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Design & Fabrication of Smart Board Cleaner

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Abstract - *Report has been written on design and fabrication smart board cleaner to introduce a new advance mechanism for erasing the board. In previous project, the mechanism used for erasing the board was belt drive, controlling it by switches. So to erase the board, he/she has to come near the board and press the button. Hence, this makes discomfort for the lecturer. Along with this erasing was done from one side to another side. So it was not possible to erase section wise or partially.*

The above mention problems/ limitations of previous project is resolved in our project by controlling the project by mobile phone at a range of 10m from board as well as we can erase the board partially by dividing the board in four sections and duster into two parts.

The significance of our project is that the project can be controlled by lecturer anywhere from the classroom. Electronic kit used is portable, light is weight, compact in size and for accuracy Lead Screw is used

Key Words: **ATMEGA-328P Microcontroller, Rack & Pinion, Lead Screw, L298N Motor Driver, Partial Cleaning Mechanism.**

1. INTRODUCTION

A smart board cleaner is a device, which is used to clean the board automatically with the help of duster. By using this device we can not only reduce human effort but also save time. A device for automatic operation, duster is mounted longitudinally which slides over the two horizontal rods and forward, backward motion of duster is provided by rack and pinion mechanism. In this device, the erasing action of the duster is controlled by the mobile application used in mobile. Mechanism is important in this project ,so that this mechanism can be applied on blackboard as well as whiteboard .this board is divided into four section A, B ,C, D as a four quadrants, erasing action of each quadrants is controlled by a microcontroller (arduino uno).This device can be controlled upto a range of 10m by using mobile. In present automatic board cleaner, switches are used to erase the board. So, if the teacher is far away from board he has to come towards the board to switch the button to erase the board .hence, our device can erase the board. If the teacher is away from the board by using mobile application.

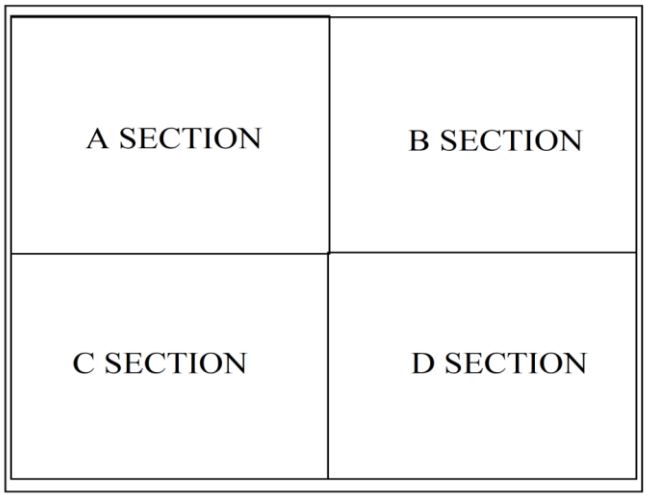


Fig -1: Board is divided into Four Sections

2. LITERATURE REVIEW

This section includes background and various systems for cleaning the whiteboard and blackboard. Different research papers are referred to study the different systems and different mechanisms. Different research papers are referred to study the different systems and different mechanisms. This machine can operate in three selectable opera table modes. Initially the board is divided into four sections, or four quadrants. So, to erase these four sections by duster we are using 5000rpm two D.C Gear motors to move duster in horizontal (x-axis) direction. To move the duster in forward and backward motion 10rpm motor is used. ATMEGA328P microcontroller is used to control the motion of duster.

The paper puts forward a kind of mechanism design scheme; the mechanism can automatically controlled by using mobile application, this mobile is connected to the microcontroller. In this way, when, the button is pressed in application at a range of 10m, the operation of that section is possible.

3. OBJECTIVES

i. Minimize lecturer's effort.
This technique was selected by us by taking into consideration some comfort for Teachers while cleaning the blackboard/whiteboard.

Ii.Reducing health hazards

The traditional blackboard chalk dust is a common problem in the traditional blackboard-eraser-chalk architecture. This operation produced a great deal of dust that is rather objectionable both from the standpoint of health and cleanliness. These tiny particles of chalk may also land on devices or computer equipment that would cause over-heating and severe damage. Also in case of whiteboards, Permanent marker will affect someone whose has allergic reaction, possible ink poisoning and side effects from inhaling ink fumes. This is because the permanent ink is made from organic solvent.

Iii.Time Saving

As the manual method is time consuming, implementing automatic cleaning mechanism will definitely save the significant amount of time.

4. PROBLEM DEFINITION

- To design and develop a board cleaning system which can overcome the problems related to chalk dust, such as respiratory problem, burning of eyes.
- The chalk dust not only harm human but also the machines.
- Discomfort for the teachers and wastage of time in erasing the board.

5. METHODOLOGY

As a board is divided into 4 sections (A, B, C, D). Working for A-section, when button in mobile phone of section –A is pressed the signal is passed to Bluetooth controller and this signal is passed to motor A via (Arduino -UNO). Motor A rotation is controlled through relay (4 - channel). By default , duster is not pressed ,so for forward and backward motion of duster another motor is provided with rack and pinion mechanism .this motor is controlled by motor driver (L 298N). The duster move forward insert pressure till mid position and returns to original position .This is similar for the working of c – section. For B and D section, when the B or D section is pressed the duster moves to the mid-position and moves forward insert pressure on board. This duster moves till the end of the board and return back to mid - position, the duster moves back and moves in initial position. This working is similar for D - section. In case, duster stocks between the working, extra 4 buttons are provided for forward motion and backward motion of upper duster and lower duster.

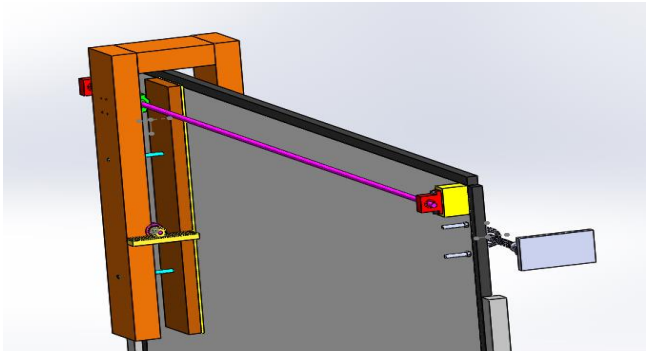


Fig -2: Front View

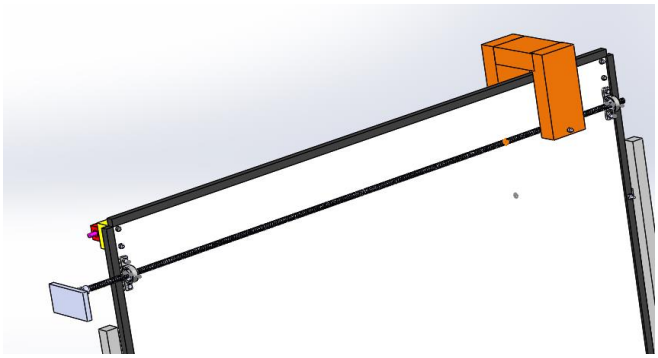
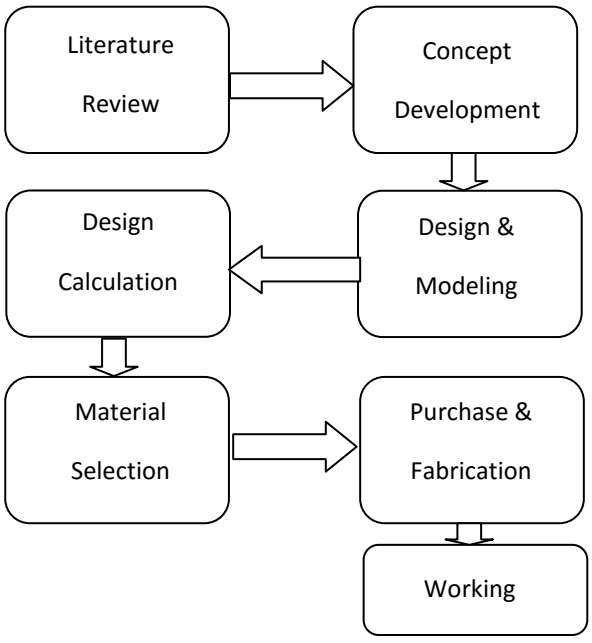


Fig -3: Rear View

Steps-



5.1. PARTS USED IN SYSTEM

- Whiteboard
- RS775 DC Motors

- Lead Screws
- Couplings
- Pillow Block Bearings
- Linear Bearings
- Rack & Pinion
- 10rpm DC Motor
- Sponge
- 12V 10A Power Supply
- Relay
- Arduino UNO
- L298 Motor Driver

5.1.1. RS775 DC MOTOR

- Type: Brushless DC Motor
- Stall Torque: 5482g-cm
- No Load speed: 5000rpm
- No Load current: 0.80A
- Diameter: 5mm
- Shaft Length :12.5mm
- Full Length including shaft length 93 MM
- Width 40 MM

5.1.2. LEADSCREW

A Lead screw , also known as a power screw or translation screw, is a screw used as a linkage in a machine, to translate turning motion into linear motion..

Lead screw used in our project is V-thread having pitch of 1.5mm and length of 1300mm.

5.1.3. RELAY

4-channel relay control board module with optocoupler, 4 way relay module for arduino.4-channel relay output modules, relay output contacts 250A 10A. Input IN1, IN2, IN3, IN4, the signal line LOW effective. VCC, GND power input, can relay a separate power supply relay power input of JD-VCC.

5.1.4. ARDUINO UNO

The Arduino UNO is an open-source microcontroller board based on the Microchip ATmega328P microcontroller and developed by Arduino.cc. The board is equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The board has 14 Digital pins, 6 Analog pins, and programmable with the Arduino IDE (Integrated Development Environment) via a type B USB cable. It can be powered by a USB cable or by an external 9 volt battery, though it accepts voltages between 7 and 20 volts. It is also similar to the Arduino Nano and Leonardo the Uno board is the first in a series of USB Arduino boards, and the reference model for the Arduino platform.

Fig-4: Arduino uno

5.1.5. L298 MOTOR DRIVER

L298N is a kind of high voltage, high current motor driver chip produced by ST Company. Having 15 pins as package, this chip has such features as high working voltage (maximum voltage up to 46V), large output current (instantaneous peak current up to 3A, continuous working current 2A) and 25W of rated power. It permits or prohibits device having a logic power supply input without the impact of input signal, which enables the internal logic circuit part works at low voltage .The chip can connects to external detecting resistor to give the variations to the control circuit .Using L298N chip to drive the motor, this chip can drive a stepping motor or four phase stepping motor, and two DC motors as well.

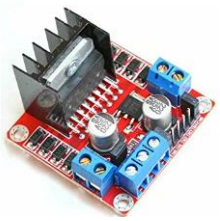


Fig-5: L298N Motor Driver

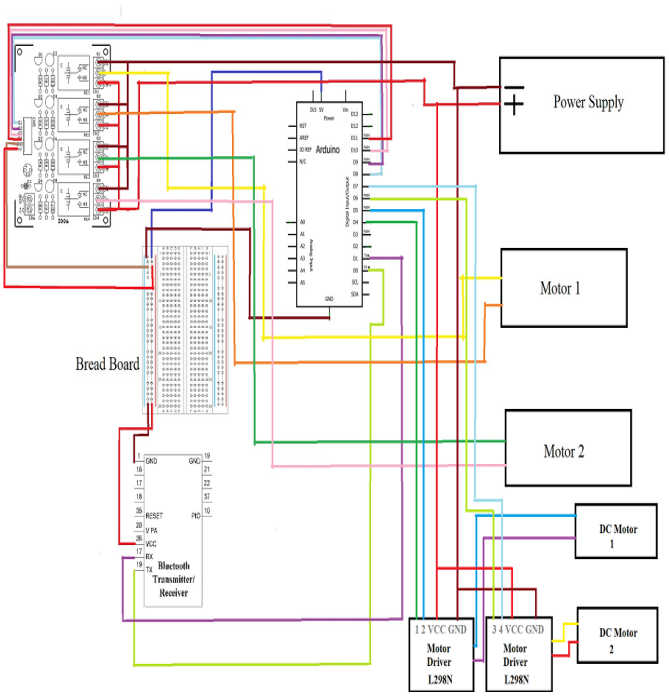


Fig -6: Circuit Diagram

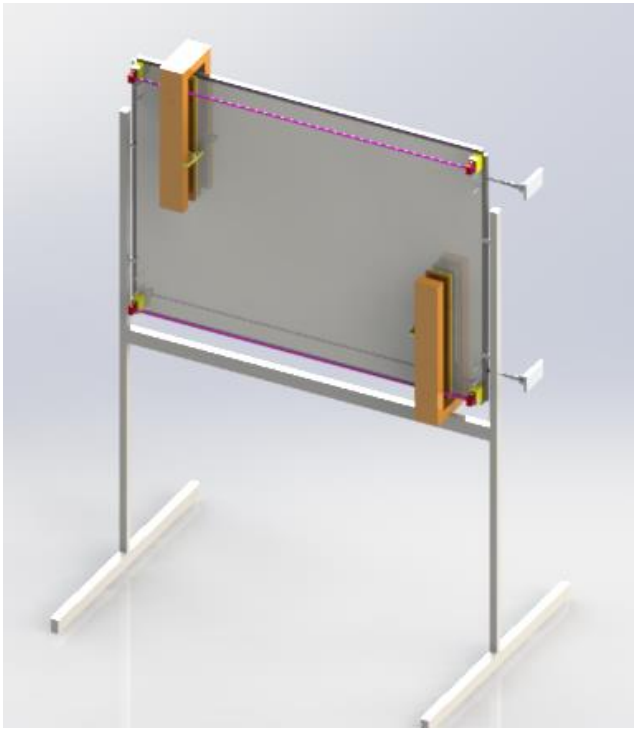


Fig -7: Model

Fig-8: Actual Model

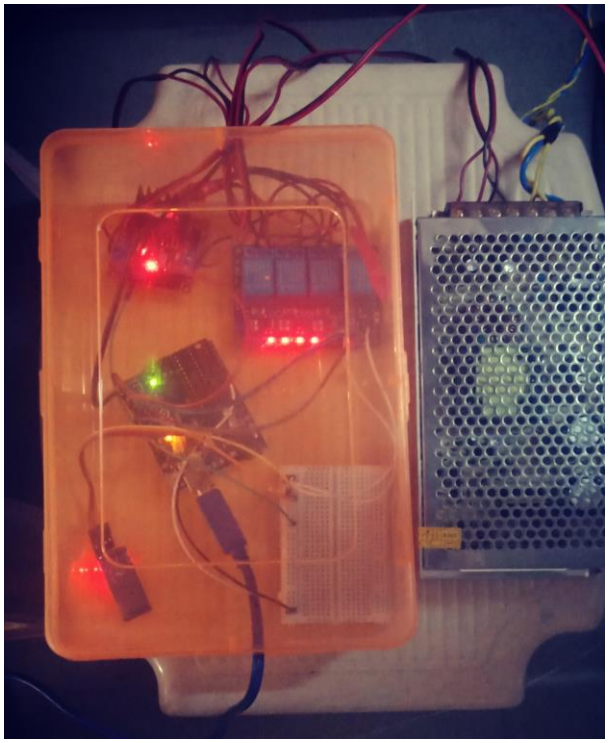


Fig-9: Electronic Components

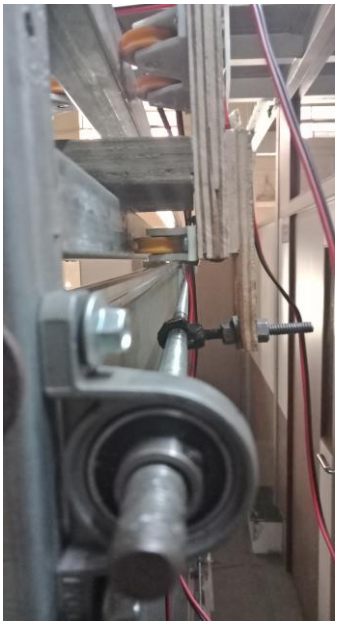
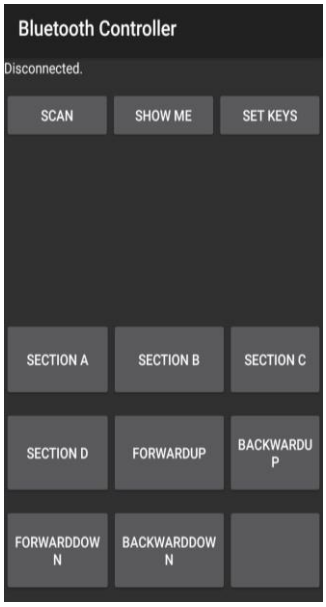


Fig-10: Lead Screw **Fig-11**: Rack & Pinion

5.2. SYSTEM CONTROLLED BY MOBILE APPLICATION

The whole project is controlled in finger tips, by using the Mobile application in android phone. After installing the application, just we have to set keys before scanning, and then select the Bluetooth controller from the device shown in the list. After selecting the device just start the operation by clicking the section button in the mobile application.



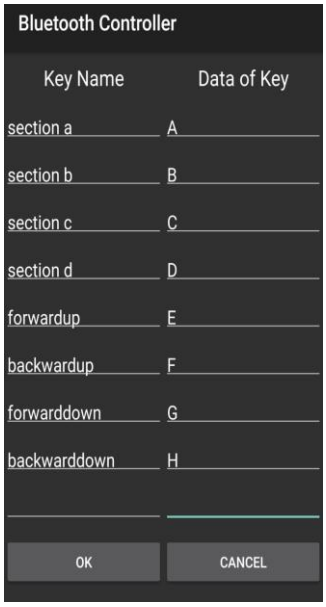
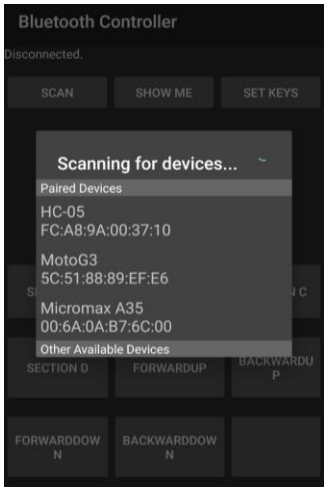


Fig -12: Disconnected **Fig -13**: Setting Keys



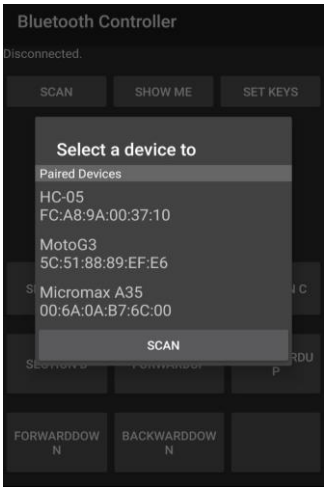


Fig -14: Scanning **Fig -15**: Select a Device

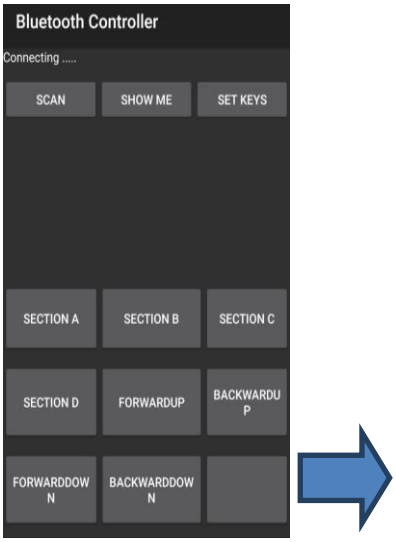


Fig -16: Connecting **Fig -17**: Bluetooth Module

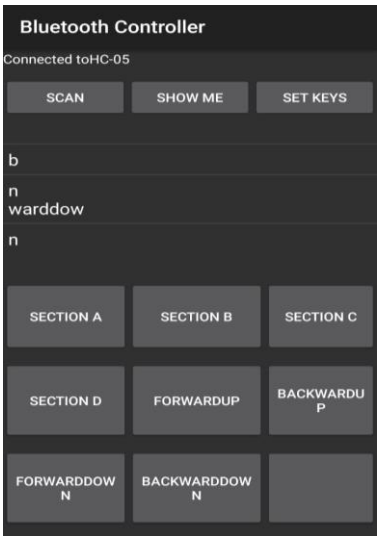


Fig -14: Connected

6. CALCULATION

Design Calculation for Motor

Distance= 1250mm

(Distance of the Board is 1250mm)

Time=12s

(Target is to complete the operation in 12 seconds)

Lead=1.5mm

(For the diameter of 10mm standard pitch is 1.5mm)

Velocity= Distance/time……..(Formula)

=1250/0.2

=**6250 mm/min**

Speed, N= Velocity/lead……(Formula)

=6250/1.5

=**4170.33 rpm**

Hence, we have selected a DC Motor (RS775) of 5000rpm of 12V, 5Ampere

Bearing Calculation:

From "DESIGN DATA Data book of engineering", KalaikathirAchchagam Coimbatore, 1978"

- Bearing selected is SKF 2200
- Inner diameter = 10mm
- Static capacity = 1.8 KN
- Dynamic capacity = 5.7 KN
- Maximum permissible speed =20,000 rpm
- Life of Bearing=1.23Hrs

7. FUTURE SCOPE

- By Application of Gesture Sensor, the whole board can be controlled by using the palm, by showing different gestures different areas of the board can be erased.
- So, different gestures would be assigned for different actions. Hence, to do the project Camera is required for image graphing and a microcontroller (Rasp berry).
- Just like we take selfies in our phone by palm sensor, in the same way we can control the Board.

8. CONCLUSIONS

In the new era of technology, people want something new in their life. They want every single thing they look in front of their life look sophisticated. People want something that can improve their lifestyle and help them to do their job by using the robot or machine. That is why development of machine and robot is now becoming quite popular and faster in marketing. So to help and give benefit to human kind the "Design and Fabrication of Smart Board Cleaner" is an alternative machine that can help lecturer, teacher, and student to keep their board clean by using this machine

- By Application of automation, the duster can be controlled without operating the switch near the board.
- Selective erasing of Board is done to move in various parts of board with the help of a microcontroller setup.
- When attached with a wireless mechanism, the duster arm can be operated remotely with the use of a remote-control unit or by mobile phone.
- By varying the duster type, this concept can be extended to the blackboard erasing techniques too.

9. REFERENCES

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