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WHITEBOARD CLEANING ROBOT USING ARDUINO

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Abstract - Education plays a very vital role in any country's development. The most traditional system in promoting education is by education institutes. Most of the children plant the seed of knowledge at this point. But there are some issues in delivering the content to the students at the institutes. One among them is the board and chalk which are often used by many of the institutes. There are many disadvantages caused by chalk powder for both instructor and listeners which is mainly caused while erasing the written content. There are some systems which consist of a moving eraser to clean the board but the cleaning time and cleaning rate with a greater sound cause some disturbance with the interest among the listeners and speaker. So we came up with a cleaning robot with a fixed cleaner and a moving roller which is operated with a microcontroller along with a switch-based technic, which addresses the above-mentioned drawbacks by this automatic whiteboard eraser where it will reduce the time and effort. It takes around 6 sec of time to clear the board smoothly and clearly. The robot is a small designed system which is integrated with servomotors and a switch-based circuit.

Keywords: Cleaning Robot, Switching System, AtMega Controller, Automatic Cleaning

I.INTRODUCTION

To develop our country or to have tremendous improvements in innovation education will act as a foundation for it. To have education one of the most traditional approach which we follow is by going to educational institutes physically. Even the technology has drawn the line in changing the lifestyle this is the very basic thing of going to educational institutes for education where that every country does. As the

improvement in the teaching styles for writing has been improved from sand writing, writing on walls and finally to a Specified writing board like Whiteboards, Sketch Boards etc. The major issue with this whiteboards are the dust caused by the chalk will cause the most severe problem when it is erased by hand manually, also it is the one of the time consuming process to clean this type of longboards. So, to address these issues we came with a solution by a robot-

like system which works on switch-motor based technique to clean the written board easily and fastly.

Motor Switch based cleaning system is one among the solution to address this problem. This simple technique often improves the efficiency in cleaning and reduces the amount of dust caused by the manual cleaning system. It can also be implemented in many organizations where board are used to have a written discussion to convey the information more clearly.

As there is some earlier development were the cleaner moves horizontally on the surface of the board. The limitation of that systems is it cant pressure the cleaner on board which indeed cleans the surface inappropriately. So, to overcome this major limitation we came with a switch and motor-based rolling eraser, instead of the moment of cleaner here the roller will make the cleaner over the surface of the whiteboard. The friction between the fixed cleaner and the roller creates enough pressure to clean the surface effectively and effectively with very less manpower. The time-consuming aspect of the moving roller is overcome by the microcontroller and also with a belt and pulley based mechanism and to control the motor, the motor drive is used to reduce the fault rate in moving of roller and a fixed cleaner.

II. EXISTING AND PROPOSED SYSTEM

2.1 Existing System

The educational institutes are one of the way to promote educational knowledge and ethics among the children from the starting

grade to higher levels. In most of the institutes, we use the dusters in educational institutes to clean the written information on boards. As the class is going on the teacher always used to use the duster to clean the board manually which in turn consumes a lot of time and also leads to breakage of interest among the students and teacher while delivering concepts and it also leads to many diseases when a person is very much exposed to the chalk powder while is released more while cleaning the board with a duster. Which shows us a major drawback with this manual cleaning system. Then by overcoming these issues we came with a smart cleaning system where the cleaner is moved around the board to erase the written content. However, the disadvantages are that due to the moving of cleaner around the board it causes less friction among the cleaner and board which in turn reduces the efficiency in cleaning the completely and efficiently. Which indeed leads to clean again by the instructor to clean completely which indeed consumes a lot of time and make the system unfit.

2.2 Proposed System

To overcome some of the limitations in the existing board cleaning model by roller-motor model along with the switch by including a controller-based technology is a cheaper and efficient technology in meeting the parameters of cleaning the board and reducing the chalk powder effect on the instructor. The main objective of this project is to style and implement a system to reduce the consuming time to erase the board. In this project, we using a fixed cleaner to a

roller which makes the roller to move over the surface of the board by making the cleaning device fixed to it. This indeed increases the friction among the board and cleaner which in turn cleans the board clearly. To make the roller move appropriately we are using a DC motor with a motor driver to control the orientation of it. To make this system more efficient we using an AtMega microcontroller which can be easily programmable with an open-source development platform. This complete system cleans the board in a 6 Sec of time (Seconds may vary based on the size of the board). To operate these whole mechanics we needed very less manpower just to switch on the device switch which is connected to a controller and this motor was operated by a switch-mode power supply to get a required power to make the roller roll around the board. The direction of the roller and making area of the roller can also be controlled by the switches which are programmed by the controller to drivers with an opensource development environmental tools.

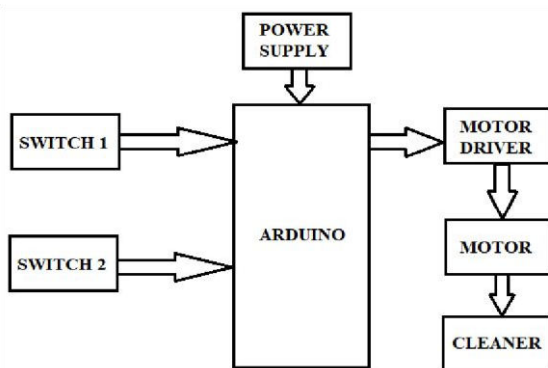


Fig 1: Block Diagram of White Board Cleaning Robot using Arduino

2.2.1 ATmega 328P Micro Controller with opensource Board

An AtMega 328P MicroController along with an opensource board which is called as an Arduino Uno acts as a controller to control the defined instructions. The instructions are fed by using an opensource Integrated Development Environment. It has a 14pins among which 8acts as a Digital pin and 6 act as PWM pins. This AtMega 328P MC performs 16MHz cycles in a One second. It also has a push-button to perform reset operation in the case of inappropriate response from the controller board. This device can be operated with power from a USB port which can also be used to dump the code into the controller or we can also switch on the board to operate by using 9V AC-DC Adapter. Each pin gives an output in the range of 5V. The data is transmitted and received to this board using these pins. The status of Transferring data and also receiving data can be predicted by using the onboard Tx and Rx LEDs. This board also have an onboard fixed LED to know the function of the board to use. The platform using code is very user friendly and can be easily processed by any beginner to implement some amazing results with this type of controllers. This Device also allows different protocols to communicate among devices.

2.2.2 12V Geared DC Motor

To have a rotating or moving mechanism of roller around the board we can't implement a traditional thread and pulley system while making an automatic device. So, we needed a device to make the roller move in the

specified area. The devices which are capable of generating rotatory motion is called motors. Here in this approach as per traditional model we are trying to pull the rope belt of roller with a pulley but with not manpower. To rotate the pulley here we using this electromechanical motors to cause that motion. These motors vary with its functionality, Speed, Size, Guage, etc. to make the roller move here we using a 12V DC Motor which can cause enough motion for rotation of the pulley. The gravitational force also considered withstanding even if we hang the motor on the top.

Brushed and Brushless are the two special types of motors in this.



Fig 2: DC Motors

2.2.3 L293 Motor Drive and H-Bridge

The Direction of DC Motor can't be changed manually all the time while making an automated system. But, to control the motor is one of the challenging tasks without touching it. Later due to advancements in technology with the help of Driver which can control the direction of Motor automatically by changing its voltage parameters with the help of some controllers. Here to make the roller move which is connected to motor we need a

specific driver to control its direction based on input instruction. To meet that requirement here we using an L293 Motor Drive. There are a vast number of driver modules to control the motion of a motor among them this is the most widely used driver.



Fig 3: L293 Motor Driver

Here this motor driver is also used as a special controller in orienting the motion direction a motor which indeed responsible for moving the cleaner which is fixed to a roller setup. We can program this driver with the help of the AtMega 328P Board. Some of the Tx and Rx pins are connected to this driver along with the two terminal of the motor.

2.2.4 Circuit Explanation

The Circuit consists of Microcontroller, Motor Driver, DC geared motor, Limit Switches, push switch & Power Supply. The Limit Switches are used to identify the Start and End position of the White Board. When the Robot was given the power it checks whether the robot was in initial position or not, if the robot was not in the initial position it Runs the motor backwards and reaches the initial position. If the robot was in initial position

it does nothing until an External input is given. When the Push Switch (External Input) is pressed the microcontroller runs the

motor in forwarding Direction and waits till the Robot reaches the end of the board when the robot touches the limit switch at the end the MCU runs the motor in the Backward direction and waits for the robot to reach the initial position, this operation is repeated two times and stops the robot at the initial Position.

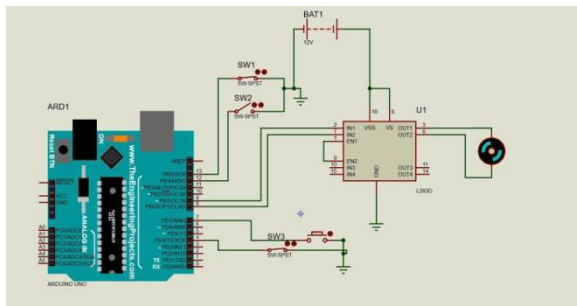


Fig 4: Circuit Diagram

III.RESULTS

The testing of the designed model is showed in the below figure.

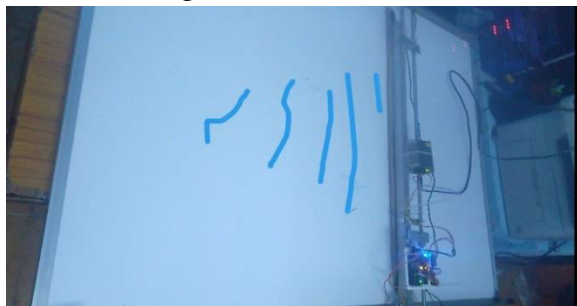


Fig 5: Proposed System

IV.CONCLUSION

The developed system will work in the span of 6 Sec by reducing the usage of manual erasing of the board and making the teaching more effectively without wasting time on making the board clean. It also increases the concentration of listeners by reducing the noise caused by it. The structural construction is so easy with a user-friendly and easily programmable

controller tools. Due to less time operation and reduced noise setup makes this system to be fit in installing in conference meeting and organizations. The moderate power consumption of the device also makes a point of less usage of electricity which indeed reduces the cost of power required. As we used very low cost and easy types of equipment servicing also make easy even an end-user can also perform it.

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