

A REVIEW AND INTRODUCTION TO ADVANCED BOARD CLEANER EMPLOYING LASER TECHNOLOGY

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ABSTRACT

In this paper we gave a special technique for white board cleaning. The proposed work is to design and develop a white board cleaner which works with the laser technology.

We demonstrate the idea of advance board cleaner with the aid of laser technology. The board cleaners present in the market are not so advanced. These board cleaners still use very old techniques and still are very costly. The white board cleaners present in the market takes a lot of time to clean the board which makes the teachers and students to wait for the machine to complete the cleaning task. This makes the students lose their concentration this also makes the teachers and the student to get bored. In this project we are focussing on the use of laser technology in cleaning the whiteboard. In the project we takes a board and divides it into two equal sections on the basis of light sensing. For the purpose of cleaning the board from remote location, we take laser light and to define the region that we want to clean, system sense the region automatically and decide the proper command and do the work.

KEYWORDS: *Laser Technology, Region Sensing, Cleaning, Sensor, Robot.*

I. INTRODUCTION

When we said teaching and learning process we will focus on teacher and student, who are person that delivering and receiving information and knowledge. How do they deliver their knowledge to student? Nowadays, there are many method which are teacher can use to deliver their knowledge such as computer, note given by lecture or teacher and whiteboard or blackboard as medium to deliver the information to student. Until now many schools and universities still used whiteboard and blackboard as medium to deliver information to student. Thus, many developments or methods of cleaning whiteboard or blackboard were fabricated.

Design and Development of Board Cleaning System is a system that is generally used to clean white 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.

This technique was selected by us by taking into consideration some comfort for Teachers while cleaning the board. . It is seen that while doing this they waste a lot of their as well as students time and it waste a lot of energy of the teachers. By thinking over it we realized that we can really do something for them to save their time as well as labour. So we decided to implement our course study and some extra knowledge to implement this project.

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II. LITERATURE SURVEY

S.Joshibaamali And K.Geetha Priya[1]:

(A) . Humanoid Robot Learns To Clean A Whiteboard: This humanoid robot was created by Italian and Japanese collaboration between Italian Institute of Technology and Tokyo City University. The robot was concept by the imitation learning. This robot has a different type of control that is upper body control and lower body control.

In upper body control it designs used the concept of kinesthetic learning. This concept will be used at the robot arm. Same with the lower body of robot, but it use to stabilized the position of the robot to keep maintain the robot when upper body doing it work. The ankle and hip of the robot will react with the motion of upper body to keep the balance of robot.

1) This machine uses a whiteboard as a prototype. So the area of dimension that it will use is 600mm x 450mm.

2) The usage of gripper. This gripper used is a simple one for holding the duster.

3) Limitation on movement of duster. Movement of duster will move in two way of direction. Duster can move in horizontal (X-axis) and vertical (Y-axis) directions.

4) Sensors are used to know the location of the duster.

(B). Whiteboard Erasing Robot: It is an autonomously robot, that can erase a written text on a whiteboard completely autonomously. Without human interface, the robot easily finds the text on whiteboard with the process that were programmed. There are three cases of study on how the robots function. First is method for the robot to find the written text on whiteboard. Next step is defining a way for mechanism to move the text written. Last step is to enable a robot to erase the text.

So in the first step robot is to find the written text on whiteboard. This step was divided into two parts.

First part is mechanism of the robot. Its consist a base with two wheels which ride on the whiteboard track. This base it use to move on the X-axis of the whiteboard. To make a robot move in Y-axis direction robot arm slider was constructed. These sliders move the robot in up and down directions on Y-axis. At the end of the arm the duster is attached to do the cleaning process.

The second part is robot vision. This robot use webcam and computer base control station that located at the opposite side of whiteboard. This vision use to find place of text written and make sure the robot clean at that place. The vision capture with a webcam will be processed with vision software, Robo Realm. This software use to find center of gravity of text. The image color will be converted into negative image, black and white using gray-scale filter. Once the center gravity of text was defined, it will convert the center gravity of text into coordinate plane. Then using basic math program, it will tell the robot which location is must move using motor command.

(C). Whiteboard Cleaning Mobile Robot: Whiteboard cleaning mobile robot was fabricate by Stefan. Diwald, VMI, TU Munchen [16] . The concept of cleaning task is the same with whiteboard erasing robot that were an autonomously robot that clean text on their own without human interface. But the different between these two projects is the mechanism.

Mobile robot used the suction concept to make the robot attached to the whiteboard, different with whiteboard erasing robot that used two parts of motion X-axis and Y-axis. The mechanism of mobile robot is quite simple, but the suction concept that make we difficult to build. Suction concept is also noisier when mobile robot doing its task.

For a vision part, the concept is the same with whiteboard erasing robot but the software that they used is different. This project used the Robot Operating System as the software to process the vision.

Sunil R. Kewate, Mr Inzamam T. Mujawar, Mr. Akash D. Kewate, Mr.Hitesh R. Pant. [2]: authors have explained in their paper that the design and principles of sliding type wipe mechanism also carried out the implementation and experimentation for motion analysis. 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 is 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 wipe system along the rail C together. The sensor is fitted at right most of the blackboard to sense the right end position and signal passed to return the wipe system along the rail C in different position.

S.Nithyananth, A.Jagatheesh, K.Madan, B.Nirmalkumar has explained about rack and pinion mechanism with the application of steering mechanism. This mechanism is used in automobiles to convert the rotation of steering wheels from left to right or right to left. A rack and pinion is generally used to convert the rotational motion into linear motion. Pinion engages teeth on rack. In the steering mechanism the author is trying to tell that the rotational motion applied to pinion will cause rack to slide upto the limit of its travel.

Dong Yeop Kim, Jae Min Lee, Jongsu Yoon, Tae- Keun Kim, Bong Seok Kim, and Chang-Woo Park have researched a gondola typed robot system for wall shape recognition using limit switch. In this the author proposed a limit switch module as a mechanical sensor method. In this system there are two limit switches. Their combination is translated to building wall shape information. The ARS sensor and the height sensor are used to mapping to 3D localization of the robot. If ARS sensor and height sensor are attached to other place of the gondola, the sensor data is need to send to this limit switch module process algorithm. The main point of the limit switch module is that two limit switches have different purpose and setting. There is the limit switch for wall that has longer stroke and senses the window areas. And there is the sensor for obstacles has shorter stroke to sense only obstacles which is closer than ordinary wall.

Rubhini, Mrunalini [3]: The project was about finding a real time solution for the problems caused by the chalk pieces used in the class room. To overcome the problems that are faced daily by the students and faculty, the project entitled 'Real Time Automatic Blackboard Eraser using Embedded System' had been suggested to automatically erase the blackboard. DC motors of three different types were used for the movement of the instrument. The instrument moves forward and backward erasing the board and collecting the dust automatically from the erasing material due to the rotation of the roller. These processes were automated using PIC16F877A microcontroller. Thus the device avoids the dust flow in the environment and thereby providing good solution for the problems faced by the student, faculty and other electronic equipments inside the class room in a cost effective and time efficient way.

The real time automated black board eraser was used to clean the board automatically and to absorb the dust produced during erasing the board. The model consists of a wiper motor which was used to move the entire erasing apparatus from one end to the other end for complete erasing of the board.

A DC Gear Motor was used to rotate the roller that was wound with the erasing material. This material was used to erase the board and get hold of the dusts after erasing. A scrubber was used to remove the chalk dust that gets settled on the rubbing material. The vacuum cleaner was used to absorb the chalk dust that fall inside the erasing apparatus.

The entire apparatus was placed parallel to the board placed at one end. The roller wound with eraser was placed at zero gap between the board and the eraser, so that it erases the board cleanly. The microcontroller PIC16F877A was used to automate the entire process. The circuit designed for the automation was fixed to the wall. The cables were connected using connectors.

Amit Tiwari [4]: (A). Construction: In the construction of automatic blackboard duster the board was supported on a iron frame. Two steel rods are placed at the top and bottom of frame in horizontal direction supported by bearings, at the both end of the steel rods two sprockets are fixed. Two sprockets of upper side are connected to other two sprocket of lower side with the help of chain. A duster was mounted horizontally on these two chains. One extra sprocket was used on upper steel rod which was connected with another sprocket which was fixed on the motor. These both sprockets was also connected by a chain.

(B). Working: In the working of automatic blackboard duster as the power was supplied to the motor the shaft of the motor starts rotating. A sprocket was connected to the motor shaft which was connected by another sprocket of the steel rod with the help of a chain. Thus movement of the sprockets rotates the steel rod by which both the upper and lower sprockets start rotating. By the rotation of the sprockets, the chain which was mounted on these sprockets in vertical direction also starts rotating. A duster which was mounted on this chain starts reciprocating up and down, thus clean the board. A switch was provided for to and fro motion of the duster.

In the fast growing world there are different new technologies adopted to increase work rate in minimum time period. Thus, automatic blackboard duster was also a new technology for cleaning the board automatically in minimum time period. In this advanced world the competition is increasing

day by day, thus the time of every person is most precious. As automatic blackboard duster clean the board in less time and saves the time of student which is too important.

In their project, there was a great scope to modify it in different ways like increasing its operation like vacuum cleaner, a form of spray of water whenever required by applying pump for better finishing adopt, different mechanism in place of chain and sprocket to reduce noise and so on, so that more better result can be obtained.

III. PROPOSED WORK

Over the years school and colleges uses boards for teaching and learning purposes.

In time many methods are developed for the purpose of cleaning the boards. Boards were cleaned and mostly in India are cleaned manually but there are some institutions which uses automatic board cleaners in order to save the teachers from getting tired. These board cleaner are quite costly and takes a lot of time to clean the board. This paper presents the design and construction of an advance white board cleaner by laser technology.

This technique was selected by us by taking into consideration the time which was wasted in order to clean the board also it was very tiring for the teachers to repeatedly clean the board we wanted to give some comfort for Teachers while cleaning the board. It is seen that while the teacher cleans the board they not only waste a lot of time and gets tired but also causes the students to lose their concentration. Thinking over all these facts we realized that we can really do something for them to save their time as well as labour. That's why we decided to implement our course study and some extra knowledge to implement this project.

3.1 Working:

This work will be done in different modes-

- **Region sensing mode:**

In this mode the section which is to be cleaned is find out. In this mode we drops the laser light on the section of the board which is to be cleaned and an idr sensor detects the laser.

- **Cleaning Operation:**

For the purpose of cleaning we use motor and duster. Motor is used for the movement of the duster.

In this project the white board is divided into two equal sections. In order to take the duster to the desired location which is to be cleaned a robo car is used. As the board is divided in two equal sections two robo cars are used one on each side. When the duster reaches the desired location then in order to clean the board the duster need to move. For the movement of the duster motors are fixed on each side of the board. In order to detect the laser light an LDR(Light Dependent Resistor) sensor is used on both side of the board.

First of all, a laser is fallen on the section of the board which is to be cleaned. The laser indicates which section of the board is to be cleaned. On both section of the board there is a LDR sensor which detects the laser. When the laser falls on any section of the board then LDR sensor detects it and the robo car is triggered. Robo car containing duster start to move to the place which is to be cleaned. After reaching to the desired location the duster start cleaning the board. Motors are used to control the movement of the duster. Once the board is cleaned the robo car return to its initial position.

3.2. Software used:

Four types of software are used in Advance Board Cleaner By Laser Technology.

- Proteus software is used for circuit designing.
- ARES is used for PCB design.
- Top win is used for programmed IC.
- Kiel software is used for coding.

3.3. Circuit Diagram:

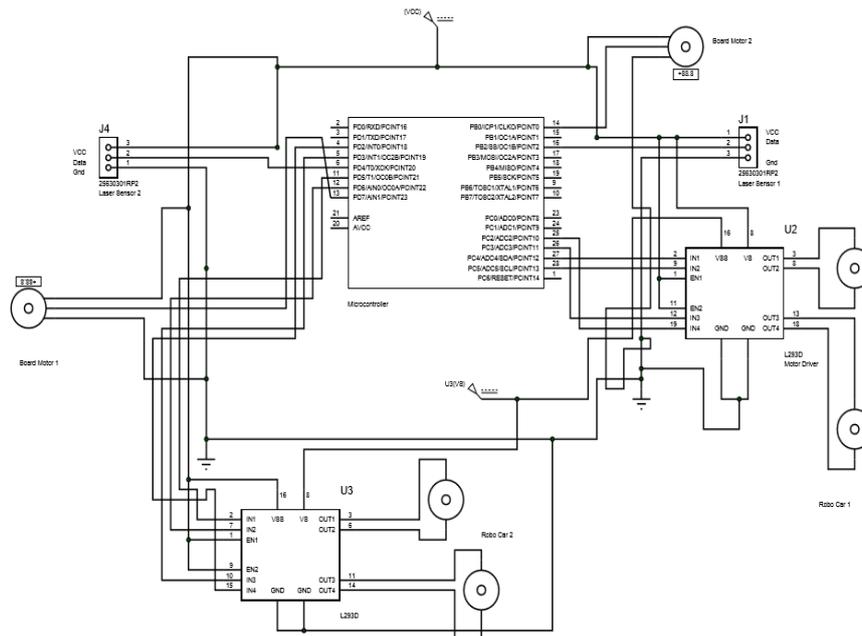


Fig. Circuit Diagram of Advance Board Cleaner[7]

3.4. Block Diagram:

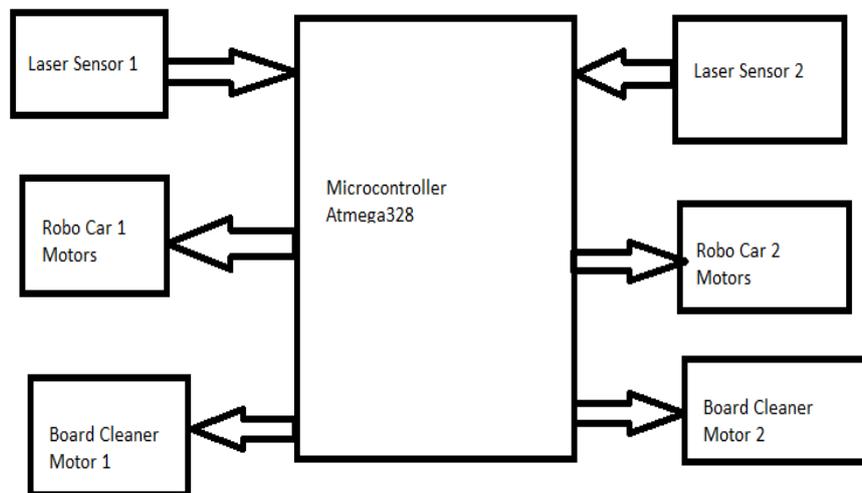


Fig. Block Diagram of Advance Board Cleaner [7]

IV. RESULTS AND DISCUSSIONS

The result which we are expecting from our project is when the laser light falls on either side of the board then that the Advance Board Cleaner Using Laser Technology detect the light using LDR sensor and starts cleaning that side of the board. We tried our best efforts of technical skills to make this project a success. This project is prediction of new invention that provides new creation and scope in future. In the future this could help the students and teachers a lot and can save their time.

In this project we demonstrate the proper working and provide complete character. It will not only save the time of teacher at the time of teaching but also student's priceless time. This project will also save the teachers from getting tired of cleaning the board again and again. One of the important factor that must be considered is the time required for cleaning the board. It effects both the teachers as well as the students. If the machine takes too much time to perform the cleaning task it will bore the

teachers and the students to wait for the machine to finish all the work. Before designing Advance white board cleaner using laser technology the time required for cleaning the board was considered as a key factor. So it was designed was designed to operate similar like human work time.

V. CONCLUSION

In today's world technology has reached to a very high level. We can call this era as the era of technology. People want something new from technology, people want technology to help them, to make their life easy. They want technology to help and assist them in their everyday life. People want every single thing they look in front of their life look sophisticated. People want something that can improve their life and help them do their job by use of robot or machine. Machines could make humans life much easier. Machines could even perform task which are impossible for the humans to perform. Another advantage of using machine is their speed. Machines can perform task with a very high speed. They can perform task faster than the humans and can also save humans labour. That is why development of machine is quite popular nowadays. Today robots are being developed at a very fast rate in the market. Advance board cleaner using laser technology is also one of the project which help humans in their everyday life. Advance Board Cleaner Using Laser Technology is an alternative technique that can help lecturer, teacher and student to keep them free from the duty of cleaning the white board.

As conclusion, an advance whiteboard cleaning machine which uses laser technology is designed and fabricated using low cost material and with user friendly interface. This machine can potentially be used in class rooms to assist the teachers in keeping the whiteboards cleaned which could save teachers/ lecturers from getting tired by repeatedly cleaning the board and also helps the students not to lose their concentration and not to get bored in the class. Another advantage of this machine is that it divides the board into two equal parts so teacher need not to wait for the machine to clean the board as the teacher can continue on the other side of the board. The time required in cleaning the board is similar to the time taken by a human to clean the board.

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