

Mechanical

INTRODUCTION

The “Mechanical Writer” bot is designed to write on a vertical board using two systems of power screw- horizontal as well as vertical. It receives input from laptop through serial communication. The sequence of motion of motors to write any character is coded into microcontroller.

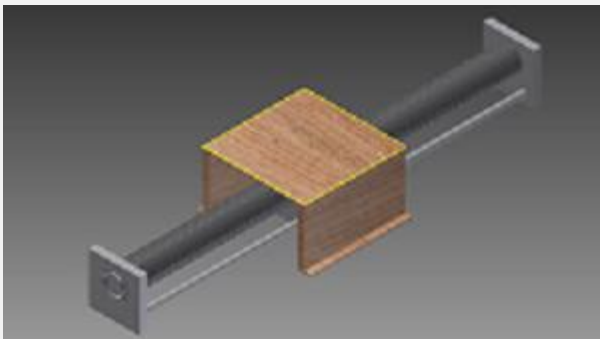


DESIGN

Initially, we developed the mechanical design of our bot in Autodesk Inventor.

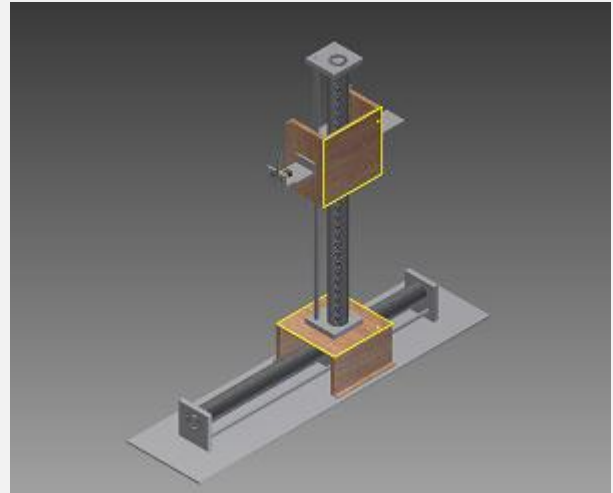
We used power screw as linear actuators for horizontal and vertical motion.

Autodesk inventor model for linear actuator:



Writer

OUR FINAL DESIGN:



COMPONENTS USED

1. MECHANICAL

- High torque and high RPM motors to rotate screws.
- Servo motor to control marker movement.
- Power screw over which nut moves linearly.
- Mild steel rods to support the design and bringing linear motion.
- Wooden base
- Coupler to hold power screw with motor
- Acrylic pieces cut by water jet machine to hold nut and support ends of rods.

2. ELECTRONICS

- MOSFET- Metal Oxide Semiconductor Field effect transistor is used to amplify electric signals. As high torque DC motor requires high current we used MOSFET as motor driver.

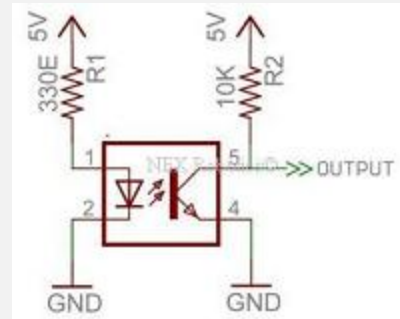


-Arduino Uno– It is a microcontroller based on atmega 328.



-Encoder kit- Position Encoder sensors are used to find position of the wheel. This encoder has wider and deeper slot with right angled mount. It consists of IR LED and Photodiode mounted facing each other enclosed in plastic body. When light emitted by the IR LED is blocked because of alternating slots of the encoder disc logic level of the photo diode changes. This change in the logic level can be sensed by the microcontroller or by discrete

hardware. This sensor is used to give position feedback to the robot.



Circuit diagram of encoder kit

We are using serial communication between arduino and laptop through serial monitor provide by arduino on laptop and RX and TX pins on arduino. board

3. PROGRAMMING

Arduino provides an open source platform to develop software and hardware tools.

We programmed atmega 328 on arduino uno board. Each character can be developed if a certain sequence of motion is followed. We hardcoded sequence in which horizontal and vertical motors should move for each character.

Characters given in serial monitor is stored in buffer and arduino read it character by character and corresponding set of motions are executed by bot.

Problems Faced during project

- In the beginning, it was difficult for us to choose linear actuator as none was precise to our expectation given the budget constraint. We thought of rack and pinion, pulley system, worm and gears etc. We finally used power screw for this purpose.
- Selecting motors was also a big task as we required high torque and high RPM motors with good precision. We tried to use high precision encoder motor but its RPM was very less so we switched to high torque DC motor and used encoder kit to increase its precision.
- The horizontal system was quite stable but it was very difficult to mount vertical system on it. We tried castor wheels for support but didn't succeed. Finally, we used toy car model to support vertical system.



Future Aspects:

We think that our project will lay down foundation to promote distance learning.

Also, image and voice recognition can be implemented in the bot to make it more user friendly.

For more details visit:

<http://students.iitk.ac.in/projects/robotics club/writer>

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