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GEOMETRICAL SHAPES DRAWING ROBOT USING ARDUINO

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Abstract: This project explores the design and development of a geometric shape drawing robot, leveraging the capabilities of stepper and servo motors for precise movement and control. The objective of the project is to create an educational tool that can draw various geometric shapes, demonstrating principles of robotics, mechanics, and programming. The project involves designing the mechanical structure, selecting appropriate hardware components, and developing software to control the robot's movements

Keywords: Geometric,Shapes,Arduino Nano, Stepper Motor, Servo Motor,Chassis, Stepper bracket, Pencollor, Servo holder, ULN2003 driver,O rings, Ball bearings.

I. INTRODUCTION

The Arduino Drawing Robot project represents an innovative blend of technology and creativity, leveraging the capabilities of robotics to automate the drawing process. This project is designed to build an autonomous robot that can accurately reproduce digital images on a physical medium. The concept combines principles from various fields, including electronics, programming, and mechanical design, offering a comprehensive learning experience.

The project is built around the Arduino platform, a popular choice due to its versatility, ease of use, and extensive community support. The Arduino board acts as the central control unit, orchestrating the movements of the stepper motors that drive the drawing arm and the servo motor that manages the pen's position. This setup allows for precise control over the drawing process, enabling the robot to produce accurate and detailed drawings.

Drawing robots have a wide range of applications, from educational tools that teach the fundamentals of robotics and programming to practical uses in industrial prototyping and automated manufacturing. This project aims to explore these possibilities, providing a hands-on approach to understanding and leveraging robotics technology.

II. LITERATURE PAPER

There are several research papers and articles available online that discuss similar projects, which can serve as a good starting point for literature review.

Here are some of them:

1. **Design and developmemt of arduino based drawing robot (2023) by** Omkar Jeevan Ankalkope , Praveenkumar Bhojane
, Adit Urmil Mehta , Kaushiki Sachin Sashital , Ritwik PK , Rohan Sandeep MahatekarThe design and development of an Arduino-based drawing robot in 2023 showcases an innovative application of robotics technology. The project highlights the integration of mechanical and electronic components to achieve precise and automated drawing capabilities.

2. **Arduino Based XY Drawing Robot (2020)** by Mrs. R. Dayana, Gunaseelan P.This paper describes The Arduino-based XY drawing robot using ATMEGA328 microcontrollers efficiently draws images. The system uses stepper motors to position the pen and a servomechanism to lift it, producing accurate and complex drawings with ease and speed

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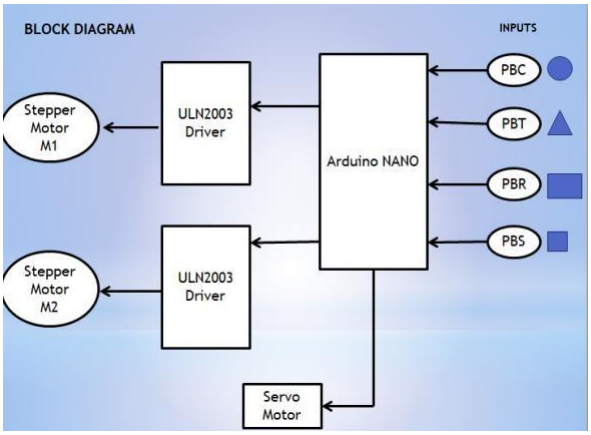
3. Design, Implementation and Analysis of a Low Cost Drawing Bot forEducational Purpose (2018) by Rajesh Kannan Megalingam, Shreerajesh Raagul, Sonu Dileep, Sarveswara Reddy Sathi, Bhanu Teja Pula, Souraj Vishnu, Vishnu Sasikumar, Uppala Sai Chaitanya Gupta. The paper presents the design, implementation, and analysis of a low-cost drawing robot intended for educational purposes. The robot demonstrates unique capabilities in drawing and painting, delivering results that closely match the input images. The evaluation indicates consistent response times across trials and a total system cost, excluding the microcontroller unit, of approximately Rs 2500

4. **Design and Implementation of an Autonomous Drawing Robot (2017)** This research paper details the design and implementation of an autonomous drawing robot. It covers the mechanical design, electronic components, control algorithms, and performance evaluation..

5. Robotic Drawing Machines (2017). This paper surveys various types of robotic drawing machines, including those based on Arduino. It discusses different approaches, hardware configurations, and software algorithms used in these projects

III. METHODOLOGY



A. BLOCK DIAGRAM

Figure 1 represents the block diagram of fingerprint geometric shapes drawing robot using Arduino in which we have used the components like ULN2003 driver,geared 5V Stepper motor, servo motor, Servo bracket, Stepper bracket, Arduino nano, pushbutton pins, chassis ,ball bearings, wheels,O rings,Pen collar

B. WORKING

A mechanism is developed to hold and control the drawing tool (e.g., pen or marker). This could involve a servo motor for lifting/lowering the tool to the drawing surface

Inputs are given through the push bottons.

Once the command is given Arduino runs a program that processes user inputs or pre- defined drawing commands and translates them into stepper motor movements.

As the motors move, the drawing tool makes contact with the drawing surface, creating lines and shapes as per the programmed instructions.

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C. FLOWCHART

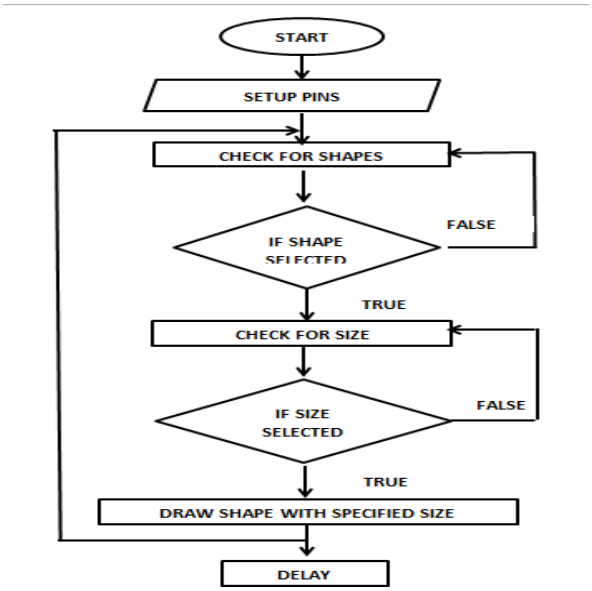

Figure 2 represents the flowchart of the system. We initialize setup pins according to that shapes will be selected in same way we can also define the shapes. As per the requirement shapes will be drawn if no push button is pressed no shapes will be drawn.

IV. RESULTS

The prototype of the proposed system is shown in Figure 3.

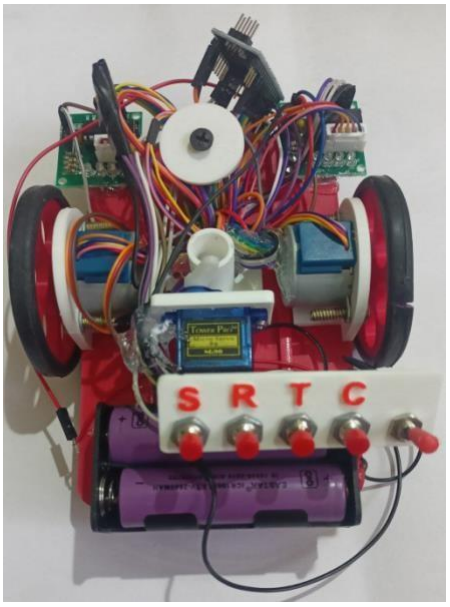

Fig1:System of the project with the complete connections.

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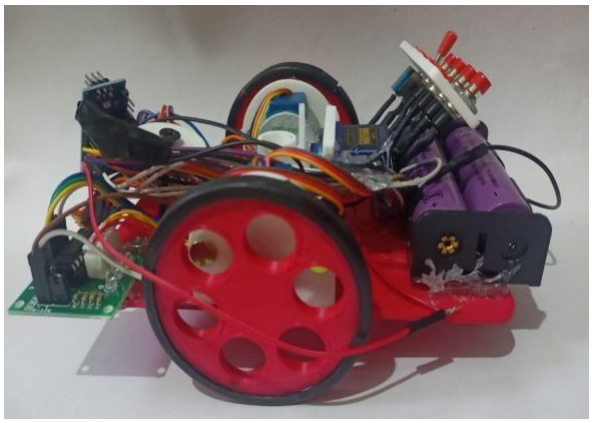

Fig 2: Other side view.

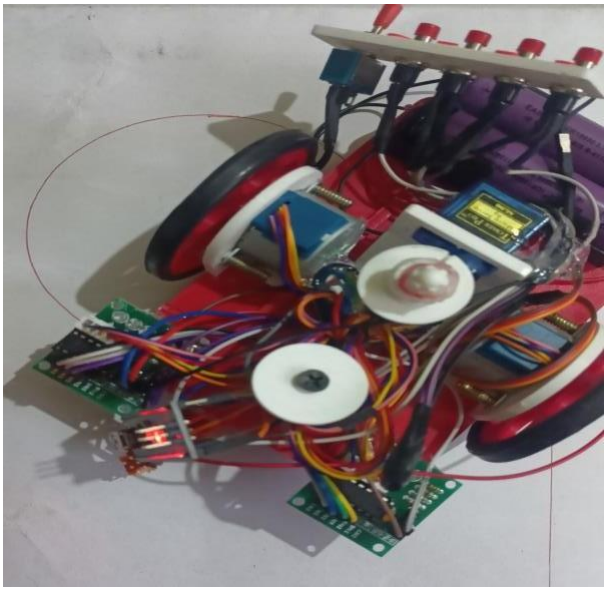

Fig 3: Demo of robot drawing circle.

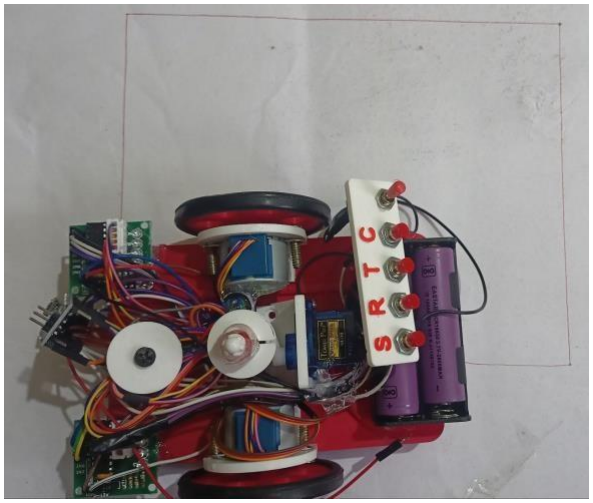

Fig 4: Demo of robot drawing square

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V. APPLICATIONS

- Helps students learn geometry and robotics.
- Designs accurate shapes for buildings and decor
- Educational Institutions.
- Creates beautiful geometric art.
- Makes programming and engineering fun and hands-on
- It can be implemented in architectural design
- It can be used to draw different types of letters as per user input
- Enginnering drawings
- Art and design field

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