



ARDUINO BASED SMART BLACKBOARD WIPING SYSTEM

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Abstract - Chalk dust generated in traditional blackboard is a common problem faced in class rooms by students and faculty. This may lead to many health issues to eyes, nose, mucous membrane and respiratory system like breathing problems, irritation to tissues, hair loss etc and also cause issues to the electronic devices used in class room. To overcome these health troubles and to reduce the manual work, a smart blackboard eraser system is connotated to erase the blackboard automatically. In this method, a roller wiper is placed and fixed on blackboard and it moves left to right and right to left according to the split-up made in blackboard using dc motor and collects the dust automatically using vacuum cleaner. To push and pull the roller wiper a servomotor is used and the position of the wiper is automated by an ARDUINO board microcontroller. Thus it avoids dust flow to the environment thereby preventing health issues and keeping the environment clean.

Key Words: Arduino, Blackboard, Wiping, Dc motor, Roller.

I INTRODUCTION

Blackboards are the backbone in classroom for effective teaching and learning purpose where chalk pieces are used to write on the board. These chalk piece is a soft, a form of limestone produce the chalk dust which leads to many health issues to human and produce harmful effects to the equipments in class room[1][2][3]. It includes irritation and allergies to skin, tissues , eyes and during inhaling it leads to the problem related to respiratory system and when it observed by the skull it cause severe hair loss[4][5][6]. To overcome these health issues and to reduce the manual work, the arduino based smart blackboard erasing system is introduced.

In this method, a roller wiper is placed to wipe the blackboard and is fixed on it to make a movement from left to right and right to left according to the split-up made in blackboard using dc motor and collect the dust automatically using vacuum cleaner. To push and pull the roller wiper a servomotor is used and the position of the wiper is automated by a ARDUINO board microcontroller. Thus it avoids dust flow to the environment thereby preventing health issues and keeping the environment clean.

Chrish.B et al., proposed an automatic chalkboard erasing apparatus [7] which spans the board and has bearings running along the top and bottom. Electric motor is carried by the long narrow light weight body .Manual and automatic switches are placed for operation. Circular eraser used to erase the board and it contains inner belts and pullers.

Rolland L Schlick et al., proposed an automatic blackboard eraser [8] where carriage is mounted for longitudinal movement on the blackboard. Brushes are counter rotating and are used for erasing purpose. Motor is mounted in the carriage which is used to move the brush to and fro and after completing its process it return to its initial position.

Yu-Hsuan Liu et al., proposed a structure of a multifunctional board eraser [9] in which the two sides of long bar body are symmetrical and a shallow trough is installed on the top of the body for embedding wiping cloth wrapped around a magnetic element.



The class room becomes untidy with those dusts. Though dust free chalk pieces are being manufactured, they produce few amounts of chalk dust lesser than normal chalk pieces but still there are possibilities for the dust accumulation. Hence the automated blackboard eraser can be used to avoid the above problems and to reduce the manual work.

II ARDUINO BASED SMART BLACKBOARD WIPING SYSTEM

The Arduino integrated development environment (IDE) is a cross-platform application written in Java, and derives from the IDE for the Processing programming language and the wiring projects. It is designed to introduce programming to artists and other newcomers unfamiliar with software development. It includes a code editor with features such as syntax highlighting, brace matching, and automatic indentation, and is also capable of compiling and uploading programs to the board with a single click. A program or code written for Arduino is called a sketch.

The traditional blackboard chalk dust is a common problem in the traditional blackboard-eraser-chalk architecture [13][14]. Lots of improved blackboard eraser structure came into being, but these improvements changed the original wipe, or not fundamentally solve the problem, or too costly and difficult to spread. Figure 1 shows the mechanical structure of the proposed arduino based blackboard wiping system.

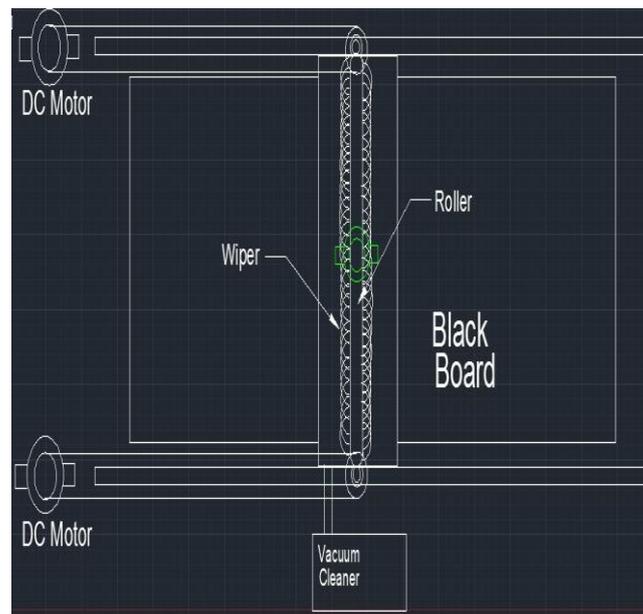


Fig1. Mechanical structure of arduino based wiping system

System consists of DC motors, servomotor, guide rails, roller, vacuum cleaner and an ARDUINO board microcontroller. The real time automated black board eraser is used to clean the board automatically and to absorb the dust produced during erasing the board [15]. DC motor which is used to move the roller wiper to erase the split-up portion of the blackboard and it is controlled by switches. DC motor placed inside the roller wiper is used to rotate the roller that is wound with the erasing material. Vacuum cleaner is connected in the bottom of the roller which is used to suck the dust [16][17][18]. ARDUINO board microcontroller controls the entire operation of the system. Figure 2 shows the bottom view of the roller wiper.

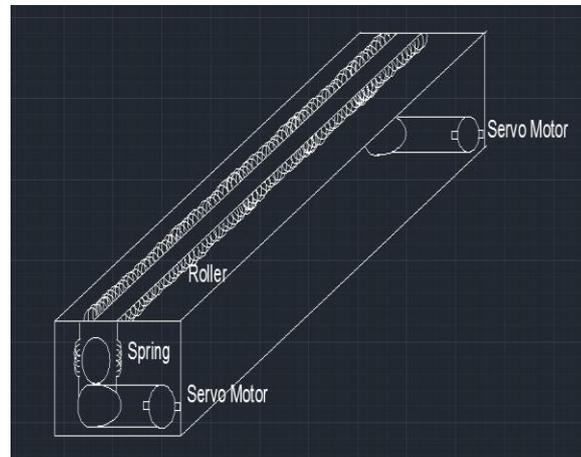


Fig2. Bottom view of roller wiper

A ARDUINO BASED WIPING ALGORITHM

1. Start the program.
2. Energize the circuit from the main supply.
3. Switches activated according to the partitions made.
4. When the switches are turned on, the roller wiper placed on blackboard will rotate and the blackboard will be erased.
5. Dust will be sucked by the vacuum cleaner.
6. Stop the program.

The flowchart for the arduino based wiping system is shown in figure 3.

Flowchart:

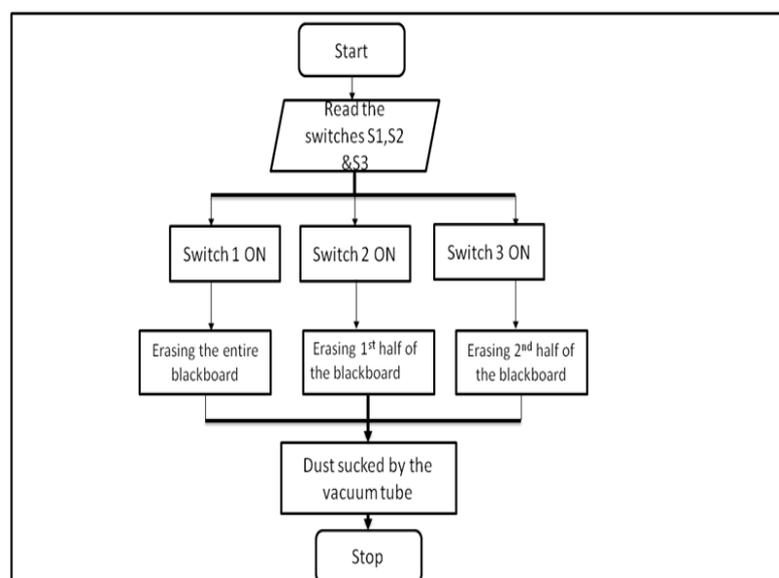


Fig 3. Flowchart for arduino based wiping system



B PERFORMANCE ANALYSIS

Figure 4 shows the simulation set up for arduino based blackboard wiping system.

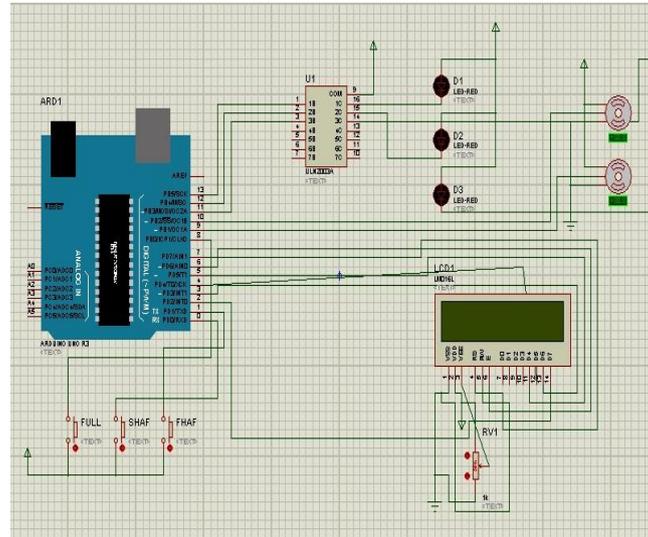


Fig4. Simulation environment of arduino based blackboard wiping system

1. Wiping full blackboard

In entire blackboard erasing mechanism the roller wiper is moved from the initial position and erasing the entire blackboard, DC gear motor is rotated in forward direction. If erasing completed, the DC gear motor will rotate in reverse direction and the roller wiper will come to initial position without touching blackboard using central car locking system.

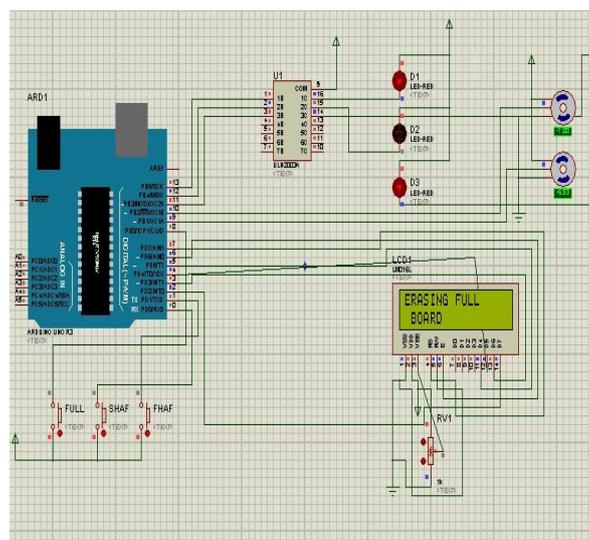


Fig5. Simulation for switch 1(full board)



2. Wiping first half of the blackboard

While erasing the first half of the blackboard by roller wiper mechanism, the roller wiper is moved from the initial position and erasing the first half of the blackboard, DC gear motor is rotated in forward direction. When the erasing is completed the DC gear motor will rotate in reverse direction and the roller wiper will come to initial position without touching blackboard using central car locking system.

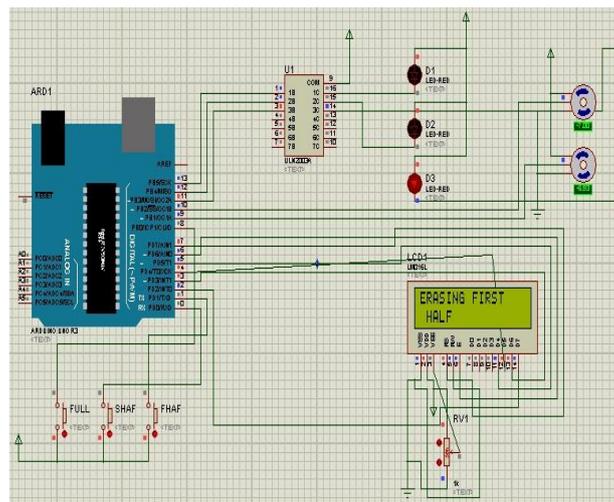


Fig6. Simulation for Switch 2(first half of black board)

3. Wiping second half of the blackboard

While erasing the second half of the blackboard by roller wiper mechanism, the roller wiper is moved from the initial position and erasing the second half of the blackboard, DC gear motor is rotated in forward direction. When the erasing is completed the DC gear motor will rotate in reverse direction and the roller wiper will come to initial position without touching blackboard using central car locking system.

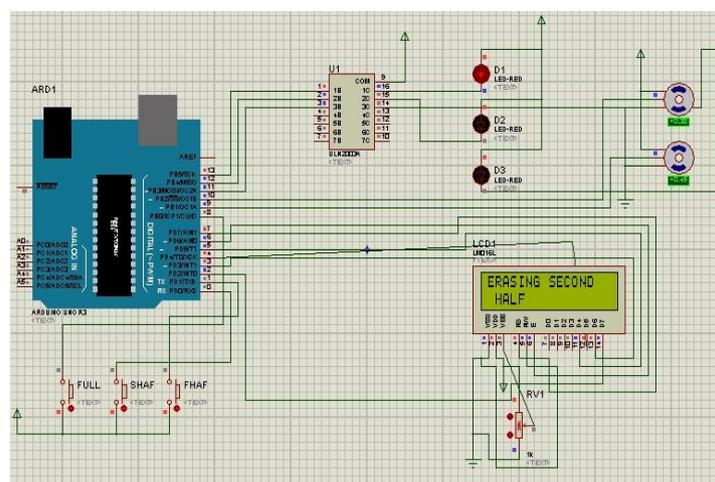
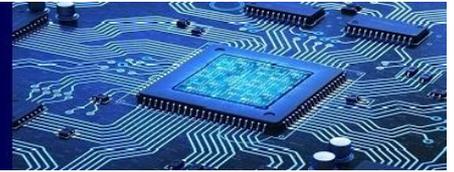


Fig7. Simulation for switch 3(second half of black board)



III CONCLUSION

The proposed work demonstrates the usefulness of arduino based smart blackboard wiping system and it overcomes the problem created by chalk dust which is produced during the class hours. In proposed blackboard system, complexity and the time consumed to process gets reduced compared to existing techniques. The chalk dust is completely sucked by the desired pumps in our proposed approach and also partitions are made on the programming to erase desired part of the blackboard. It is much faster than the existing approaches and the size of the system is reduced. This approach can be extended using crank slider mechanism and by using cameras we can sense the desired part and erase the chalk dust alone. Vacuum cleaner can be replaced by HEPA filter to reduce the size compared to our approach and in future it can be extended to recycle the chalk dust produced to reproduce chalk pieces so that the system can be more economical and environment free.

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