



International Journal of Engineering, Business and Enterprise Applications (IJEBA)

www.iasir.net

Automated Motorized Whiteboard

Puneet Mathur¹, Bhushan Tukaram Chougule², Ravina Nangare³

^{1, 2, 3} Student (Department of Mechanical Engineering), Sinhgad Institute of Technology, Lonavala, Maharashtra, INDIA.

Abstract: Teaching and learning processes in schools and colleges have been continued from the past. Different methods of writing on boards and cleaning the boards have been developed. This paper presents the design and construction of automated motorized whiteboard. The system consists of four basic units: Flexible whiteboard surface material, dusters, plastic rollers, motors. The working of this system is based on rotation of flexible whiteboard surface material around the rollers and automatically cleaning the surface by the dusters fixed on the back side of the board. The system makes teaching efficient and reduces human efforts.

Keywords: automated, cleaning, motorized, renrenxin, rotation.

I. Introduction

The history of teaching starts from the very beginning of mankind. Knowledge was passed down from generation to generation. The materials used in teaching also got advanced along with the teaching and learning methods. Writing was earlier done on sand, walls, slates made out of wood, chalkboards and in recent times on white boards and electronic boards [2]. The white board has been largely adopted into many other sectors of human endeavour besides teaching because of its many advantages over the chalkboard [4], [5]. Motors has huge applications in the field of automobiles and robotics. Other applications include home appliances and various fields of mechanical sector. In this paper the design and implementation of motorized automated whiteboard is presented as an introduction to the automation of the teaching process easing and reducing the task of clearing the board as it cleans itself by rotation of whiteboard surface and the dusters fixed at the rear side of the board.

II. Related Work

Researches and experiments had been done on white board from a long time. Many modifications had been done on cleaning of whiteboard surfaces. Mostly whiteboards are cleaned with the help of hand dusters but further innovations in this field have made the cleaning system easy. Remote control motorized cleaners are made in which the dusters are operated with the help of remote control [2]. This type of cleaner moves horizontally by means of motor mechanism and erase the board with the help of dusters attached to it but there are some limitations in above design. The pressure is to be applied on the moving dusters for proper rubbing of the board and user have to wait till the cleaner comes to its initial position. These limitations have been overcome by the proposed design in this paper. Instead of moving the dusters the whiteboard surface is moved around the rollers. So there is no need of providing the external pressure on the dusters as they are already fixed at the rear side of the board with certain amount of pressure. The friction produced between dusters and surface will erase the written data on it.

III. System Description

This system is designed considering the present scenario of black boards and white boards. It consists of seven main parts-DC Gear Motors, Wooden block, Rollers, Duster holders, Dusters, AC to DC Converter and White board surface.

1.1 Dc Gear Motors

The DC Gear Motor is operated within the range of 4V - 12 V and has a speed of 100 RPM. It requires stall current of 6.9 A and gives stall torque of 42.51 kg cm. The gear assembly used in the motor is of spur gear. The shaft length of motor is 25-30 mm and shaft diameter is 8 mm. The motors are mounted on the four corners of the wooden block connected to the rollers. These motors are used to rotate the rollers so that whiteboard sheet can move around and get rubbed easily by the dusters. This type of gear motors has high torque and produces very less vibration effect so that the rollers can rotate smoothly.

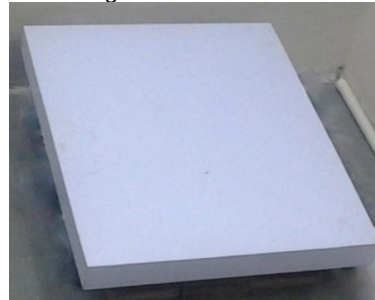
Figure 1 Dc Gear Motor.



1.2 Wooden block

The wooden block is used as a supporting base for the whole system and is made up of plywood. It is of length 50cm, breadth 5cm and height 40cm. The front and back surface of the wooden block is laminated with sunmica so that whiteboard sheet can move smoothly. It is used to support the whiteboard sheet at the time of writing. The duster holders and motors are also fitted on wooden block.

Figure 2 Wooden Block.



1.3 Rollers

The roller is of 5cm diameter and height 40cm made up of PVC plastic. Two rollers are placed vertically on the left and right side of the wooden block. The rollers are connected to the shaft of the motors by means of welding and screws. The motors are placed at the top and bottom side of roller. Rollers are coated with rubber to provide proper gripping for the whiteboard sheet so that sheet can move easily.

Figure 3 Rollers.



1.4 Duster holders

The duster holders are of C shape having height 44cm, width 10cm, breadth 10cm and thickness 2cm. It is made up of plywood. Three duster holders are joined at the back side of the wooden block by keeping equal distance between them. Holders are fixed in such a position so that pressure can be applied by the dusters on the sheet. Dusters are attached at the inside of duster holders.

Figure 4 Duster holder.



1.5 Dusters

As in whiteboards sponge or cloth dusters are used for cleaning the remains. In this model 6 Sponge pieces are arranged in 3 vertical columns on the backside of board. They are arranged in particular pattern for longer working resulting in proper cleaning of the whiteboard. The 1st pattern of the duster is of length 28cm, 2nd pattern of 14cm while the 3rd pattern is of 40cm having thickness of 3cm each.

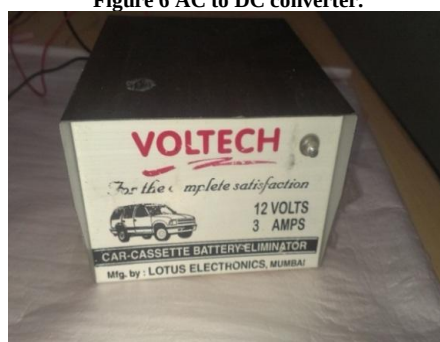
Figure 5 Dusters in fixed pattern.



1.6 AC to DC Converter

The main function of converter is to convert AC supply into DC supply. In this system the converter is used to step down the 240V AC to 12V, 3 amp DC supply. The converter is required for functioning of DC gear motors because these motors work only on dc supply.

Figure 6 AC to DC converter.



1.7 White board surface

In most of the whiteboards melamine resin or PET (Polyethylene terephthalate) coated on steel is used as whiteboard surface. These whiteboards are solid and cannot be rolled. In this system flexible white board surface material is used which is made up of plastic. It can be rotated around the rollers and is easy to rub. The length of the whiteboard surface material is 132cm and breadth is 40cm. The Renrenxin material surface can also be used instead of plastic material because it has same properties and longer life.

Figure 7 White board surface material.



IV. Construction and Working

The system is assembled by using all the components as mentioned above. The duster holders with the dusters fixed in it are attached on backside of the wooden block. Two motors are fixed on the upper and lower side of the roller by connecting the shaft to the roller by welding. Two rollers are placed on the left and right side of the wooden block by attaching motors on the four corners. The flexible white board surface material is passed over the wooden block and rollers.

Now, considering the system is in use and the teacher wants to rub the board. When the teacher switch on the supply, current is passed to the motors and they start rotating. Due to the rotation of the shaft the rollers connected to it also rotates which in turn rotates the sheet around it. The sheet moves from the front to the back side of the board and get rubbed due to the friction between sheet and dusters. Meanwhile the sheet which is initially at the back side of the board comes in front for use.

Figure 8 Front view of the system.



Figure 9 Side view of the system.



V. Conclusion

An automated motorized whiteboard has been successfully designed with innovative features. The system is tested and results obtained from the test carried out shows that the system cleans the board as the supply is switched on. Hence, an automated motorized whiteboard could be used in lecture theatres, classrooms and seminar rooms to facilitate the effective and efficient teaching using whiteboards. Further improvement can be done on this system. If a microcontroller chip is used along with DC Motor and delay time is provided by coding a program then system will stop automatically by cleaning the board within that time. This increases the efficiency of the cleaning system and saves time.

References

- [1] Chris Betcher and Mal lee, *The Interactive Whiteboard Revolution*, Camberwell Victoria, 3124, Australia
- [2] Tsado Jacob, "A Remote controlled motorized whiteboard clener," AU J.T. 15(4), pp 273-280, Apr. 2012
- [3] Shmuylovich and Salcman, "Whiteboard Presentation of Interactive and Expandable Modular Content," U.S. Patent 057106 A2, sept. 07, 2012
- [4] Wikipedia. 2012b. Whiteboard history.
Available: <<http://www.wikipedia.org/wiki/Whiteboard#History>>.
- [5] Wikipedia. 2012a. chalkboard design.
Available: <<http://www.wikipedia.org/wiki/Chalkboard#Design>>.
- [6] Ogirima, M.A. 2007. Design and Construction of a Motorized White Board Cleaner. Final Year Project Report, Department of Mechanical Engineering, Federal University of Technology, Minna, Niger State, Nigeria.

Acknowledgments

It gives us great pleasure to present a seminar on 'Automated Motorized Whiteboard'. In preparing this seminar number of hands helped us directly and indirectly. Therefore it becomes our duty to express gratitude towards them.