

To cite this article: Elmerison L. Barañaño, Maeven Uriel A. Dela Cruz, Athaiah Mae Arroyo, Mary Grace Vien L. Erlano, Juliana Khristel M. Mendoza, Jasmine Desiree P. Robles, Jeri M. Macahia and Noriel P. Tolentino (2023). THE USE OF A CAR WINDSHIELD RUBBER BLADE TO MAKE A MOTORIZED WHITEBOARD ERASER, International Journal of Applied Science and Engineering Review (IJASER) 4 (2): 132-145

---

## **THE USE OF A CAR WINDSHIELD RUBBER BLADE TO MAKE A MOTORIZED WHITEBOARD ERASER**

**Elmerison L. Barañaño, Maeven Uriel A. Dela Cruz, Athaiah Mae Arroyo, Mary Grace Vien L. Erlano, Juliana Khristel M. Mendoza, Jasmine Desiree P. Robles, Jeri M. Macahia and Noriel P. Tolentino**

Research Development, Accreditation and Publication Office, PSD, Doha, Qatar

DOI: <https://doi.org/10.52267/IJASER.2023.4209>

### **ABSTRACT**

Innovation from scrap materials can go beyond expectations. For this reason, the objective of this study is to create a motorized whiteboard eraser out of a car windshield rubber blade from a broken car. With the help of Arduino Uno and Arduino Interface, an open-source electronics platform based on easy-to-use hardware and software, was able to help read the coding and inputs in causing the wiper move with a switch, battery and motor. The results of the study showed that the time of executing the command was 0.35 seconds after turning the switch on, while the distance covered in centimeters by the motorized whiteboard eraser was 75cm. It is also noted that after four rounds of horizontal swiping directions it had totally erased the writings on the whiteboard. Further, in terms of the speed of erasing the writings, the shortest time was 0.0852 miles per hour. Proving its efficacy on erasing various percentages of shaded parts it is recorded that in 50% shaded part it took a minute and six seconds, while in 75% shaded part it took one minute and 20 seconds, lastly, in a 100% shaded it could totally be erased in a span of one minute and 36 seconds. As a result, it is recommended to increase the speed of the motorized whiteboard eraser by utilizing a bigger motor with a higher RPM capacity. Moreover, it is advised that the whiteboard eraser be improved in order for the rubber blade to entirely adhere itself to the whiteboard in order to have less constraints on erasing. It is also recommended that you choose a lighter material than PVC in order for the eraser to operate smoothly.

**KEYWORDS:** Arduino Uno, Arduino Interface, Car Windshield Rubber Blade, Whiteboard Eraser

### **1. INTRODUCTION**

Living in a world filled with technologies, people became interested in what technology's wide and exclusive varieties have to offer. May it be related to their studies for students, work for adults and even

for the people's personal lives. Inventions, such as new tools, devices, and processes, have provided significant benefits to society. (Miller et al., 2021) It also helps students build 21st-century skills. In this study, the researchers want to use automatic technology, specifically those technologies which are powered by a motor, to an even greater extent by applying it to education and give both educators and students the advantage. An advantage which could be considered as life-changing enough to give us all the benefits technology has to offer.

This study explains how to conserve time and teach more about technology and even preserving things. Producing an Automatic Whiteboard Eraser from a windshield wiper is a study that is innovative, for the reason that it has a lot of advantages to the users, majority to adults whose professions are educating young people, even students may play a big role in this study." Time is Gold," is a quote famous to people. Nearly all people believe in this quote, especially educators or teachers who are requiring a lot of time for themselves when they are in a class. A quote of reminder and motivation to spend their time as wisely as possible to its fullest. A teacher's time is one of a school's most valuable and scarce resources, yet it's often wasted because of poor leadership and management (Anderson, 2019).

Inside and outside the classroom, teachers are demanding ample or more time to finish their tasks. Managing time effectively to achieve what needs to be accomplished during their period is quite a challenge for teachers because of time limitations. This demand cannot be granted because of many reasons. One of those many reasons is doing unnecessary things, like erasing the whiteboard after writing on the board. This takes time away from the teacher/s, since they need to pause from their lectures just to erase the writing on the board. Even if it only takes a second or a minute, it is still a waste of time and unfortunately could have been used more efficiently. This is why this study is an important matter that needs to be acknowledged by many, especially to the teachers. Taking this into consideration that would help them save time, effort and avoid height limitations. This study shall be implemented to help those people in need especially for the ones that want efficiency and sustainability to help them during their class hours.

In this study, recycling plays a crucial role in our part. Using windshield wipers is one of the important components in this study since it will serve as an eraser for cleaning the whiteboard. Instead of buying new windshield wipers to make this project to work, people can use old windshield wipers from an old car instead. Even those broken windshield wipers will have the same outcome, though if it only needs little repairs, then the user can fix it up a bit to ensure the windshield wipers won't break halfway through. For the other materials to be used to make this motorized whiteboard eraser to work, some of its parts can be found available in your house to save money and the effort of having to find them. Although it will not be easy to those people who are not so good in the field of mechanics, this research does provide a step-

by-step instruction on how to assemble the motorized whiteboard eraser. This shall make things easier for the ones who are interested and inspired to have their own motorized whiteboard eraser that would benefit a lot especially for the time usage.

## RESEARCH QUESTIONS

The main objective of this study was to create a Motorized Whiteboard eraser for educators and students using a Car Windshield Rubber Blade. Specifically, the study sought answers the following questions:

1. What is the effectiveness of the whiteboard eraser out of car windshield rubber blade in terms of:
  - 1.1. time executing the command;
  - 1.2. distance covered in centimeters; and
  - 1.3. horizontal swiping direction?
2. What is the speed that the whiteboard eraser out of a car windshield rubber blade can erase writings?
3. How much time can the whiteboard eraser out of a car windshield rubber blade can erase markings in terms of:
  - 3.1. 50% shaded part;
  - 3.2. 75% shaded part; and
  - 3.3. 100% shaded part?

## Hypothesis

**H1:** It is feasible to make a motorized whiteboard eraser out of a car windshield rubber blade for students and educators.

## II. METHODOLOGY

This study utilized the experimental design of research. According to Pubrica-Academy (2022) experimental research is a type of scientific examination wherein the independent variable is being changed and applied to a dependent variable to see how they will react or what the outcome will be. In this study, the Car Windshield Rubber Blade is the independent variable and the motorized whiteboard eraser is the dependent variable. Quantitative design was used to ensure that the experiments were well formulated and the right description of data to answer. (Fleetwood, 2023). This method should be used because it provides a high point of control over the variables that perform the results, and is beneficial in finding precise results.

## **DATA GATHERING PROCEDURE**

The following steps-by-steps procedures were presented on how to make an enhanced car windshield rubber blade as a motorized whiteboard for students, educators and people with disabilities using an arduino board and car windshield rubber blade along with the testing procedures in order to prove its effectiveness.

### **Ensuring protection and safety**

1. Since assembling the materials is hazardous it is relevant to wear safety gloves and appropriate clothes when performing the procedures.

### **Below is the testing procedure to test the efficiency in terms of reaction time of the product**

1. 3 trials were conducted
2. In each trial, the switch was turned on.
3. Idle time of the product was observed until it executed the said command.

### **Testing procedure to test the efficiency in terms of cleanliness and appearance of the whiteboard**

1. 3 trials were conducted.
2. In each trial, the product erased the whiteboard full of markings.
3. After it had been erased, the area was judged.
4. Remarks were recorded.

### **Here is the testing procedure to test the effectiveness of the product against a manual whiteboard eraser.**

For Manual Whiteboard eraser

1. 3 trials were conducted.
2. The text of the same size, using the same marker, was written on the whiteboard.
3. The ink was erased manually.
4. The time for the whiteboard was recorded.

### **For Motorized Whiteboard Eraser**

1. 3 trials were conducted.
2. The text of the same size, using the same marker, was written on the whiteboard.
3. The whiteboard was erased using the product.
4. The time for the whiteboard was recorded.

**Here is the testing procedure to test the effectiveness of the product against a manual whiteboard eraser.**

1. 3 trials were conducted.
2. Text was written near the boundary of the whiteboard.
3. The ink was erased using the product.
4. The area where the whiteboard eraser can erase was measured and marked.

To ensure the effectiveness of the motorized whiteboard eraser, the output was assessed to measure the degree of how much the whiteboard can cover based on centimeters. Along with the help of a tape measure, data was gathered and the distance covered in centimeters and horizontal swiping direction was revealed.

Meanwhile, the time of executing the command is significant for proving its effectiveness. In this study, the researcher used a phone timer to measure the idle time of the time of executing the command.

On the other hand, the speed of the motorized whiteboard eraser to erase the writings is crucial to the contribution to its effectiveness. Using the help of a phone timer, the velocity was measured and three trials were performed in order to reveal its speed in erasing writings.




Lastly, the researchers carried out trials to test the effectiveness of the motorized whiteboard eraser in terms of erasing. The researchers made use of a whiteboard ink marker to shade designated parts of the whiteboard to help determine how much the eraser can truly erase.

### **III. RESULTS**

This section presents the results and interpretations of the data that were collected during the testing procedure in relation to the research questions.

1. The effectiveness of the whiteboard eraser out of car windshield rubber blade in terms of:

**Table 1 Time of Executing the Command**

Trial	1	2	3
Photos			
Time in Seconds	0.35s	0.40s	0.50s

The researchers assessed the time of executing the command on a per second basis by using a time on a phoner. The timer button and the mechanism switch will be pressed at the same time to test the alertness of the motorized whiteboard eraser. With this, the researchers have gathered the following results. Table 3 shows the time of executing the command on a per second time basis. The table shows that the mechanism of the whiteboard is efficient and is responsive to the command of the switch. The first trial shows 0.35s, the second shows 0.45s while the third result came out 0.50s. This proves that the mechanism's command is alert and immediate when it is turned on for erasing.

Myolos (2012) claimed in their product handbook titled "2 binary inputs module with module rocker switches" that the product's reaction time to turn on and off was 2 seconds. This supports the effectiveness of the product's ability to operate with alertness and prompt response, with an average of 0.42 seconds.

1.2 distance covered in centimeters

**Table 2 Distance Covered in Centimeters**







Trial	1	2	3
Photos			
Before:			
After:			
CM COVERED (given dimension of the board is 80cm)	75cm	72cm	73cm

Table 2 presents the appearance of the trace of the erased area of the whiteboard eraser. The researchers observed the appearance on the trace of the erased area of the whiteboard eraser has been partially erased after one round. Writing on the board has been written. The erasing after trial one, two and three show that writings on the board have been cleaned to a certain degree.

The study was mentioned by the International Journal of Research in Engineering and Science (Komuna, 2021) with their study Automated Whiteboard Eraser. The study found that the majority of the whiteboard was clean after using the automated eraser. However, some parts were still not clean, indicating that there is room for improvement in the cleaning mechanism. The study suggests that although the current wiper is effective, it does not provide thorough cleaning for the entire whiteboard. Therefore, the researchers recommend further improvement to the mechanism to achieve complete cleaning of the whiteboard.

### **1.3 horizontal swiping direction?**



**Table 3 Horizontal Swiping Direction**







Trial	Successful rounds	Before Photos	After Photos
1	4 rounds		
2	3.5 rounds		
3	3.5 rounds		

Table 3 shows the effectiveness of the swiping directions of the Motorized Whiteboard Eraser. The researchers observed the appearance of the whiteboard ink after a few rounds of horizontal swiping directions. Trial one, had erased the writings on the board after completing 4 rounds. As for trial two, it managed to erase the writings after 3.5 rounds of horizontal swiping directions. And as for the last trial, trial three had the same results as trial two.

This is supported by the findings of the International Journal of Computer Sciences and Engineering (Romeo, 2021) with his study Automatic Whiteboard Cleaner, they stated that a horizontal swiping direction when erasing the markings on the whiteboard is effective with a few trials and takes only a few seconds. This demonstrates the validity of the researcher's results that the swiping motion in terms of the amount of erasing rounds needed.

**2. The speed of the whiteboard eraser out of a car windshield rubber blade can erase writings?**

**Table 4**




Seconds	0.0994194 miles per hour	0.0894775 miles per hour	0.0852166 miles per hour
Photos			
Average	0.0913 miles per hour		

Table 4 presented the speed of the motorized whiteboard eraser to erase writings. The researchers observed that the motorized eraser could erase its writings in 0.0994194 miles per hour on the first trial. Trial two shows that at 0.0894775 miles per hour was also able to erase the writings on the board. Trial three, which had the shortest time results, 0.0852166 miles per hour.

This is in line with the study of the International Journal of Research and Engineering and Science (Oyekola, 2021) titled Performance Evaluation of an Automated Whiteboard Cleaner, in which the mechanism operated at average speed of 0.0378 miles per hour and took 9.9 seconds on a 24 square inch board. This confirms the researcher's findings that the 90x60 cm board moved at an average speed of 0.913 miles per hour.

3. The time the whiteboard eraser out of a car windshield rubber blade can erase markings in terms of:
- 3.1. 50% shaded part;
  - 3.2. 75% shaded part; and
  - 3.3. 100% shaded part?

**Table 5 Time the whiteboard eraser out of a car windshield rubber blade can erase markings**




Shaded Part	Time	Photos
50%	1 minute and 6 seconds	 <p><b>Before</b>                      <b>After</b></p>
75%	1 minute and 20 seconds	 <p><b>Before</b>                      <b>After</b></p>
100%	1 minute and 36 seconds	 <p><b>Before</b>                      <b>After</b></p>

Table 5 showed how much time the motorized whiteboard eraser could erase writings in terms of the writings being 50% shaded; 75% shaded; and 100% shaded. The researchers observed that in only a minute and 6 seconds, it could erase a 50% shaded whiteboard. Trial two showed that in 1 minute and 20 seconds, the motorized whiteboard eraser could totally erase the whiteboard shaded 75%. Trial three presented that a 100% shaded whiteboard could be erased totally by the motorized whiteboard eraser in a span of a minute and 36 seconds.

As reported by International Journal of Research and Engineering and Science (Clinton 2021), linking with their study Automated Whiteboard Eraser. Its performance evaluation concluded that the total cleaning effectiveness of an automated whiteboard eraser was only within the wiper radius also in a certain amount of time. On the other hand, the motorized whiteboard eraser could erase from 50% to 75% up to 100% shaded parts that were written on the whiteboard, also requiring a certain amount of time.

#### **IV. DISCUSSION**

Whiteboard erasers are the common materials that teachers or instructors have been using nowadays in the classroom for discussing lessons every day. Whiteboards are one of the most efficient and most effective ways of teaching and learning in class. These days, however, it also has its disadvantages which affects the time, the students and the teacher. In general, this is a problem, the amount of time used just from simply erasing what was written on the whiteboard is time consuming on a limited time basis and interrupts the discussion. The height limitations of one's person can affect the amount of reach when it comes to cleaning the whiteboard. Nearly everyone faces hardships and difficulties at one time or another. But among the people with disabilities, such as those who are health concerned like people with disabilities (PWDs), it will greatly benefit them. Support must be considered for those who are struggling in this disabilities-experience. This is why some researchers are eager to develop a device that can erase a board without any human interaction and discuss a lesson with no disturbances.

This automatic whiteboard eraser can bring many benefits. This is an inexpensive tool which can save your time with a press of a button from your device. Not only can it save time, but it lessens stress and energy as well and won't need to worry about shorter people's heights just to clean the upper parts of the whiteboard. It can revise their learning while thinking and it is convenient. It can be used for a variety of purposes. And it is an effective interactive teaching tool. With the use of whiteboard erasers, students, teachers and other people can easily erase their mistakes quickly, saving them time and valuable energy. It is perfect for us, especially students without having to worry about messing up. With the use of this wiper, you won't have a hard time stretching your body.

During these days in our society, people depend so much on technology, so with the help of wipers anything can be possible. A number of other problems, such as wrist aches, hand movements can also be relieved with it. With this automatic wiper, you won't have to waste your energy and make plans. It is easier, faster, better, and much more fun. There is no need for you to even try, it has a fast enough speed to wipe everything for you. In addition to saving a lot of time, the wiper also eliminates

the need to clean the whiteboard by auto with unnecessary efforts. This motorized whiteboard eraser is designed to wipe whiteboards in less than half the time required by a human. For this purpose, we also ensured that the entire board gets cleaned efficiently. With this method, an automatic eraser will be attached to both sides of the board operated automatically with button control. Along the length of the board will be a tracking that allows the device to move back and forth. This device will be powered by an electric motor. It can enhance the teaching process as well as the learning process for the teachers and students. Not only can it have a great benefit for teachers but also for students. With this purpose of a whiteboard eraser, it will make everyone's life feel simpler and much more advanced in today's generation. The research questions seemed to find answers based on the effectiveness and efficiency of the Automatic Whiteboard Eraser. Research question one proved that the time in executing the command is efficient due to the fact that it is amenable to the command of the switch. This is seen based on how fast the command started after turning on the switch, which had an average of 0.42 seconds. Research question number one also showed that the writings on the whiteboard were erased by the product effectively, but this is only seen to be applicable to a certain degree.

The motorized whiteboard eraser had its limitations when it came to erasing specific parts of the writings on the whiteboard itself and it was seen when the motorized whiteboard eraser had only erased approximately 73.33cm (average of the erased area of the whiteboard) out of 80cm. The horizontal swiping direction had been proved effective based on the number of successful rounds it had to execute to properly erase the writings on the whiteboard.

After the successful horizontal rounds, the motorized whiteboard had carried out, it had completely erased the writing with no residue left. Research question number two showed that the time of the whiteboard in erasing writings on the board was efficient in terms of speed. The motorized whiteboard eraser managed to erase the writings on the board with an average time of 0.2741135 miles per hour given that the motorized whiteboard eraser had completely erased the writing.

This indicates that it was successful and efficient in terms of erasing and the speed that goes along with it. Research question number three proved that the motorized whiteboard eraser could auspiciously erase shaded markings on a whiteboard. In all trials, the product had successfully erased shaded areas on the whiteboard indicating that it is effective in the aspect of having to erase parts in the whiteboard whether it be 50%, 75%, or 100% shaded area. The hypothesis was deemed tested and proven. The Automatic Whiteboard Eraser is feasible and can be made effective based on the findings and the collected data of the study.

## REFERENCES

International Journal of Research in Engineering and Science (February, 2021) - Automated Whiteboard Eraser

[https://ijcrt.org/papers/IJCRT\\_187756.pdf](https://ijcrt.org/papers/IJCRT_187756.pdf)

International Journal of Research in Engineering and Science (May, 2019) - Automatic Whiteboard Cleaner [https://www.researchgate.net/publication/335803726\\_Automatic\\_White\\_Board\\_Cleaner](https://www.researchgate.net/publication/335803726_Automatic_White_Board_Cleaner)

Jill Anderson. (2019) - *Harvard Graduate School of Research. The Gift of Teacher Time.*

<https://www.gse.harvard.edu/news/uk/19/09/gift-teacher-time>

Mylos Building Automation (Open Source, n.d.) - Mylos KNX: 2 binary inputs with rocker switches 2CSYK1023C/S

[https://library.e.abb.com/public/41b9b147a2d54d3ea604ca142cdbdc51/ProductManual\\_2CSYK1023\\_EN.pdf](https://library.e.abb.com/public/41b9b147a2d54d3ea604ca142cdbdc51/ProductManual_2CSYK1023_EN.pdf)

Pubrica Knowledge Work (2022) - *Research Design; Experimental Study Designs: Research; Types of Design, Methods and Advantages*

<https://pubrica.com/academy/experimental-design/experimental-study-design-research-types-of-design-methods-and-advantages/>