International Journal of Industrial Engineering
2022;6(1):26-33.
ISSN: 2456-8449

A Novel Approach for Conducting Secure and Performance Proctored Examinations by Organization

Vanshika Rastogi[1*], Abhilasha Varshney[2], Shruti Keshari[2]

[1]*Department of Artificial Intelligence and Data Science, East Point College of Engineering and Technology, Bengaluru, Karnataka, India.*
[2]*ABES Engineering College, Ghaziabad, Uttar Pradesh India.*

**Corresponding author: rastogi.vanshika21@gmail.com*

Abstract. Conducting online quizzes and examinations have been done for several years in many ways. However, it became popular and unavoidable during this covid-19 pandemic. There are many types of solutions which are available predominantly in the web pages. Thorough study was carried out to enhance the prevailing methods with better security and performance. In existing online exam there are many ways to identify the malpractice, hence it is vital to develop an effective face detection algorithm to avoid malpractice. However, detecting faces continuously throughout the exam from the candidate is still challenging and memory consuming. In this paper, a computer vision algorithm named Haarcascade classification has been proposed for robust and continuous face detection for conducting proctor exams. One of the main malpractices is using the Virtual machines during the online exams. This work also focuses over an algorithm to detect the malpractice which has been done with the help of External or s Third-Party Virtual Machines. In future, a secured application can be developed for uploading the random questions for the respective organization to conduct Online Examinations.

Keywords: Online Examinations, Face Detection, Haarcascade classification, Third Party Virtual Machines, Server client.

INTRODUCTION

Online Examinations have become the most common and important happening in and around the world. Lack of proctoring can make the candidate to do malpractice easily, so this becomes the one of the primary issues behind the Online based exams. Hence, proctoring using the webcam with the help of algorithm named HAAR CASCADE classification is proposed. This type of malpractice is more likely to happen in the offline exams and in the Pandemic period it has become the vital place. However, the requirement for an exam location runs counter to accessibility, which is the main draw of online or distance learning. The rule might also make e-learning less affordable or make it more difficult for students who attend classes remotely.

Other advantages of online education include the automation and simplification of educational procedures [2, 3], and online assessments also benefit from these features. This paper suggests a solution to the problem of security and cheating for online exams, removing the need for human participation to benefit from the advantages of online processes. Although there are a unit few solutions projected during this direction, most of them haven't been enforced with success and lots of them solely stay in theory. It has been implemented and tested. Due to this covid19 pandemic, all the educational institutions instructed to conduct their examination through online. So, this is the right time to implement new technologies for conducting examinations. This work allows any organisation to conduct test from anywhere and the test attendees can attend the test from anywhere provided if they have an internet connection. Increased strictness of the test is observed. Proactive methods are employed to detect malpractice. Application memory is made friendly for the test attendees to attend the test smoothly.

The e-monitoring eliminates the need for attendees to travel to a set location by acting as a proctor for remote examinees to prevent cheating. This essay focuses on online exams for middle- or high-school math or English competitions, as well as assessments for distance-learning university courses. This essay tackles the issue of giving an online exam at a set time with the same questions to everyone taking it, just like an offline exam, but without limiting the examinees' actual locations.

Received: 02.03.2022 Revised: 10.04.2022 Accepted: 26.04.2022
Licensed under a CC-BY 4.0 license | Copyright (c) by the authors

S.G. Klauer et.al [1] achieved good results using differential regions on face detection and in a public dataset Models were trained in 2015.They used a dataset with repeating images, but the image order was carefully chosen producing well trained output model. While going through their paper we found that there were 2-3% increase in accuracy because of randomly shuffled input images. Images were also edited before being passed as input to the model training. During testing the images were labelled in output hence output comparison checking were made easy for multiple images also.

U. Yufeng et.al [2] produced a test accuracy of more than 50 percent in a 2015 national competition through using a combined method of modification of facial structures along with facial boundary restrictions. Instead of using a common method like detection through whole element structure and shape, they used simple facial structures to detect the entire face. This cut off in data to be trained decreased training time required thereby increasing training efficiency and allowing to train on more images with same power. X. Fan et.al [3] generated trained models to detect small and acute faces in images with well populated dataset. This model could also be used to produce fine-tuned results with greater accuracy. Figure 1 shows the theoretical face model.

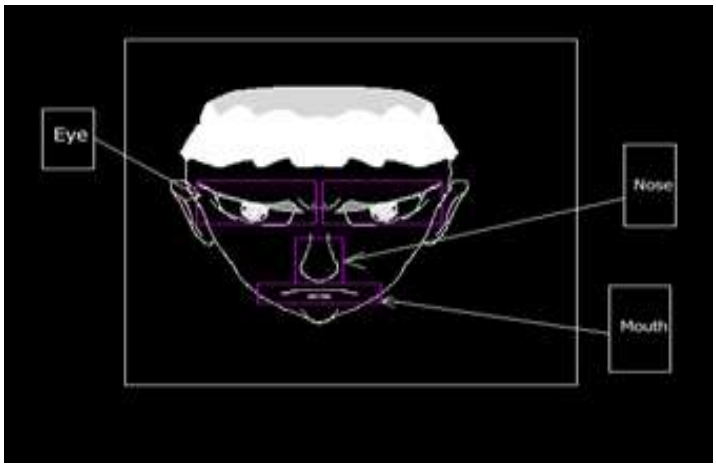

FIGURE 1. Theoretical Face Model

T. Azim, et.al [4] planned design was put to the test on several publicly available data sets. On the Emote information collection, this module will receive the formatted user data, but it received position insists art. check gained a matched result alternative information. L. Li et.al [5] suggested that on most data sets, their expected design enhanced results by 1–3 percent as compared to Associate in Nursing Alex's internet design [6].

T. Wang et.al [7] stated that dropout is one of the regularizations for dealing with the over-fitting problem. Throughout coaching, it recognises the random gives a united data by the set of data. N. A. A. Rahman., et.al [8] quoted that secured units from old data will help to provide an excessive amount of prediction. This prevents the matter of over fitting and provides higher leads to preventing over fitting than different regularization ways. M.H Yang et.al [9] proposed that Virtual Machine is run on top of the OS to detect and handle OS crashing exceptions. Our assembly code method of is going to set an error bit of such kind. The rest is simple as we just need to detect if there is presence of fault op codes set by the VM. These fault codes can be detected from the LP Exception pointers, pointing to the context record [10].

The purpose of this systematic literature study was to evaluate the research that is currently available on online exams and its counterparts [11]. Most students found that their personal lives, academic performance, and welfare were all supported greater by online learning settings [12]. Staff preferred online exams due to their workload implications and simplicity of completion, and a simple analysis of the logistics of print-based exams could reveal some significant recurring cost savings. Although some faculty and students disliked the concept of taking exams online, research that took age and gender into account found very little variation in preference [13].

Figure 2 shows the Haar cascade Face Detection. Since there is a true need for more study before a synthesis of information on the latter pathways, we now turn our attention to areas of need in future research and place a greater emphasis on accreditation and authenticity than these alternatives [16]. Since there is a potential for integrity violations owing to the distance between students and teachers, online courses are under fire for their veracity [14]. Researchers claim that to ensure that students are evaluated fairly and effectively, online programmes must address student integrity. One way to do this is by using proctoring software. According to Moten and colleagues, instructors may not know who is taking tests or how to most effectively validate learning in online courses because students work with a fair amount of liberty and anonymity [15].

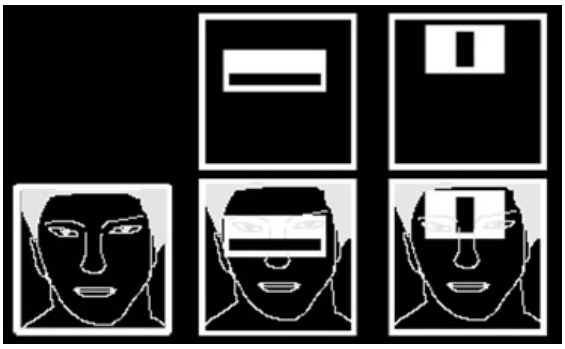

FIGURE 2. Haarcascade Face Detection

PROPOSED SYSTEM

For the security purposes, there are two parts of application naming DB Server Client and Quiz WPF. They share a common database which is securely stored and served on a web server. One part of the application helps to upload the questions and monitor the students in an efficient way. Other part of the application is where the security comes in with continuous face detection as well as VM machine detection (Virtual Machine detection). Face Detection is being efficiently done through a separate thread. This is possible because of the application being a custom-made desktop application. Figure 3 shows the overview of the secured web server layers.

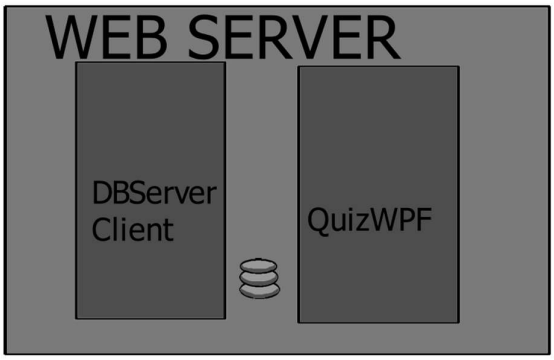

FIGURE 3. Overview of Secure Webserver Layers

It is good that the readers have an idea about the assembly language to better understand how the code works. In previous approach there is no concern for detecting virtual machine usage. This can lead the candidates to do malpractice which cannot be detected easily, because using virtual machine it is possible to bypass the window resize events without being detected by the application. As resizing the VM window doesn't raise the window resize event inside the Virtual Machine. So that virtual machine detection is introduced using assembly code, it will increase the security level up to the mark. Figure 4 depicts the process of VM Error and Exception Detection in an efficient manner.

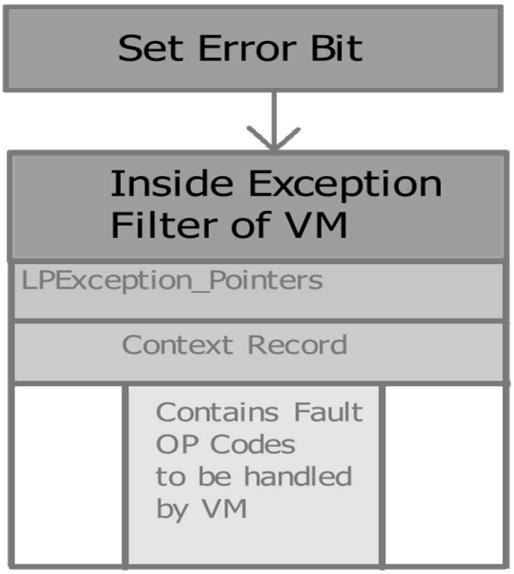

FIGURE 4. Process of VM Error Detection and Exception Detection

RESULTS AND DISCUSSION

Haar Cascade face detection algorithm is used to monitor the users. In this approach, face detection is being done continuously. So that it will ensure that whether the user is actively participated throughout the exam. The face detection algorithm is being carried over on a separate thread. This enables the off-load work in a multiprocessor system. Training has been given for face detection module at several intervals using different models. It leads to achieve a good accuracy rate. It is found as the best result and implemented it. Figure 5 depicts the overall working procedure of Haarcascade algorithm.

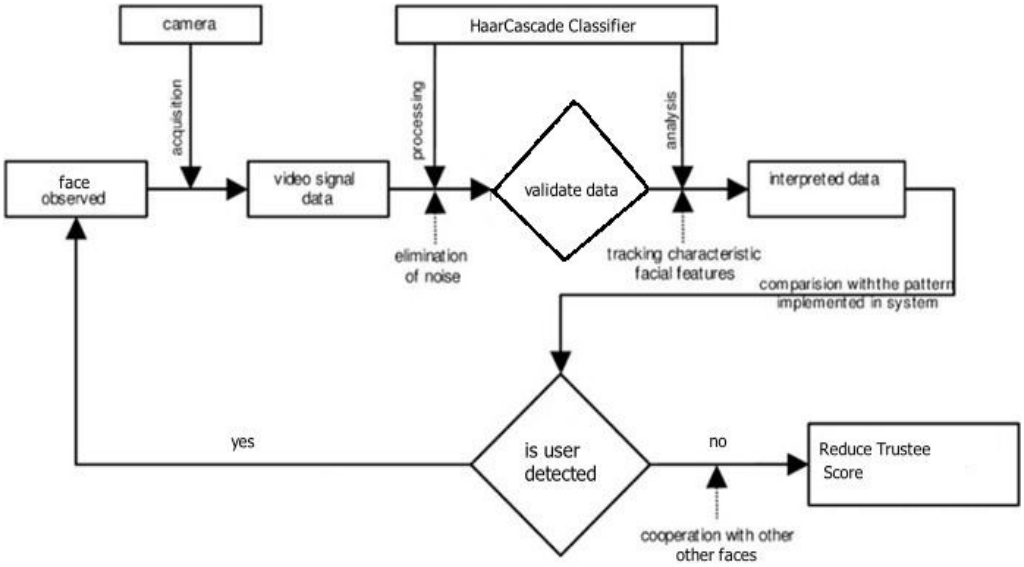

FIGURE 5. Procedure of HAARCASCADE Algorithm

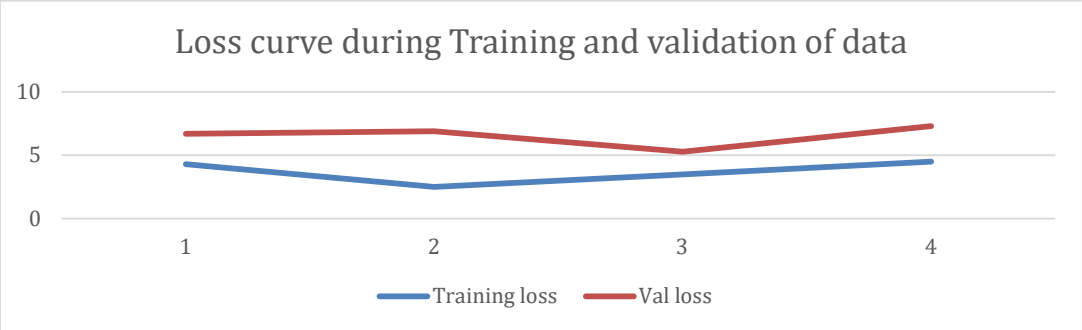

FIGURE 6. Training and predicted Loss

There are two components of the application called DB Server Client and QuizWPF for security reasons. They share a database that is safely kept and made available on a web server. The application has a feature that makes it easier to upload the quizzes and effectively keep track of the students. Figure 6 shows the Training and Predicted Loss.

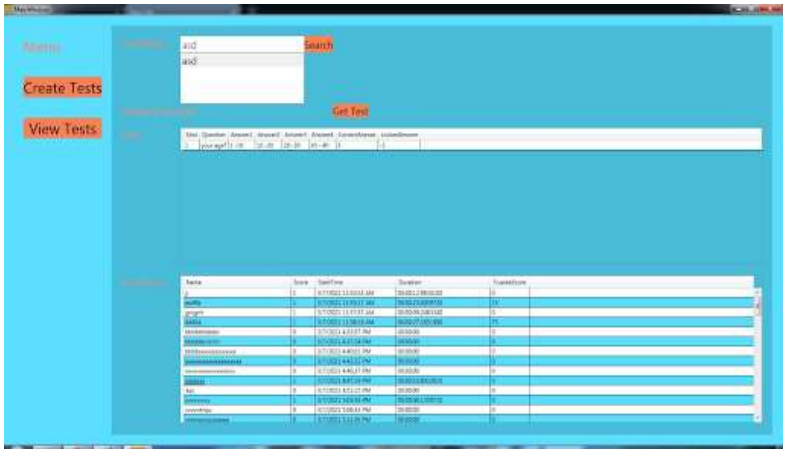

FIGURE 7: Test Images

Another area of the application is where security is implemented with ongoing face and virtual machine detection (Virtual Machine detection). Figure 7 shows the Test images. A different thread is effectively used to carry out Face Detection. The fact that the application is a personalised desktop application makes this possible. The overview of the secured webserver tiers is shown.

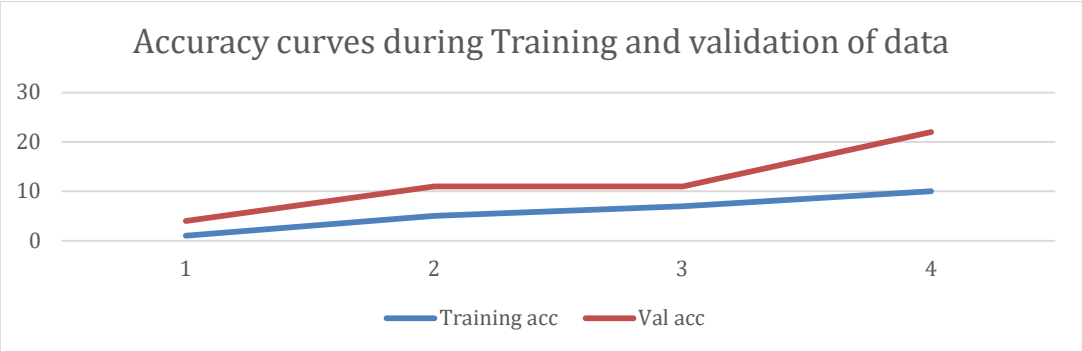

FIGURE 8. Training and Predicted Accuracy

In this paper, a robust and continuous face detection technique for proctor exams called Haarcascade classification has been suggested. Figure 8 shows the Training and predicted accuracy. Using virtual machines for taking online tests is one of the biggest frauds. Figure 9 shows the result image.

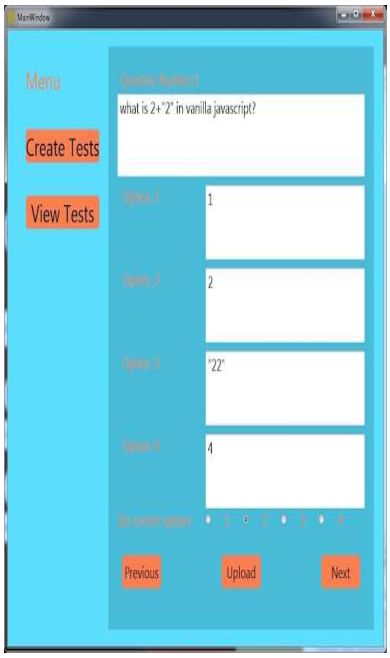

FIGURE 9: Result Images

This work also focuses on an algorithm to identify wrongdoing committed using external or third-party virtual machines. In the future, a secure application can be created to upload the arbitrary questions that will be used by the relevant organisation to conduct online exams. Table 1 and Table 2 shows the loss and accuracy of the training and validation of data.

TABLE 1. Training Loss and Predicted Loss

S.No	Training loss	Value loss
1	4.3	2.4
2	2.5	4.4
3	3.5	1.8
4	4.5	2.8

TABLE 2. Training Accuracy And predicted Accuracy

S.No	Training accuracy	val_accuracy
1	1	3
2	5	6
3	7	4
4	10	12

IMPROVEMENTS

Discarding irrelevant areas of the image like the areas with no faces improved the results while monitoring. We maintained a margin around the face area in the image and used it differentially to detect the change in face area poistions. We also implemented features to detect multiple displays in our application. Our application also

closes other windows and processes in the OS decreasing the chances of malpractice increasing security. Figure 10 shows the output files of the system.

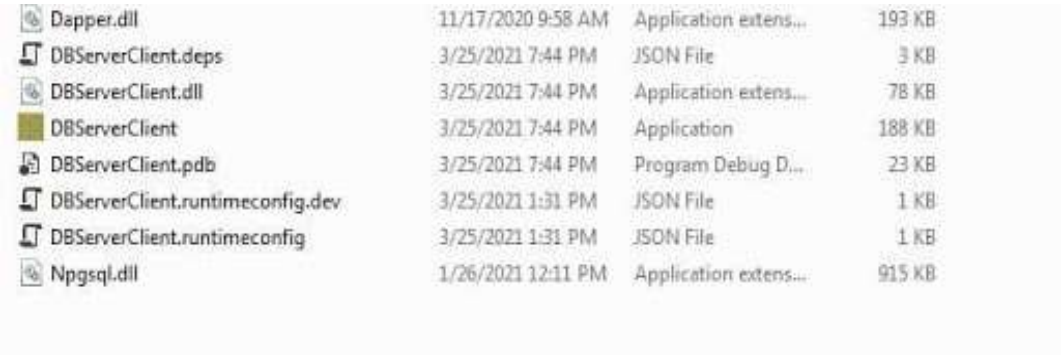

FIGURE 10. Output Files

CONCLUSIONS

Following online learning, which has experienced a major increase in demand because of the issues caused by the continuing COVID-19 Pandemic, online testing is the next phase of adoption. Although OPS do not assert to be entirely error-proof, they are quickly influencing the acceptance of online testing from home, a situation that was previously dismissed by the public as absurd. In this paper, a Malpractice recognition method is designed with the following features. face detection/tracking, Haarcascade Classification Virtual Machine Detection, Using Assembly code, Checking System Directory, Checking Screen and Display height and width, Windows Presentation Form (WPF), PostGreSQL (Online database. The effectiveness of the proposed system is validated on the open dataset. This work also focuses on an algorithm to identify wrongdoing committed using external or third-party virtual machines. In the future, a secure application can be created to upload the arbitrary questions that will be used by the relevant organisation to conduct online exams. This simple yet efficient method combined with effective virtual machine detection using assembly code produced a stricter desktop application to conduct tests.

REFERENCES

[1]. S.G. Klauer, T. A. Dingus, V. L. Neale, J.D. Sudweeks and DJ Ramsey, 2006, "The Impact of Driver Inattention on Near-Crash/Crash Risk: An Analysis Using the 100-Car Naturalistic Driving Study Data", *Technical Report,* pp. 1-224.

[2]. U. Yufeng and W. Zengcai, 2007, "Detecting driver yawning in successive images", *Proc. 1st Int. Conf. on Bioinformatics and Biomedical Eng.*, pp. 581-583.

[3]. X. Fan, B. Yin and Y. Fun, 2007, "Yawning Detection for Monitoring Driver Fatigue", *Proc. Sixth Int. Conf. on Machine Learning and Cybernetics*, pp. 664-668.

[4]. T. Azim, M.A. Jaffar and A.M. Mirza, 2009, "Automatic Fatigue Detection of Drivers through Pupil Detection and Yawning Analysis", *Proc. Fourth Int. Conf. on Innovative Computing Information and Control*, pp. 441-445.

[5]. L. Li, Y. Chen and Z. Li, 2009, "Yawning Detection for Monitoring Driver Fatigue Based on Two Cameras", *Proc. 12th Int. IEEE Conf. on Intelligent Transportation Systems St. Louis*, pp. 12-17.

[6]. T. Wang and P. Shi, 2005, "Yawning Detection for Determining Driver Drowsiness", *IEEE Int. Workshop VLSI Design & Video Tech. Suzhou*, pp. 373-376.

[7]. M.H. Yang, D.J. Kriegman and N. Ahuja, 2002, "Detecting faces in images: A survey", *IEEE Trans. Pattern Analysis and Machine Intelligence*, **24(1),** pp. 34-58.

[8]. N. A. A. Rahman, K.C. Wei and J. See, 2006, "RGB-H-CbCr Skin Colour Model for Human Face Detection", *Proc. of The MMU Int. Symposium on Information & Communications Technologies*, pp. 1-6.

[9]. S. Bhushan, M. Alshehri, N. Agarwal, I. Keshta, J. Rajpurohit and A. Abugabah, 2022, "A Novel Approach to Face Pattern Analysis. *Electronics*," **11(3)**, pp. 1-14.

[10]. Gopalakrishnan, K., N. Dhiyaneshwaran, and P. Yugesh. "Online proctoring system using image processing and machine learning.", *Int. J. of Health Sciences*, **6(S5)**, pp. 891-899.

[11]. I. Ahmad, F AlQurashi, E. Abozinadah and R. Mehmood, 2021, "A Novel Deep Learning-based Online Proctoring System using Face Recognition, Eye Blinking, and Object Detection Techniques," *Int. J. of Advanced Computer Science and Applications*, **12(10)**, pp. 847-854.

[12]. Hrithik, S., J. Sumanth, And K. U. M. A. R. Vishal Nikhil. 2022, "Face Recognition Based Online Test Proctoring Platform.", *New Horizon*

[13]. P. Srinath, and V. Tallam. 2022, "Automated Online Proctoring Using Deep Learning.", *New Horizon*

[14]. K. Garg, K Verma, K Patidar and N Tejra, 2020, "Convolutional neural network based virtual exam controller," *In2020 4th Int. Conf. on Intelligent Computing and Control Systems (ICICCS),* pp. 895-899.

[15]. NA Karim and Z Shukur, 2016, Proposed features of an online examination interface design and its optimal values. *Computers in Human Behavior*, **64**, pp. 414-422.

[16]. B Pattanaik, and S. Murugan, 2017, "Cascaded H-Bridge Seven Level Inverter using Carrier Phase Shifted PWM with Reduced DC sources." *Int. J. of MC Square Scientific Res.* **9(3)**, pp. 30-39.