

## Research Article

# A Smart-Sketch to Alleviate Drawings on Lecture Board and Facilitate Intellective Lecture Illustration in Classrooms

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## I N F O

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## A B S T R A C T

Smart-sketch is widely used software for designing, drafting 2D as well as 3D structures. This software has an international reputation of being the most user-friendly software for designing and sketching. In this study the authors have modified and utilised this for ease of lecture delivery by combining it to the lecture board to facilitate intellective lecture illustration thereby helping to improve the efficiency of lecture. This also helps to improve accuracy and precision in the drawings, flowcharts, etc. which are made through this. The prototype developed in this study was successfully tested at the facility which was highly appreciated by both students and faculty alike.

**Keywords:** Smart Sketch, Drafting, Arduino Programming Language, Stepper Motors

**Introduction**

Smart sketch is a pioneering tool for technical offices, which puts together the most awarded drawing technology and world class business diagramming. Due to its adaptable, profitable meticulousness engineering and drafting product, the owner has a modest edge during the course of the plant lifecycle by dissemination of yield, lowering costs and providing refined degree of computerization for detailed work.

**Motivation Behind Smart Sketch Technology**

While designing of the house we have to get the help from an architecture or a skilled person to draw the design for our dream house. Even when we want to decorate the walls of our house, we have to call for professionals for which they ask for an unreasonable amount of money. In

one way or the other, we are wasting our money by hiring professionals for every work. Another big problem arises when a teacher has to draw complicated figures or diagrams with hand on white boards. Sometimes, it becomes a problem for students to understand. Not every student is calligraphically skilled or artistic.

Smart sketch technology provides intelligence at the top of your pointer. It integrates with our data-centric product, permitting users to specialize in their primary goals. It is clear-cut to interface, stand up and running quickly. This gives us a handy help in making equipment's drawings for knowledge sheets, preliminary drawings, etc. A mixture of 3D plant views and graphics provides help to construction outworkers work packages. Its maintenance and active packages may also be simply created with good Sketch, combining varied files format into one document.

It mechanically creates and maintains relationships between geometric components. It permits user to investigate “what if” style situation by driving them as functions of varied style parameters. It translates/ reference knowledge from alternative CAD product, permitting you to look at, edit or separate CAD knowledge. It allows behaviours on symbols to mechanically snaps to pure mathematics, align and rotate throughout placement. Intelligent routing that maintains connections between objects and symbols. It labels that displays dynamic attribution updates on objects and symbols.

Smart Sketch deals with the tough and not-so-possible styles to be drawn with the assistance of hands to the most minute details, with no error or delay. It is a moveable device which might be employed in any condition, and on any plane surface. This is very simple to control with no hazards, thus is utilized by any individual effortlessly.

Smart Sketch is a very efficient and reliable device that can work on any plane surface. Smart sketch also gives prevailing features like parametric & relationships, which help in the accomplishment of design changes swiftly and proficiently. It habitually generates and sustains relationship among geometric elements, & smart sketch chains parametric graphs.

Because of the above 2 functions, output & style quality are improved significantly by the user.

## Hardware Requirements

### Technology Statistics

- Arduino Uno R3
- 2 PCs Ne-ma 17 Stepper Motor
- Expansion Board A 4988 Driver
- Mg 90 S Metal Gear Servo
- 12V to 36V DC Cell or Battery
- Linear Rail
- Ball Pen
- Screw

Arduino always receives the inputs which are done by the widespread sensors, and creates an impact on the surroundings with dominant lights, alternative actuators and motors.

Arduino programming language (based on wiring) along with the Arduino development atmosphere (based on processing) are used to program the microcontroller on the board.

A full rotation is divided in a number of equivalent steps using either a stepper motor or step motor or a motor which are brushless DC motor.

When Dc voltage is applied to terminals, the brushed motors rotate incessantly. A sequence of input pulses (essentially

sq. wave pulses) is converted into a predetermined augmentation with shaft position by the stepper motor. The shaft is moved through a set angle by each pulse waves. Stepper motors have numerous “toothed” electromagnets prearranged about a central gear-shaped piece of iron.

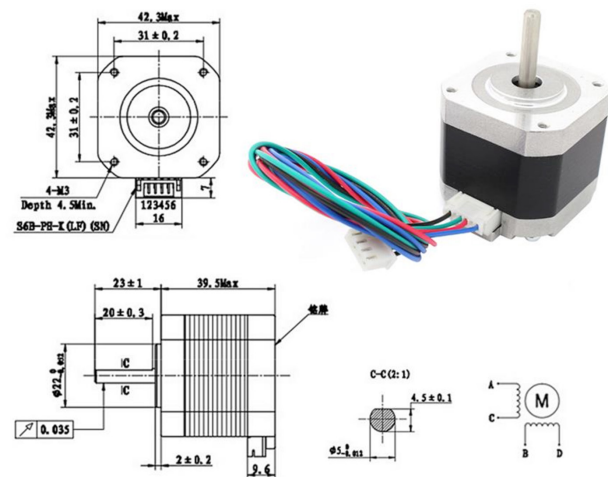


Figure 1. Stepper motor cross-sectional view

Once the magnet is given power, to make motor shaft flip, it magnetically attracts the gear’s teeth. Once the primary magnet is aligned to the gear’s teeth square, it becomes a little offset from the following magnet. That implies the turning on of the following magnet and turning off the 1<sup>st</sup>, will make the gear rotate a little and align to the following one. This process is continuously repeated.

Stepper motors are classified into the following 3 types:

- Permanent magnet stepper
- Variable reluctance stepper
- Hybrid synchronous stepper

## Methodology for Smart Sketch Technology

### Steps Involved are

- Connect all the circuit elements as required according to the circuit.
- Check all the power provided to the boards in the circuit because excess power can damage the board.
- Then after checking all this select an image which we want to execute.
- Load the image to the inkscape software and adjust the parameters according to your requirement and set the certain parameters according to your needs.
- After checking all the needs save the image in gcode format, using inkscape software so that we can further use this gcode file in our process.
- Now connect the Arduino to your computer and attach the various required hardware.
- Use the software grbl uploader after this.
- In grbl software we have to select the port on which

our Arduino is connected, select the correct baud rate for the communication purpose.

- After finalising the correct settings upload that gcode formatted file which we have created using inkscape software in the previous step.
- After finishing all this you can start the process.
- After starting the grbl software will create a virtual path which the machine is going to follow while executing the process in drawing that image.
- After seeing all this you can start the process and the machine will execute the path decided by the grbl software, and the gcode will move the stepper motor accordingly.
- At the end you will have a image with precise dimensions.

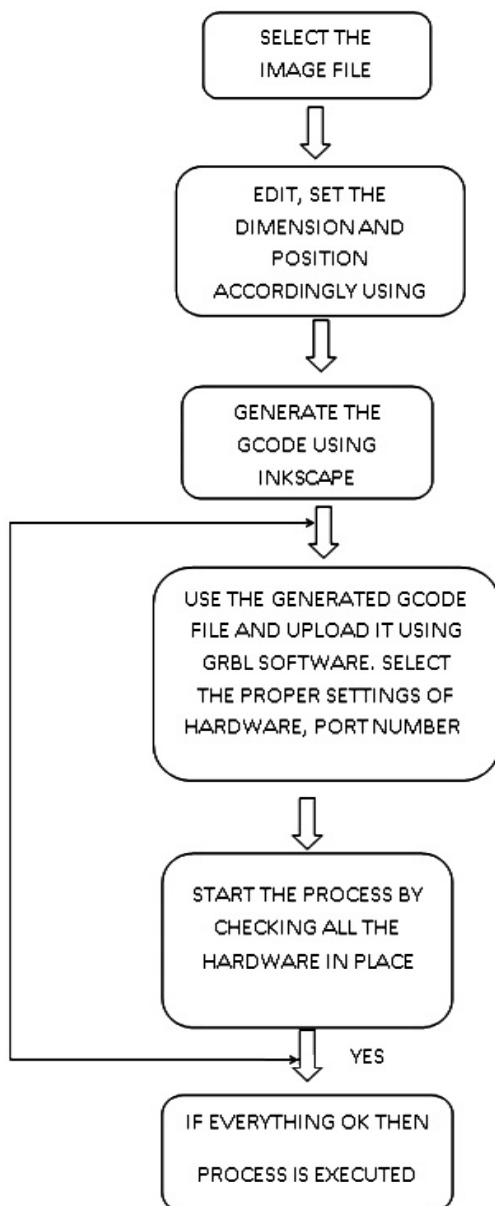


Figure 2. Flow chart of implementation

## Implementation

First we need some light weight wooden pieces for making the frame or axis of the Smart Sketch. We use hand saw to cut down the wood. For joining the wood parts to each other use nails as well as glue (glue gun). Make the y-axis of the frame, and subsequently the x-axis. Y-axis doesn't have a motor connected to it, but the x-axis does. Drill holes for fixing the metallic rods through the wood. Fix the stepper motor along with the axis. Before fixing the rods we have to enter linear rails in the metallic rod. This will work as a slider for the pen holder. We use servo motor for making the pen holder. Pen holder is also made of wood. We use spring in the pen holder and wired the stepper motors.

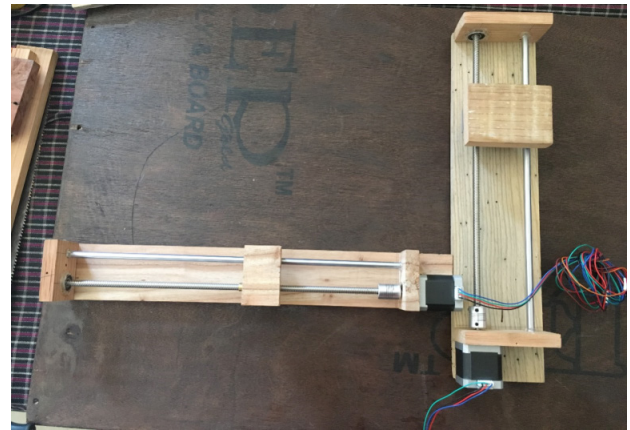


Figure 3. Wiring x-axis and y-axis with stepper motor

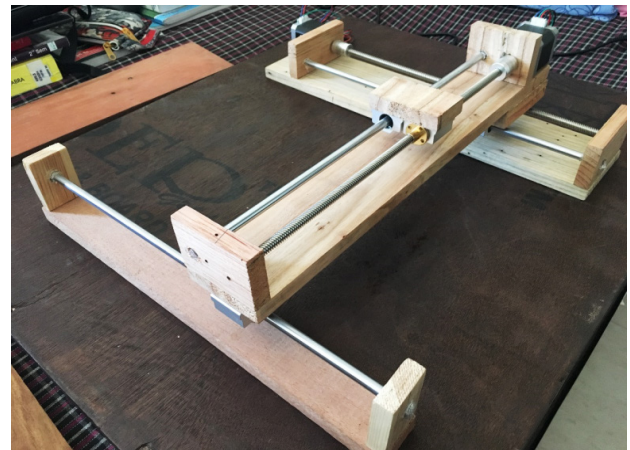


Figure 4. All axes assembled

## Conclusion

Everything around us should be technologically advanced and easy to do, so our SmartSketch comes here. This project is all about making the hand written work as easy as possible. It makes all of the detailed work easy. As it uses Arduino, this will also be a good opportunity for new people to learn anew. Basically it will reduce human efforts. It will be good for the teachers as well as for the students to have SmartSketch. This is an economic way

when compared with other products of similar purposes. It requires less maintenance and can work with battery attached to it, it doesn't require other electricity source. It is great combination of hardware and software. This is a device that can give shape to your imagination. Some people cannot draw, they don't have good artistic skills, this device can help them. It can be used at different places and can serve differently according to the needs of the user. Smart Sketch can be used on any 2D surface whether be it horizontal or vertical. People hire trained sketch artists to make a design of their dream home. Well this device can easily turn your dream into reality. SmartSketch is device that can replace architectures who charge huge sums of money to just draw some lines on a white paper. Well now even you can do that, you just need to have SmartSketch and that's it. The only requirement for using this device is that you need to be smart enough to buy SmartSketch.

### Future Scope

- It can be used in teaching institutions.
- It can be used for creating wall arts or glass carving.
- It can be used for designer wood cutting.
- It can be used for creating posters and for making sticker cutouts.
- It can be used for personal uses as well. (writing, designing, layouts etc.)

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