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An Embedded Based Wireless White-Board Eraser Using RF Module

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ABSTRACT

white boards are the most common and effective basis form learning in organization and education sector. The most tradition way of erasing the board is using duster, which required manual labor. Since the size of are large it is very time consuming process to erase the board using duster and it also reduce the visible quality of board. In order to overcome this we can make a system by using it we can erase the board automatic without any manual labor. The system consists of a DC gear motor, wiper, chain, arduino Uno. This system helps to reduce time and also reduce stress. In traditional way it takes around 5-6 min to erase the board but by using this system it can be done in around 5-6 sec. This system can be implement anywhere easily and the main thing is it is affordable. This system is control by using RF module which consist of a transmitter and receiver, receiver is placed in the wiper and for transmitter we are using remote which is control by the user.

Keywords: Control circuit, DC motor, Automated Wiper, Electro-Mechanical

I. INTRODUCTION

Board that is commonly used in the almost all the department including educational sector. It is known to be one of the major ways amongst many for teaching, presentation and display. Although it started out as the blackboard, it has emerged into enhanced technological boards such as the electronic board, interactive whiteboard and plain whiteboards. The whiteboard which is commonly used in the educational sector is the basis of this paper, aiming to ease lecturers, teachers as well as students of the work, time and effort it takes to clean the board. This paper mainly focus on the things which lead to reduce in human effort. In this paper, an automatic whiteboard erasing system which consistently cleans boards with the push of a button is created. It is an electro-mechanical system that applies the use of combinational circuits and DC motor to automatically control the wiping of a board. It's a tool for teaching and a tool for learning. These two broad categories emerged in this reports: the Automatic Whiteboard wiper as a tool to enhance teaching, and as a tool to support learning. Not just does it help teachers and lecturers but it supports students to also learn by its flexibility and versatility, interactivity of teachers and students, efficiency and modeling electronic skills.

As due to continuous uses of duster in the board reduces the visibility of the board, but due to these the quality of the board remain as it is. As we can say that due to this system stress is easily reduced. [1].Deepanjan Majumdar,

II. BACKGROUNDS AND MOTIVATION

It not as like whiteboard has just started, as it has been using since long back but the thing is the early whiteboards that came out were comprised of

melamine. Not only was it costly, but excessive use left faint images of the material on it. Cleaning was also difficult and it reduced the visibility of the board. In view to rectify this, modification has been done not just on the materials used for board production but also on the type of marker used on them (Simolowo, 2014). The interactive whiteboard (IWB), which is also known as the electronic Whiteboards are touch-sensitive boards which comes in various sizes, controls a computer connected to a digital projector. In the early 1990s, the interactive whiteboard was introduced to the public. The boards were used as tools to help corporations conduct training sessions and meetings, professional sports teams improve coaching and in educational settings (Interactive Whiteboard). Over the next decade and a half, use of interactive whiteboard technology grew substantially.

Most of the growth seen in the use of interactive whiteboards is in the classroom. They were originally developed for office settings (Greiffenhagen, 2002) and are a relatively new technology to education. Despite the benefits of this technology, it is unrealistically affordable for most institutions to implement in all classrooms, especially in developing countries, hence the need to increase the efficiency of the affordable white board. As the whiteboard was implemented in various institutions and organizations, improvements was also performed,

Majorly on its surface, by various companies. Students became distracted by the glossiness of the surface and this led to the reduction of the surface gloss. As at the late 2000s, the surface was of high value due quality of the paint coating being used resulting in a very smooth and clear surface. The Whiteboard surface can be of various materials such as the melamine, magnetic glass, porcelain and painted steel. The most widely used material is the Melamine. This is widely used due to the fact that it is the least expensive. However, it is the least durable form in comparison to the other types and wears out after a period of time. It is a trade-off between cost and durability. A more durable type is the painted steel which is way smoother than the melamine. A major disadvantage of this surface material type is that the markers leave behind traces. The glass type overcomes the limitations of both Melamine and Painted steel. However, the porcelain type has been proven to be the most environmentally sound surface type. Permanent markers can be erased. All non-abrasive cleaners can be used on it as well.[2].Billie R. Chrisp

III. SYSTEM MODEL

For the methodology of the board wiper, various components have been put together to make the automatic board wiper functional. These electrical and mechanical components work hand in hand to provide the desired output. Below is an introduction to the various components and how they work and thereafter the combination of them to produce the board wiper. Major components include the dc motor, logic gate, resistors, capacitors and transistors, gear, moving belt and pulley, transformers, relay diodes, pilot light etc. reverse movements of the motor. After every completed cycle, the motor returns to its initial position. Figure 3 shows a detailed process flow diagram of the board wiper from the input to the output motion of the wiper. [10.] Praveen

3.1 DC MOTOR

The direct current (DC) motor is a device that converts electrical power into mechanical power. Permanent magnet (PM) direct current converts electrical energy into mechanical energy through the interaction of two magnetic fields. One field is produced by a permanent magnet assembly; the other field is produced by an electrical current flowing in the motor windings. These two fields result in a torque which tends to rotate the rotor. As the rotor turns, the current in the windings is commutated to produce a continuous torque output. The stationary electromagnetic field of the motor can also be wire-wound like the armature (called a wound-field motor) or can be made up of permanent magnets (called a permanent magnet motor).

3.2 HT12E ENCODER

HT12E is an encoder integrated circuit of 212 series of encoders. They are paired with 212 series of decoders for use in remote control system applications. It is mainly used in interfacing RF and infrared circuits. The chosen pair of encoder/decoder should have same number of addresses and data format. In this project encoder is used to send the data to arduino controller which gives signal to the L293D for controlling of DC motor in either forward or reverse direction.

3.3 HT12D DECODER

HT12D is a decoder integrated circuit that belongs to 212 series of decoders. This series of decoders are mainly used for remote control system applications, like burglar alarm, car door controller, security system etc. It is mainly provided to interface RF and infrared circuits. In this project the main use of decoder is to receive the data that has been send by the encoder, once the data is received it will verify the data and send it to arduino controller.

3.4 ARDUINO UNO

ATmega 328 controller used in this project is arduino uno R3 that is ATmega 328. The total number of pins in ATmega 328 is 28 out of which 14 are the digital pins and 6 are analog pins. In our project we are using total 7 digital pins, 4 for to connect two motors and remaining 3 for to connect pushbuttons.

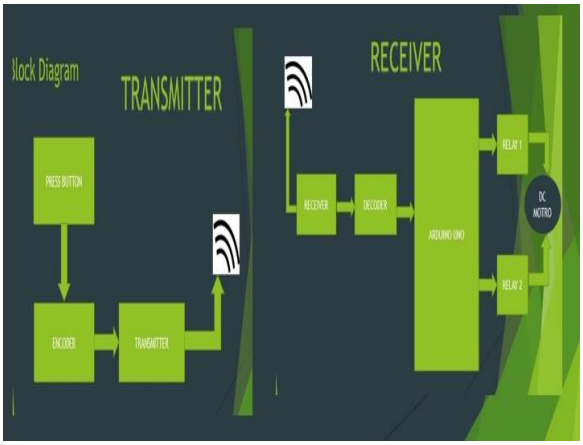

Figure 3.1. Block diagram

With the power supply connector switched on, when the push button is pushed, the control process is initiated changing the states of the switches which in-turn controls the motion of the DC motor in forward and then reverse directions. The mechanical part of the system that physically wipes the board is connected to the DC Motor and cleans the surface of the board during the forward and reverse direction.

3.5 SCHEMATIC DIAGRAM

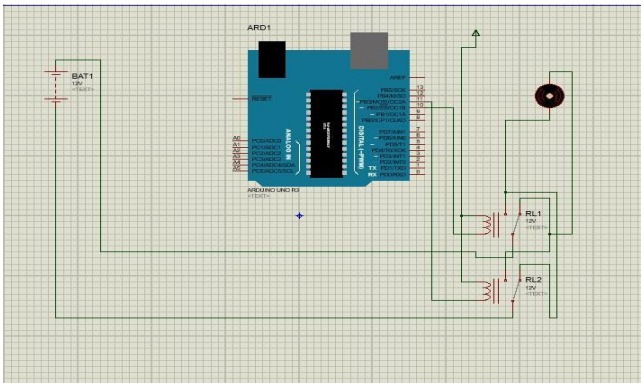

Figure 3.2. schematic diagram

IV. SOFTWARE MODEL

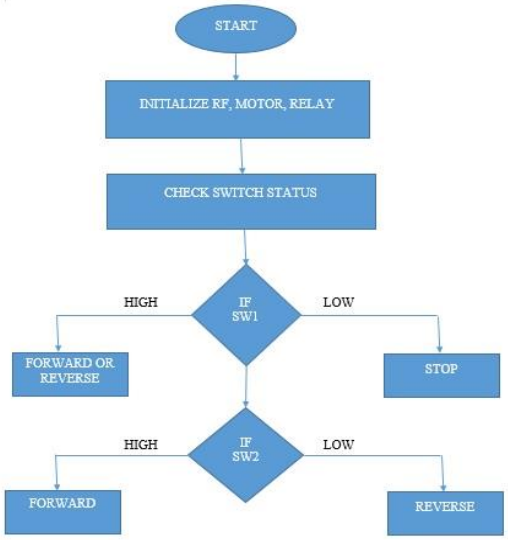

Figure 4.1. flowchart

In the above flowchart it has been clearly explained that how this project will work, in this system we are using the function of these pushbutton is to control the movement of eraser that is used to erase the white board. Sw1 is work for forward and reverse of the eraser and sw2 is used for start and stop of eraser.

V. MECHANISMS OF THE MECHANICAL COMPONENTS

The major component of the wiper is the motor, gear teeth, pulley and moving belt. A pulley is a wheel which is driven by a power source. Connected to the wheel is a belt which in turn is connected to another wheel, when the wheel which is connected to the power source turns, the belt drives the second wheel. With a gear system the wheels are in direct contact and each has teeth round its edge. The teeth from one wheel drive the teeth on the to her wheel which in turn makes the wheel go. [11] Tsado Jacob

Figure 4.2 .front view of white board

Calculating the Power Required:
Physically, power is defined as the rate of doing work. For linear motion, power is the product of motion multiply by

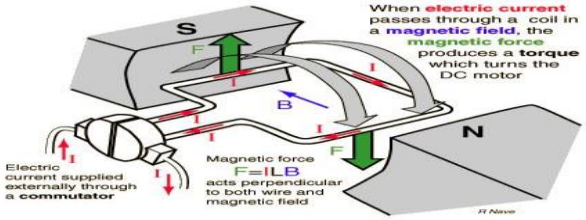

Figure 5.1. *DC motor mechanism adapted from NCERT*

Distance per unit time. In case of rotational motion, the analogue calculation for power is the product of torque multiplied by the rotational distance per unit time.
Where, Prot= rotational mechanical power
M = torque
W = angular velocity
Where, angular velocity = Wrad/sec
The motor operate on 12 volt direct current. Motor rotational power rotates the alternator to generate voltage out. The motor power determines the capacity of the generator.

5.1 POWER SUPPLY WORKING MECHANISM

The motor uses a high current transformer of 3amps and rectified with bridge diode so as to power the motor effectively. The project uses two transformer .The panel control stage in the project uses +12V DC power supply. The 220V AC power supply from PHCN was stepped down by the transformer to 18V rms and the bridge rectifier which uses four diodes of 2m amps was used to convert the alternating current to a direct current by rectifying it, after which a filter simply a capacitor connected from the rectifier output to the ground was used to filter the ripples from the transformer and then an integrated circuit 12V voltage regulator connected to the output of the filtered rectifier was used to regulate the voltage and keep it fixed at 12V i.e. by maintaining a constant output voltage despite changes in the input or Load current. The capacitor input filter reduces the input ripple to the regulator to an acceptable level. A power transistor was used to boost the 1.5mA current from the voltage regulator to 1A to power the circuit by connecting to the base of the bipolar junction transistor and the emitter is connected to the ground, collector to the relay. The power supply circuit diagram is shown in figure below

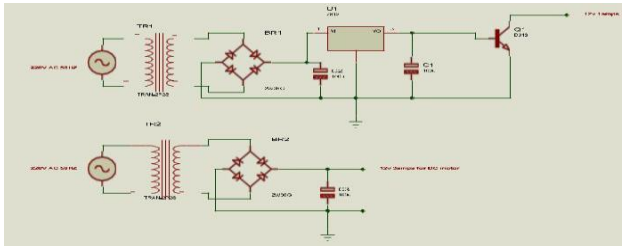

Figure 5.2. *Power Supply Circuit*

VI. TESTING, CONSTRUCTION AND IMPLEMENTATION

This section basically outlines a detailed documentation of the implementation of the automatic board wiper and its various modules, both mechanical and electrical modules. The testing of the various components that makes up the movement of the board wiper to and fro will also be looked into to give more insight into the topic.

Testing: The physical realization of the paper is very vital. This is where the fantasy of the whole idea meets reality. The designer will see his or her work not just on paper but also as a finished hardware. The hardware was tested by connecting the power cord to the AC input and the output was read with voltmeter before it was connected to the circuit. The motor was tested manual on battery to ascertain functionality of the motor before connected on the circuit.

After carrying out all the paper design and analysis, the system was implemented and tested to ensure it's working ability, and was finally constructed to meet the desired specifications. The process of testing and implementation involved the use of some test and measuring equipment stated below.

Bench power supply: this was used to test the control circuit model on a bread board before the project was finally soldered.

Implementation: The implementation of this work was first done on a breadboard. A D.C power supply was first derived from a bench power supply in the school electronics lab to test the touch switch circuitry. Stage by stage testing was done according to the block Representation on the breadboard, before soldering of circuit Commenced on Vero board. The various circuits and stages were soldered in tandem to meet desired workability of the system. [4]. Chirag Shah

VII. RESULT

OBSERVATION	MOTOR	TIME TAKEN
1	FORWARD	18 SEC
2	REVERSE	17SEC
3	FORWARD	16SEC

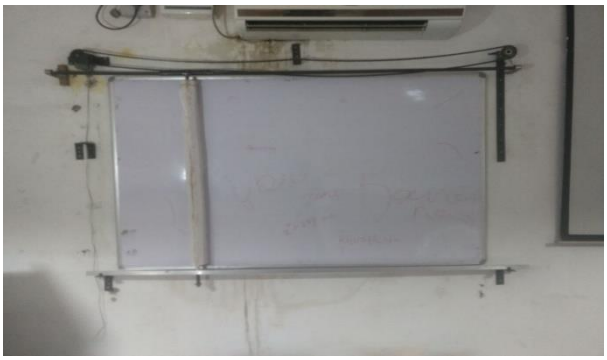

Figure 6

VIII. CONCLUSION AND FUTURE SCOPE

This project has been help to improve in technology in the educational sector has been achieved in this work. Besides the electronic gadgets, in the educational sector as well as the business sector, learning is the most important key and improvements technically on training and teaching tools are needed so as to achieve set goals in due time. The construction of an automatic board wiper system that provides the learning environment with an improved wiping system on boards can be wholly applied in all the sectors where there is used of white board like schools, institution, colleges, business and office environment thereby easing them of the pain, effort, energy and time it costs to wipe a board and opening new doors into a whole new world of technology.

As this system was already exist but as we have implemented this system by adding remote control, now this system purely becomes an automation project where there is no need of manual labor to erase the board. This system would surely make learning more interesting to both tutors and students.

IX. FUTURE SCOPE

We can further implement this system by simply adding the sound sensor and we can make it voice recognition. By simply voice command this system can work. This Project can be further changed into a gesture controlled eraser by utilizing camera and DSP processors in order to recognize the development of the clients hand and make the duster do as such. This venture can likewise be changed to clean glass as present on high structures which is an extremely dangerous employment for any human to perform.

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