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Design and Development of Board Cleaning System

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ABSTRACT

This technique was selected by us by taking into consideration some comfort for Teachers while cleaning the blackboard. It is seen that while doing this they often have to cover their mouth with one hand while cleaning the blackboard by the other. By thinking over it we realized that we can really do something for them. So we decided to implement our course study and some extra knowledge and with the help of electrical and mechanical concept, our project came into the picture. The project Design and Development of Board Cleaning System can clean the blackboard and whiteboard automatically with rack and pinion mechanism and reduces the time consumed in hand erasing. This project basically works on combined principles of mechanical and electronics. The growth of technologies requested higher performance machine in order to fulfil human needs and market. This project is implemented to make human work easier and can reduce the use of human power because of its potential applications. This appertains to new and useful improvements and more particularly to an apparatus whereby blackboards and whiteboard can be cleaned in an easy and convenient manner.

Keywords: ATMEGA-328P Microcontroller, D.C Gear Motors, Cleaning Mechanism.

1. INTRODUCTION

Design and Development of Board Cleaning System is a system that is generally used to clean board automatically with the help of duster. By the use of this automatic system, we can save time and energy. It is a new technology that is generally used now a day. A system for cleaning the blackboard and whiteboard wherein a duster is mounted for longitudinal movement on the board and has a motor mounted thereon that is mechanically interconnected to a drive assembly for producing the movement of the duster in an erasing operation. It will use the rack and pinion mechanism to convert the rotary motion of the motor into linear motion of pinion. The principal object of the present automatic blackboard duster is to provide an attachment for blackboards in the form of a power driven erasing apparatus which can be set in operation by the throw of a switch, thus eliminating the drudgery of manually cleaning blackboards. The utility model relates to teaching aid. The prior board has no

Automatic cleaning function, a teacher wastes time in writing and erasing, and the use is not ideal. The structure is simple; the use is convenient, clean and sanitary; and the effect of

saving time is good. For teaching purpose generally, boards are used. For effective learning, the board is the basic thing in the classroom. The powder obtained from the chalk piece while erasing the blackboard causes problem to the respiratory

Organ when inhaled by a human. Those who are allergic to dust cannot sit near the blackboard.

Other than this there are more problems related to the dust or chalk powder like hair loss, burning of eyes etc. For cleaning the board manual work has to be done by the teacher which is time consuming while taking classes. Moreover, chalk dust not only harm the human but also the machines such as projectors when exposed to chalk dust there could be heat production in it.

ARDUINO UNO

The Arduino Uno R3 is a microcontroller board based on a removable, dual-inline-package (DIP) ATmega328 AVR microcontroller. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs). Programs can be loaded on to it from the easy-to-use Arduino computer program.

The Arduino has an extensive support community, which makes it a very easy way to get started working with embedded electronics. The R3 is the third, and latest, revision of the Arduino Uno. The Arduino Uno is a microcontroller board based on the ATmega328. It has 20 digital input/output pins (of which 6 can be used as PWM outputs and 6 can be used as analog inputs), a 16 MHz resonator, a USB connection, a power jack, an in-circuit system programming (ICSP) header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer (or appropriate wall power adapter) with a USB cable or power it with an AC-to-DC adapter or battery to get started.



Fig:-1. Arduino-Uno with ATMEGA-328P Microcontroller

ATMEGA-328P Microcontroller

The Atmel 8-bit AVR RISC-based microcontroller combines 32 kB ISP flash memory with read while-write capabilities, 1 kB EEPROM, 2 kB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes. The device operates between 1.8-5.5 volts. The device achieves throughput approaching 1 MIPS per M.Hz.

L-293D Motor Driver

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction



Fig: 2 L-293D Motor Driver

The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively. Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

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. This machine can operate in three selectable opera table modes. In the first mode, it cleans the left side of the board. In the second mode, it cleans the right side of the board. In the third mode, it cleans the whole area of the board. The machine uses 180rpm0 two D.C Gear motors to move duster in horizontal (x-axis) direction. To move the duster in Left and Right direction linear motor is used. ATMEGA-328P microcontroller is used to detect the horizontal direction of the motor. One switch is used to detect the boundary of the board. An atmega-328P microcontroller which was programmed in Arduino-IDE software is used as the main controller in the machine [1].

The paper puts forward a kind of mechanism design scheme, the mechanism can automatically detect the blackboard chalk stains, and erase the font, keep the blackboard clean. The further research work will be based on computer processing i.e on two parts of information processing unit and motion control unit. This system consists of two motors, three guide rails, and three sliders. The construction of mechanical structure is slider 1 and slider 2 are connected by cross guide rails C and is installed on them, can be moved in parallel with the slider 3, power driven provided by two motors A, B. Motor A drives the left and right movement of cross rail beam C and motor B drives the vertical movement of slider 3 (wipe system) to rub the blackboard surface for cleaning by moving the wiping system along the rail C together. The sensor is fitted at the right most of the blackboard to sense the right end position and signal passed to return the wiping system along the rail C in original position [2].

3. OBJECTIVES

There are two main objectives of doing this project. The first objective is to design a low cost and user friendly whiteboard or blackboard cleaner machine which can erase the board with a single key pressed.

The second objective is to enhance the efficiency and accuracy of the movement of the duster. The purpose is to make the movement of this machine accurate even if it has been used multiple times. Another important purpose is to make the machine work faster and smoothly.



Fig: 3 Board Cleaning System Setup



Fig: 4 Controller, Motors and I293D Setup



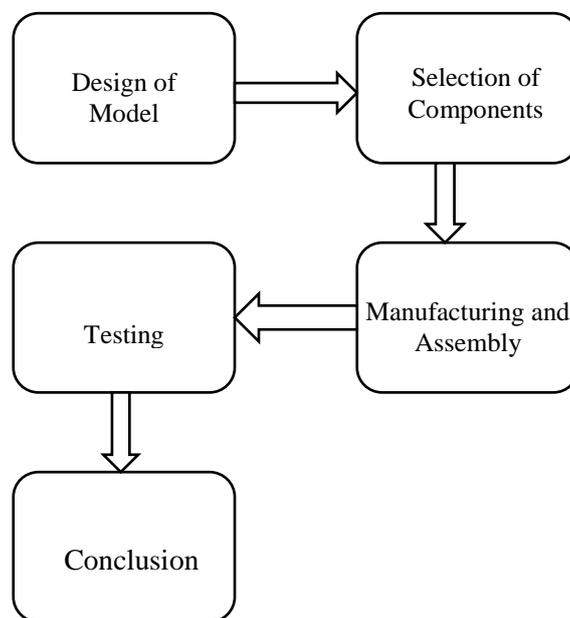
Fig: 5 Duster Cleaning Mechanism

and another anti-clockwise. A small water sprinkler is also going to be used to spray the water on the blackboard. With the help of wiper motor, the pressure will be created by sprinkling the water on the blackboard. Which will save energy, time and eliminate the load on the motor? Toggle mechanism is used in back connecting strip to adjust the clearance between pinion and rack. White board does not require the sprinkler system.

Table-1: Specification of Components

S. No	COMPONENTS	MATERIAL
1)	Board	WOODEN
2)	RACK	Mild steel
3)	PINION	PLASTIC
4)	D.C GEARED MOTORS (2)	150-RPM
5)	LIMIT SWITCH	STANDARD
6)	ROLLERS	ROBOTIC WHEELS
7)	DUSTER	SPONGE

STEPS:



4. PROBLEM STATEMENT

To Design and develop a board cleaning system which can overcome the problems related to chalk dust, discomfort for the teacher and wastage of time while erasing the board.

5. METHODOLOGY

The system uses the rack and pinion mechanism for cleaning the blackboard and whiteboard with the help of the DC geared motors. The motors will drive the pinions which will convert the rotary motion of pinions into linear motion on the rack carrying the connecting strip with duster attached to it by bearing arrangement. DPDT switch and limit switch are also going to play a minor role in this system for stopping the pinion and rotating one gear clockwise

7. SCOPE

In the present time not everything is automatic but seeing towards the progress of present technologies, In future, everything will be operated automatically. So this project will serve as one of the advanced technology in future and will be installed in every college, school, etc. Seeing towards our basic version, there are some ideas for the Design and Development of Board Cleaning System. In future, if this project is taken to the next stage then for collecting the dust from duster a vacuumed blower can be arranged.

1) Operate in the schedule – this machine can be set up the time. It can operate automatically when we set up the time we want it to work

8. CONCLUSION

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 DEVELOPMENT OF BOARD CLEANING SYSTEM is an alternative machine that can help lecturer, teacher, and student to keep their board clean by using this machine.

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