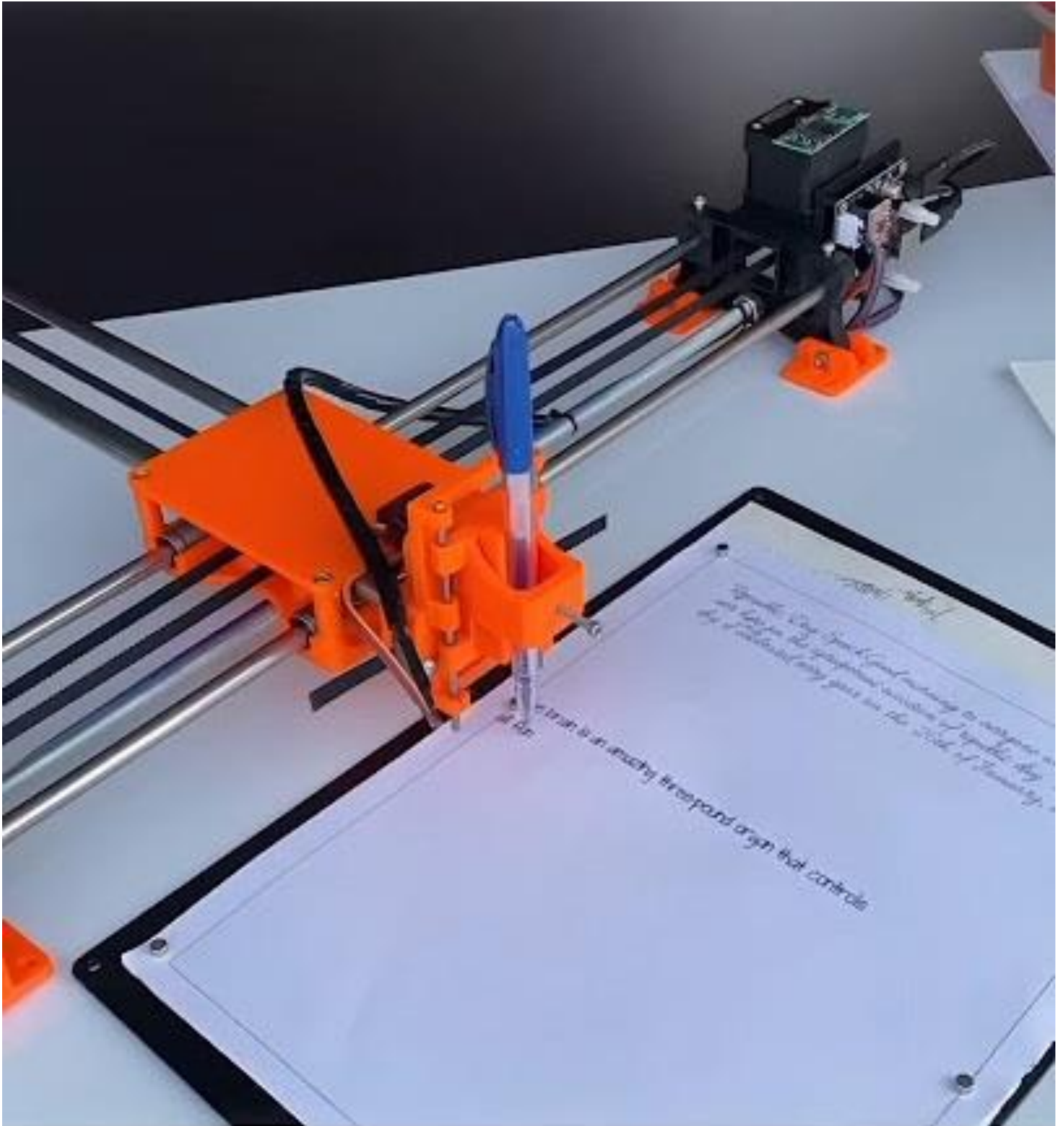# Handwriting Machine

Joseph Nguyen / Trumbull High School / May 20, 2024
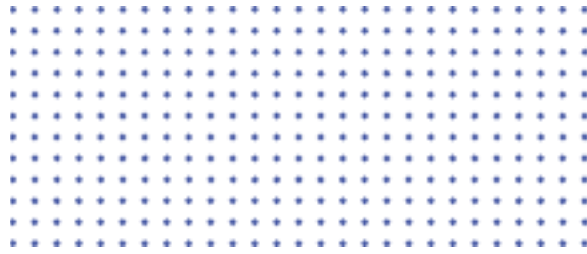
TABLE OF CONTENTS
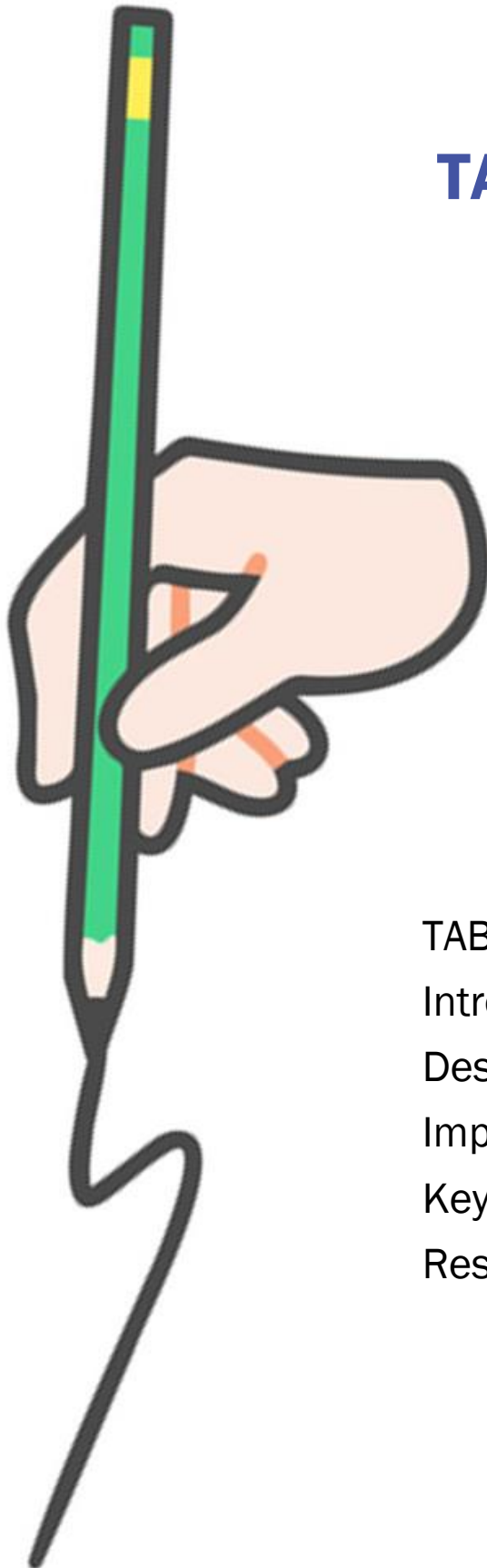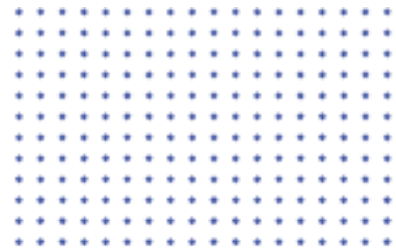
INTRODUCTION

The **Handwriting Machine** project focuses on automating the process of writing notes using a mechanical system. The goal is to create a machine capable of handwriting notes that can be digitized and shared online. It utilizes **Fusion 360** and **Sketchup** for design, and **C++** for coding, with a focus on automating the physical process of writing.
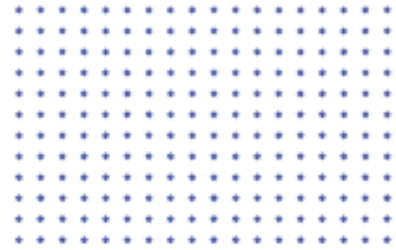
- See the final project information in [GitHub](#),

Objective

- **Automate Note Writing**: The machine is designed to write notes using a pencil, which would allow users to create handwritten notes without manual effort. The notes are then shared or posted online.
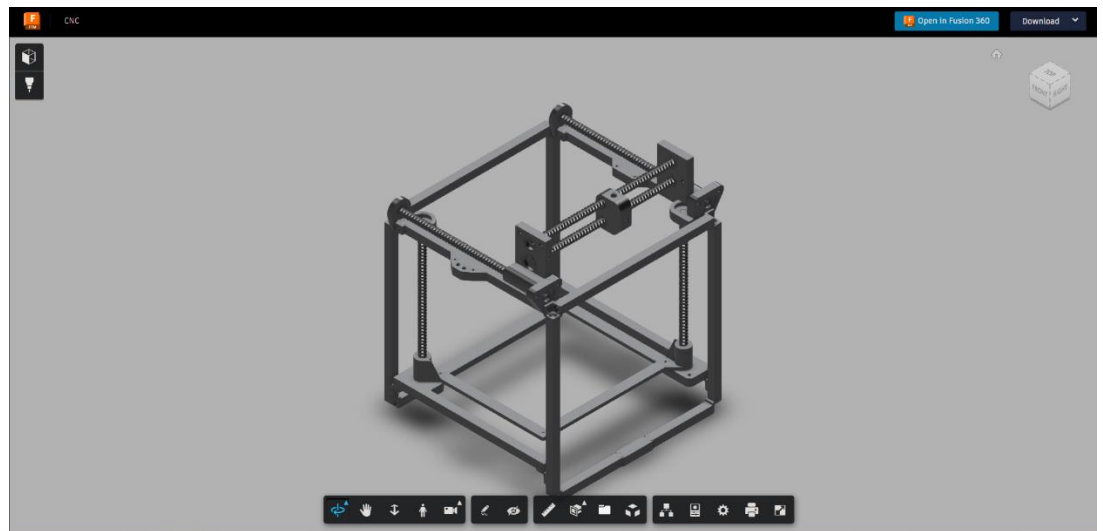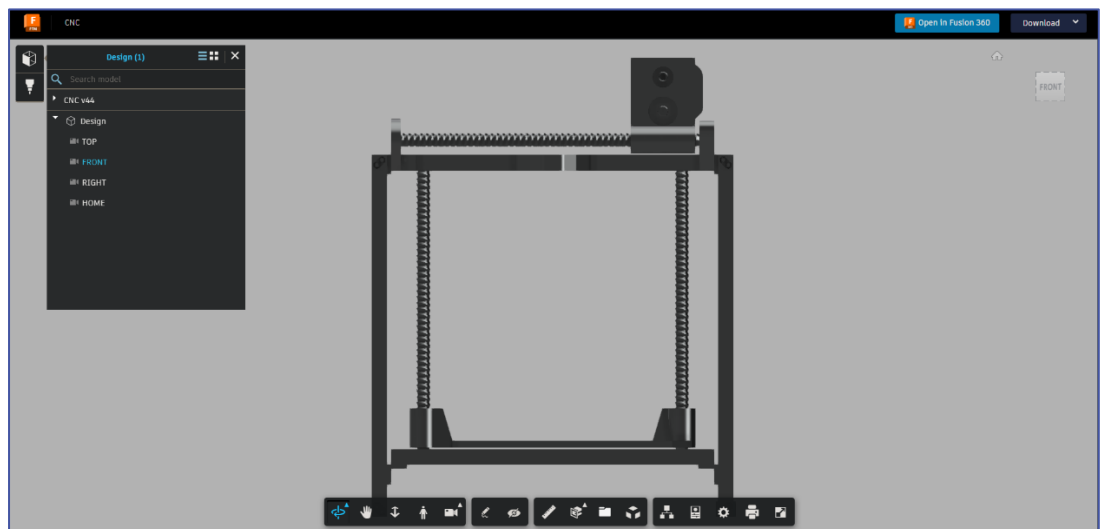
DESIGN

Initial Design

- **Cubic Structure**: The machine is built with a cubic frame that uses screws to move a pencil along the **x** and **z** axes. Two additional screws control the movement of a platform that holds the paper, enabling the pencil to press down and write.
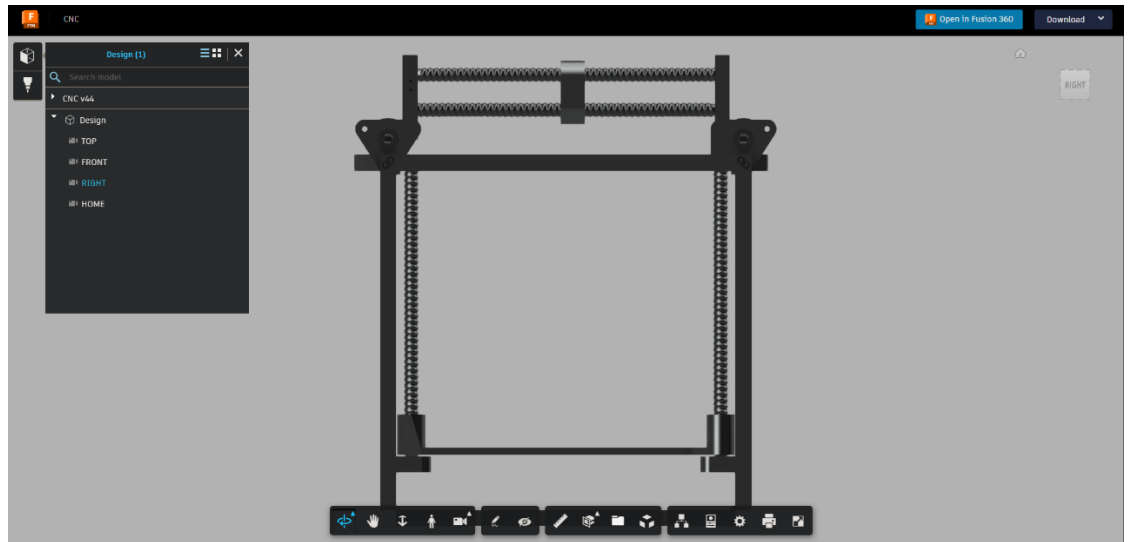

- **Movement Mechanics**: The screws are designed to rotate at around 15 rpm, which moves the pencil and paper into position for writing.
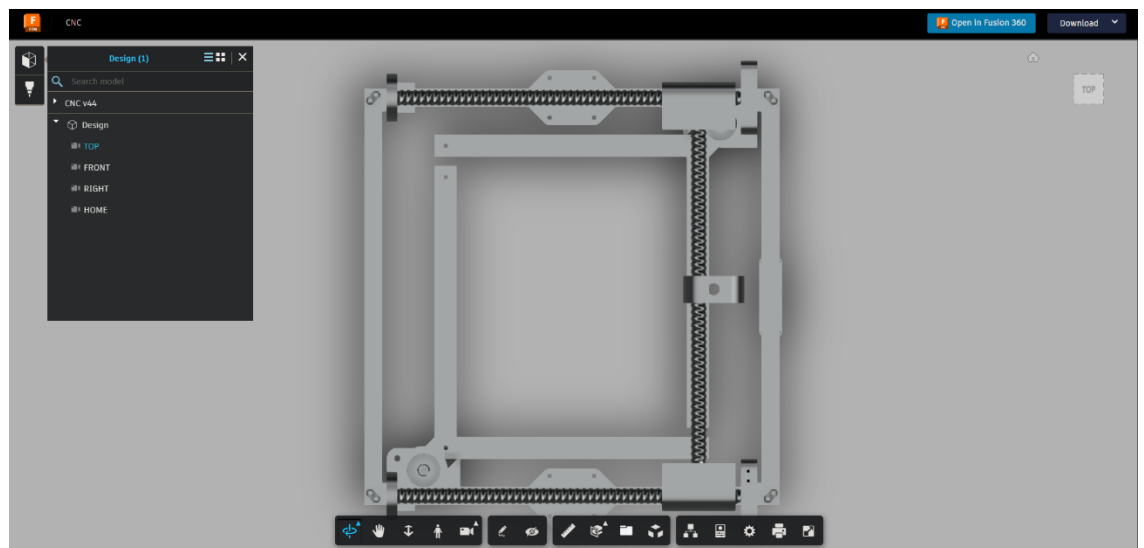
  FRONT:

RIGHT:

TOP:

- **Autodesk Fusion 360**: This is cloud-based design and 3D modeling tool.

Challenges and First Design Failure

- **Problem**: The pencil wobbled significantly due to friction while moving up and down the screws. This wobbling resulted from excessive space between the pencil and the paper, making the notes unreadable.
- **Initial Solution**: The team aimed to reduce the space between the pencil and paper to minimize wobble. The idea was to flip the platform holding the paper so that the white contraptions connected to the screws would be upside down, reducing the excess space.

Revised Design

- **Platform Redesign**: Despite the changes, the team realized that flipping the platform might not fully eliminate the wobble. They decided to redesign the platform again, changing it from a structure resembling two **L-shaped brackets (L¬)** to a simpler one using two blocks (□), which could provide better stability.
- **Additional Contraption**: In the final iteration, the team explored adding a new contraption to the structure. This would attach to the white components already connecting the platform to the screws, aiming to further reduce wobbling and improve the machine's overall precision in writing.

IMPLEMENTATION
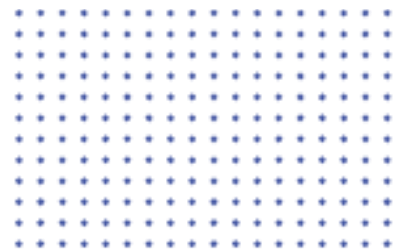
Software/Tools

- **SketchApp**: This is cloud-based design and 3D modeling tool.
- **Visual Studio Code** is used for coding in C++.
- C++, JavaScript

Coding

- Using Serial Communicate to the C++ code from JavaScript

```javascript
class LineBreakTransformer {
  constructor() {
    this.container = '';
  }

  transform(chunk, controller) {
    this.container += chunk;
    const lines = this.container.split('\r\n');
    this.container = lines.pop();
    lines.forEach(line => controller.enqueue(line));
  }

  flush(controller) {
    controller.enqueue(this.container);
  }
}

const lineReader = port.readable
    .pipeThrough(new TextDecoderStream())
    .pipeThrough(new TransformStream(new LineBreakTransformer()))
    .getReader();
```

KEY CHALLENGES

- Managing the friction caused by the screw movement.

- Ensuring the stability of the pencil to prevent wobbling.

- Designing a platform that can adequately support the paper while maintaining close contact with the pencil.
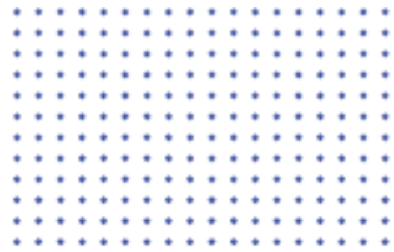
RESULTS & CONCLUSION

- [Handwriting machine_ Final video](#)

- This project combines mechanical design, automation, and coding to create a functional, note-writing machine, with ongoing iterations focused on improving precision and reducing errors.