking project that utilises mechanical innovation to redefine handwriting for modern needs.

THE PROBLEM STATEMENT

People face challenges with handwritten tasks for various reasons -

- students spend significant time writing lab reports by hand,
- individuals with disabilities (such as Parkinson's disease) struggle to maintain their personal writing style,
- historians need precise replication of ancient manuscripts, and
- clerks must complete numerous government documents manually

OUR SOLUTION

Our solution includes a physical device that mimics handwriting using a pen and a font creation system that learns from the user’s handwriting samples.

By blending artistry with technology, we aspire to make handwriting accessible, meaningful, and transformative for all.

OUR SOLUTION

Our solution is divided into two main components:

- Software - Converts an input image of the handwritten phrase "The quick brown..." into a personalized font that mimics the user’s handwriting. It also generates instructions for the hardware to execute.

- Hardware - A writing mechanism that physically reproduces the handwritten text on paper or other surfaces by holding a pen and performing precise movements based on the software's instructions.

TEAM STRUCTURE

1. Vardaan Srivastava - Software Development
2. Arya Deshmukh - Mechanical Design and CAD
3. Ayush Singh - Power Systems
4. Arnav Gautam - Actuation and Control Systems

SOFTWARE - OVERVIEW

Led by Vardaan Srivastava, the software creates a personalized font from the user's handwriting input and sends precise instructions to the actuation system for execution.

SOFTWARE - WORKFLOW

The user provides an input image

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Using the OpenCV library, the characters are cropped from the image.

↓

Then all character images are renamed, and converted into svg format

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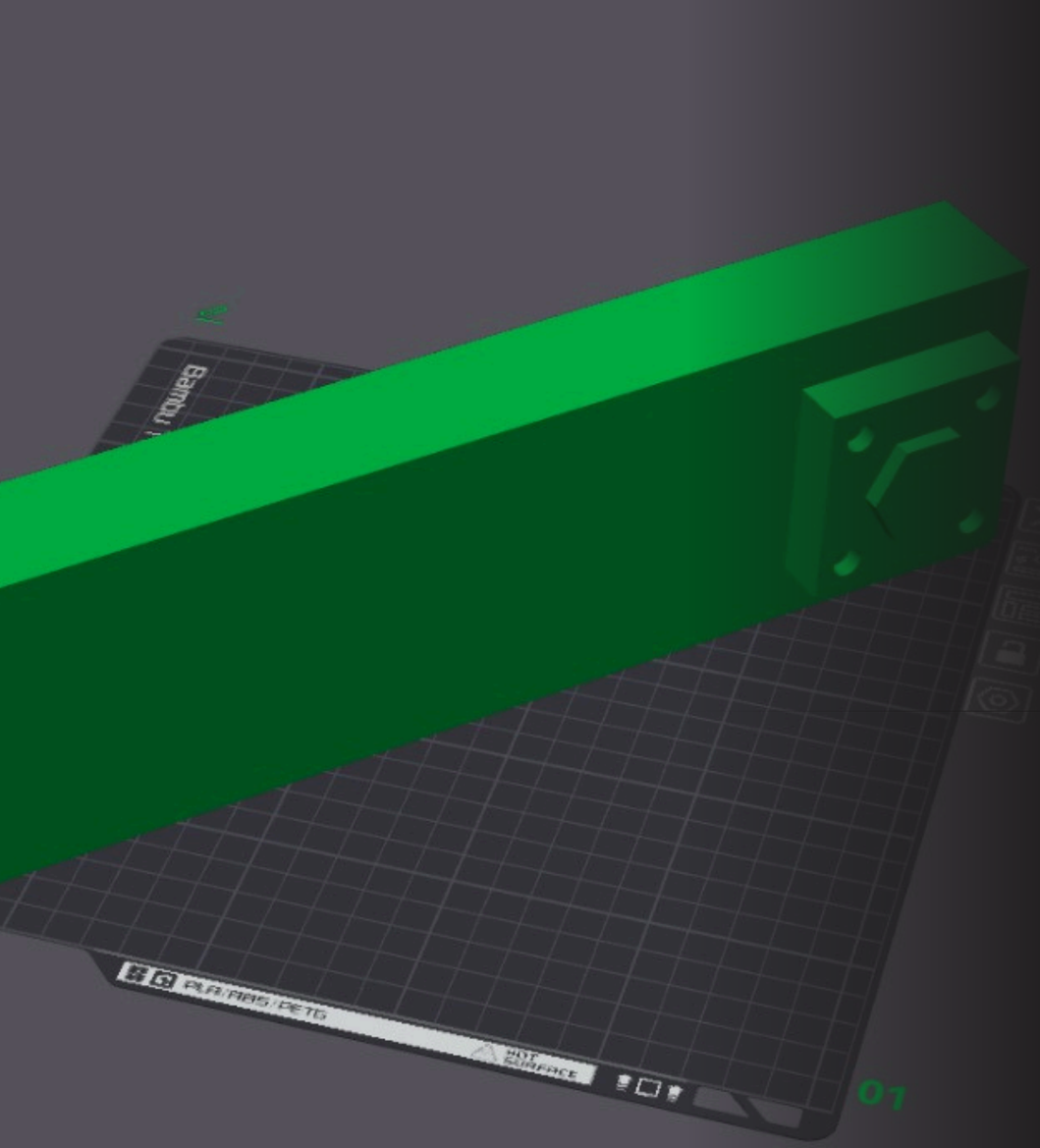
Finally they are compiled into a font file

SOFTWARE - ASPIRATIONS

The software is a work in progress, with immense potential for enhancement. Here are the key improvements we aim to achieve by the final demo day to elevate its performance and impact:

- Ligature Customization: Add support for natural letter combinations (e.g., "fi," "fl") to make handwriting fonts more realistic and expressive.
- SVG Smoothening: Refine jagged edges in glyphs for cleaner, more professional-looking fonts.

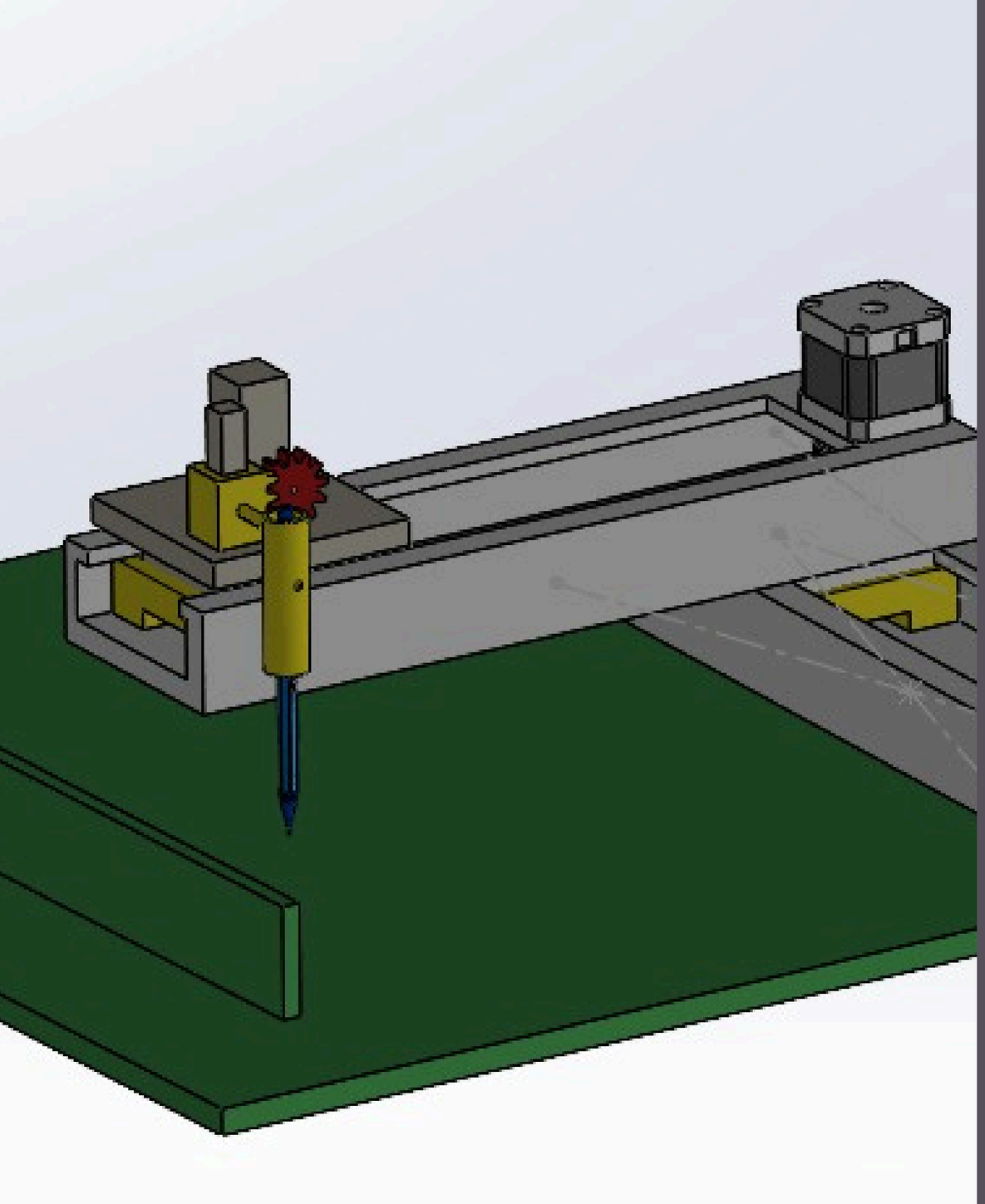


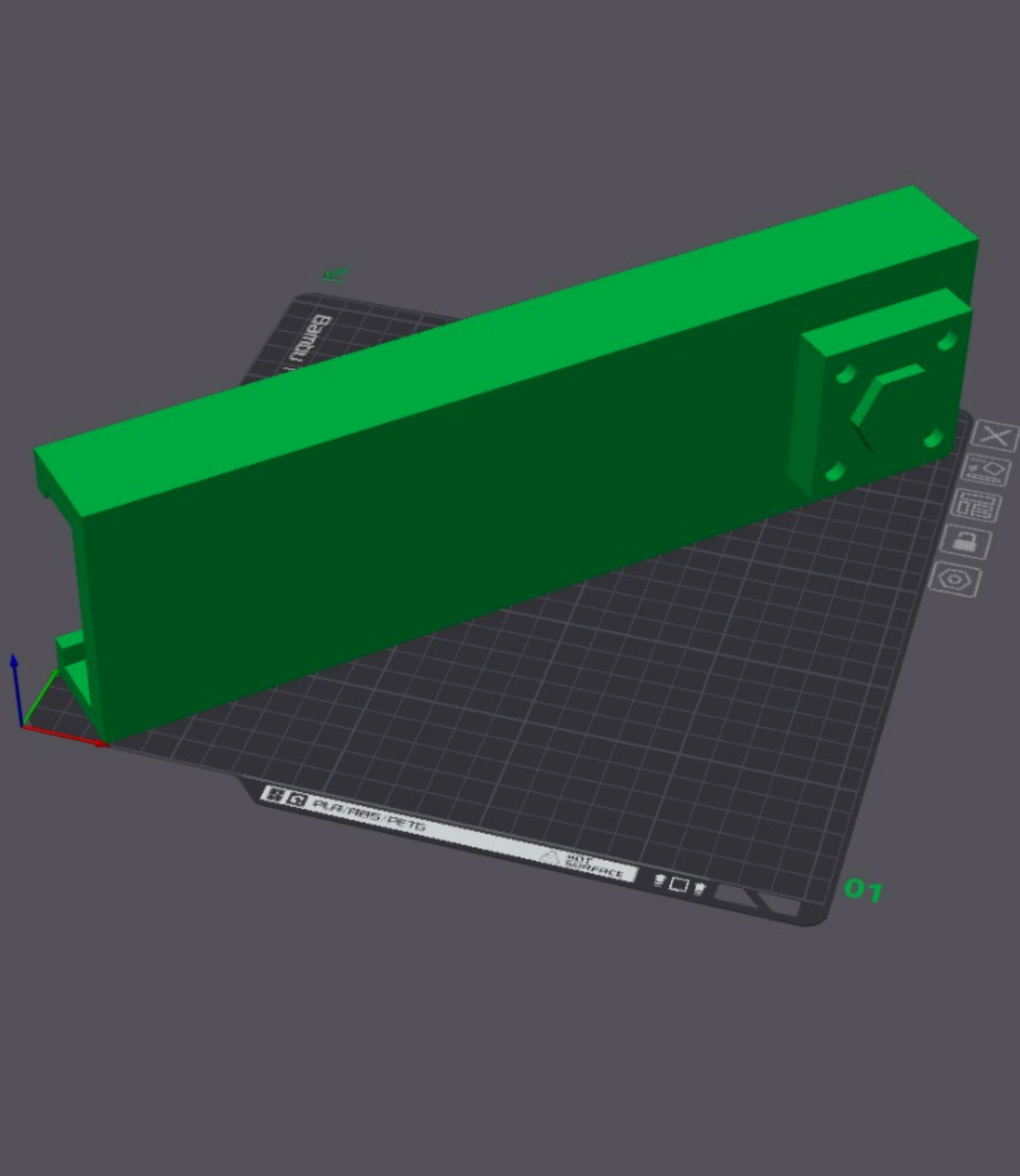
MECHANICAL AND CAD

The 3D model for the machine body has been crafted ensure precision and functionality.

While logistical challenges prevented the 3D printing of these models, the design is ready for production, showcasing our commitment to delivering a robust solution.

We have used rack and pinion mechanism along with stepper motors for precise positioning along X and Y axes.




PLA/ABS/PETG
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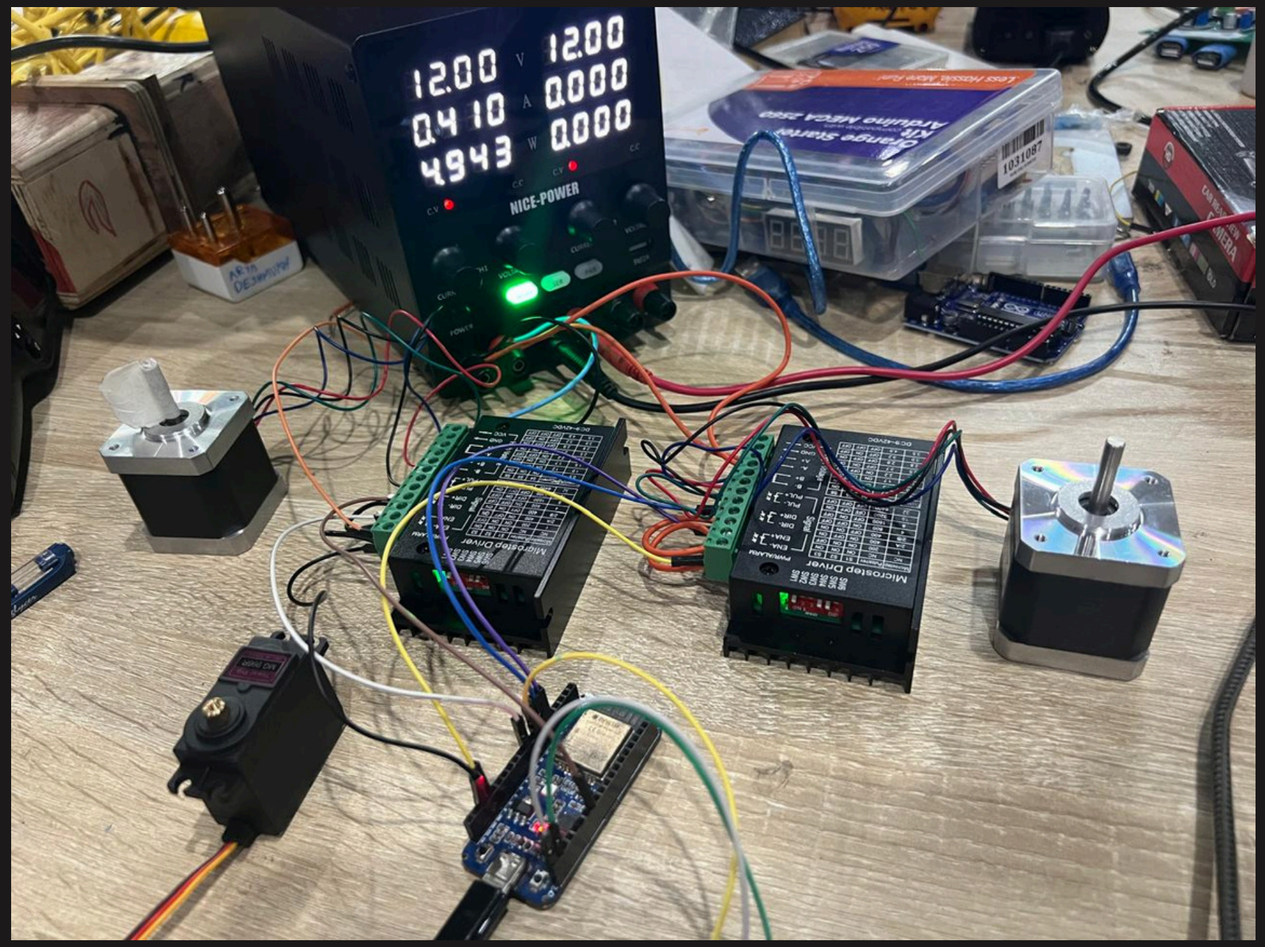
ACTUATION AND CONTROL SYSTEM



Components Used :

1. ESP32 (Microcontroller)
2. Stepper Motor Driver (x2)
3. Stepper Motor (x2)
4. Servo Motor (x1)

PSEUDOCODE

GCODE (X, Y COORDINATES) → USB SERIAL COMMUNICATION (LAPTOP TO ESP32)

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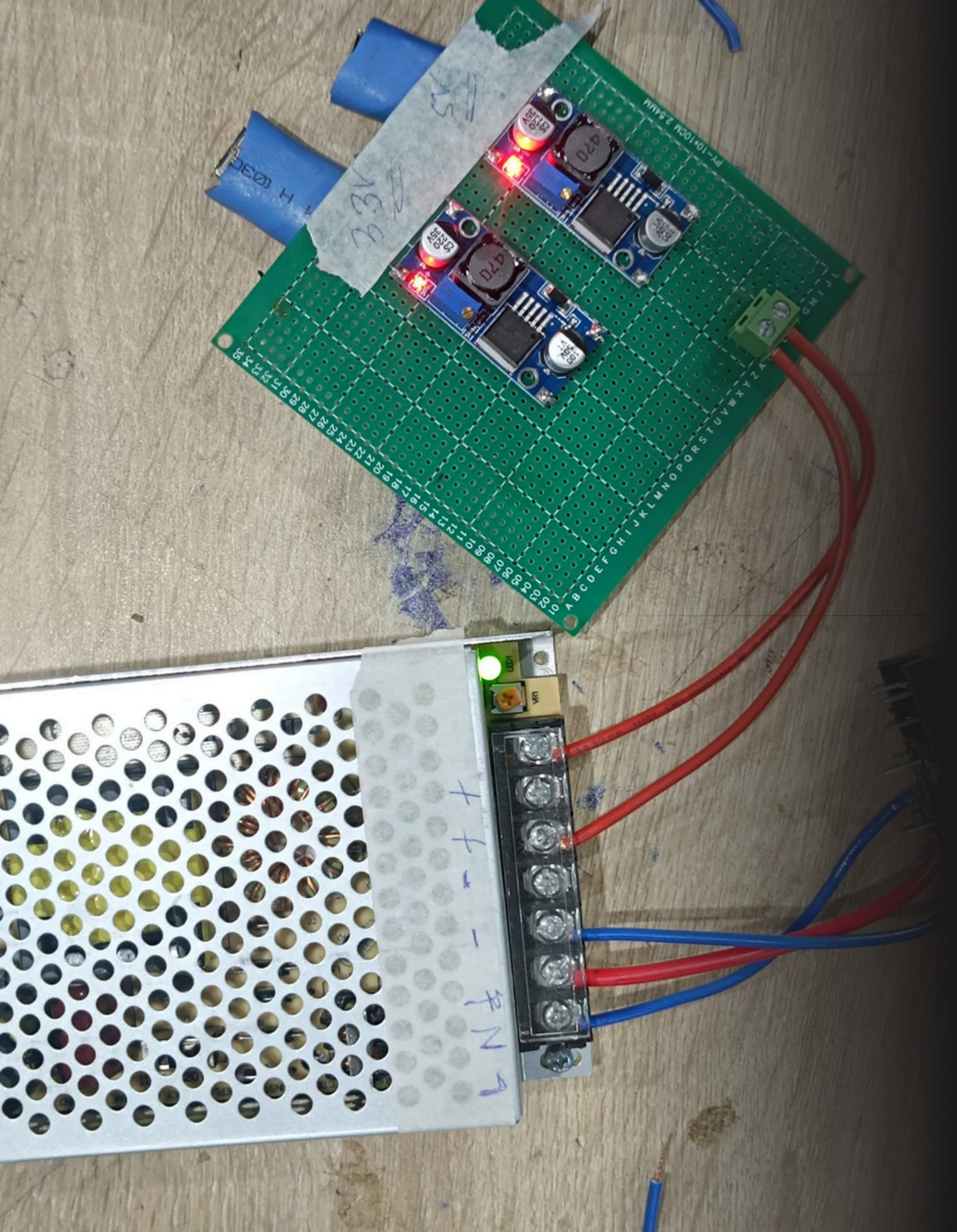
READING DATA ON ESP32 THROUGH SERIAL MONITOR

← CONTROLLING X AND Y POSITIONS BY DRIVING STEPPER MOTORS



GETTING THE POWER WE NEED

Aim for our system is to have continous stable power be it for our micro controllers or our servo drivers.

We do not rely on battery power becauseour system require a lot more power and having a battery pack will make the system cumbersome, so we are using a SMPS, and further we have put 2 buck convertors to efficiently step down 12V to 5V and 3.3V, for our micro-controller and servos, the 12V powers the steppers and stepper drivers.

TechSoc

Team Sulekhak

The handwritten document from our product

THANK YOU