

## **Viva Voce Coaching Using a Virtual Viva Simulator for Postgraduate Students**

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Mustafa Moosa Qasim <sup>(✉)</sup>, Ali Raad Abdulkareem,  
Mohamed Abdulrhman Abdulhamed  
University of Basrah, Basrah Iraq  
moosaqasim1993@gmail.com

Abdul Nasir Zulkifli  
Universiti Utara Malaysia, Changlun, Malaysia

**Abstract**—Most postgraduate students intend to complete their study successfully. Yet, they might face fear of failure or fear of facing examiners during the viva session. A viva session has been noted to be mysterious, unpredictable, and potentially frightening to some students, particularly to students whose English is their second language. Some of these students might consider themselves to have low ability in expressing their words thus lacking in confidence to face an oral assessment. These students, however, can prepare well for a viva session by rereading their thesis, arranging for a mock viva, and practicing debating their work with a senior student. This paper attempts to present a new way of viva preparation by means of a virtual viva simulator (V2Sim). This V2Sim is based on a virtual reality approach that uses an avatar as an examiner. This study aims to design and develop a V2Sim to provide a repeatable coaching for a viva session at no cost. The implementation of the V2Sim involved three phases: identification of research problem, design and development, and evaluation. The study aspires to examine the experience of postgraduate students using the new technique. For this purpose, a combination of interviews and an experimental method were adopted to evaluate the V2Sim coaching among 30 PhD students. Interpretive outcomes from this study suggest that the V2Sim coaching is a novel tool for assessing learning outcomes for a viva voce session and for improving students' skills. Based on these findings, implications for the adoption of V2Sim coaching as an assessment method are discussed, among which the improvement of the experience of viva-voce session in the future.

**Keywords**—Viva voce, Virtual Reality, Virtual coaching, Avatar, Anxiety.

### **1 Introduction**

In most of the universities in Europe, North America, and New Zealand, the viva voce (oral exam or oral test) is a compulsory process for evaluating the thesis written by postgraduate research students [1]. This examination can be optional in other countries such as Australia, Brazil, India, Malaysia, and South Africa, depending on the rules

of a university [1], [2]. The viva voce is a session in which examiners assess a student's research work through a question-and-answer session [3], [4], [5]. The process may vary across institutions, and has been noted to be mysterious, unpredictable, and potentially frightening to students [5], [6]. These aspects were attributed to the fear of failure and the fear of facing external and/or internal examiners during the viva session. For instance, fear of failure is one of the common anxieties to virtually all candidates, as noted by an international participant: "Everyone on my shoulders, there is too much to lose, my family, my mother, father, everyone, they all depend on me to do this" [7]. Students might also be clueless as to how to answer the questions [1]. In other words, anxiety and stress are considered the main concerns of postgraduate students in regard to a viva voce session. These students are generally worried about how to answer unexpected questions effectively and vigorously, and therefore, would decide to be well prepared for the examination. This paper highlights one of the means for the preparation: by undergoing a mock viva.

The present study was carried out to design an innovative technique of viva voce preparation with the use of a virtual viva simulator. The simulator serves to ask the most common questions that would be addressed in a real viva-voce session, using an avatar. Postgraduate students, including doctoral candidates will be able to access the virtual viva simulator at any time.

The simulator was developed with the use of virtual reality (VR) technology, defined as a computer simulation for designing a real or an imaginary system, using a simulated three-dimensional system [8]. The system, mostly used in the education domain [9], allows its users to perform operations on a simulated system and observe the effects in real time [10]. VR can be used to create engaging educational systems which are more convincing to public users in different domains [11], [33], [34], [35]. In the field of psychology, VR has been explored as part of a persuasive technology that works as computer simulations [12]. More recently, VR has been increasingly used as a persuasive technique in various domains [13], [14]. Due to its attractive aspect, it has been effective in facilitating the development of competencies necessary in increasing end-users' employability [15].

One of the methods of applying VR as a persuasive technology is via an expressive interface [12]. Hence, this paper intends to examine the use of VR, particularly an avatar as a persuasive technique through a virtual coaching like real life for viva voce session. A virtual viva simulator called V2SIM was designed based on the various persuasive principles including words or texts, layout, typography, and colour scheme. The aim is to assist a doctoral candidate in overcoming his/her anxiety during an actual viva voce assessment.

The design of any interactive system in a learning environment should facilitate the target behaviour to perform towards the desired outputs [16]. Therefore, this paper explains in detail the design and development of an interactive V2SIM system and its features. The outcomes from the evaluation of the system among the users will be discussed. Finally, some challenges with regard to how the V2SIM system attends to anxiety and fear among doctoral students during a real viva voce session assessment will be clarified.

## **2 Materials and Method**

This section describes the design and development of the V2Sim prototype for the postgraduate students. The Rapid Application Development (RAD) methodology [17] and the Laudon and Laudon [18] approach were adopted to construct the proposed prototype. The RAD method involved four phases: requirements analysis, design, construction, and cut over. The Laudon and Laudon approach [18] involved three main steps: developing the initial prototype, using the prototype, and revising and enhancing the prototype. The process began with the production of the first version of the proposed prototype. The prototype produced was then used to identify its ability and adequacy. Then, all the shortcomings of the prototype were revised to enhance the system. The steps of the Laudon and Laudon [18] approach were incorporated into the third phase of the RAD methodology to address the perceived limitations of the formal methods, which are based on the traditional System Development Life Cycle (SDLC).

### **2.1 Requirement analysis**

Requirement analysis or identifying the requirements was the fundamental process of designing the V2Sim. The purpose of this phase was to determine the core elements of the V2Sim. The information obtained in this phase was derived from the literature review. The literature review gave an account of all published works, through books, journals, websites, proceedings, conferences, etc. According to [19], these documents are reliable sources for fact-finding from scholars. A project requirement could be collected using various techniques, including documents analysis [20].

In this phase, all the documents related to viva voce tasks and virtual reality coaching were reviewed and related facts were extracted and utilised to identify the core functionalities of a V2Sim prototype. A viva voce exam is usually interactive between a student and an internal examiner and an external examiner who have expertise in the subject area [21]. The core elements of a real viva session include student, examiners (e.g. persons whose area of specialisation match the student's domain) and questions that are asked during the session. Therefore, the main idea of this study is how an examiner is represented by an avatar. As demonstrated by [22], a virtual avatar doctor might resemble a real human doctor and act to interact with a patient-user to establish a diagnosis scenario [22]. Similarly, [23] developed V-CAMS as an avatar system for assessing suicidal patients. These references were considered as guidelines to this study. Therefore, this phase sought to analyse the problems and issues pertaining to the latest developments in the domain and the use of an avatar for virtual coaching. In the scope of science, the study focuses only on information technology, networking, information management, and artificial intelligence as the general areas required for PhD candidates. Given these points, this study necessitates the use of a decision tree to deal with the required fields and settle the related questions. A recorder is considered as an essential device to be used in the recording of a mock viva voce session. Throughout a viva voce session with an avatar examiner, the candidate needs to record the audio and video of the session. The recording will show the behaviour of the candidate and he or she is able to identify his or her strength and weakness throughout the session. This will

help the candidate to overcome all his or her weaknesses and be more prepared to undergo a real viva voce session. Fig. 1 shows the core components of the V2Sim prototype.

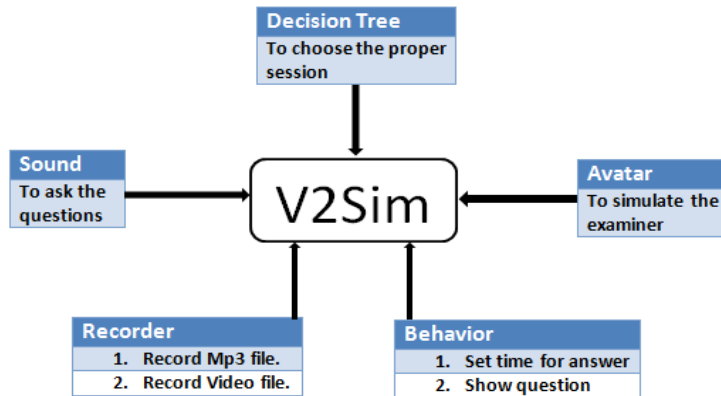


Fig. 1. Core components of V2Sim prototype

Finally, this phase also determines the required hardware and software for the development of the V2Sim prototype. Table 1 shows the hardware and software required for the development of the prototype.

Table 1. Hardware and Software Requirement

Hardware	Software
Personal computer	Microsoft Windows 10
Digital camera	Microsoft Office 2016
Microphone	Adobe Flash CS6
Scanner	Adobe Photoshop CS6
Printer	Windows Movie Maker
	BB FlashBack Express
	WampServer
	Notepad++

## 2.2 Design

The design phase involved placing the V2Sim prototype design as an interactive storyboard scenario and preparing the elements to be used in prototype development. Storyboard was used to display a draft of all the elements contained in the V2Sim prototype such as how the menu screens and the images (static and animated) are to be displayed, when and for how long they are to be displayed, and what audio and text will accompany the pictures. A storyboard in the design phase uses sketches drawn in sequence to visualise the proposed ideas through the composition of appropriate information that can be efficiently understood by the developers [24], [25]. Hence, prior to the creation

of the real content, the interactive V2Sim prototype was designed as a storyboard without using a computer.

Also in this phase, a conceptual architecture of the V2Sim prototype was produced as shown in Fig. 2. The user can interact with the prototype via a web browser. The user interface in the web browser includes a controller which is used to control the order given by the user. The V2Sim prototype uses a decision tree to determine the proper session to be conducted. The prototype has twelve sessions of files and timer file. Each of these files has a unique key. The question file contains twenty-two questions for each session. The timer file has a specific duration time to answer each of the questions given in the proper session.

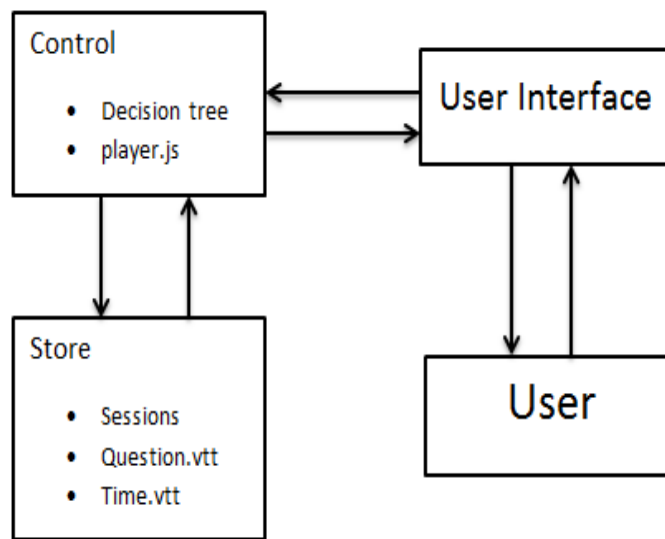
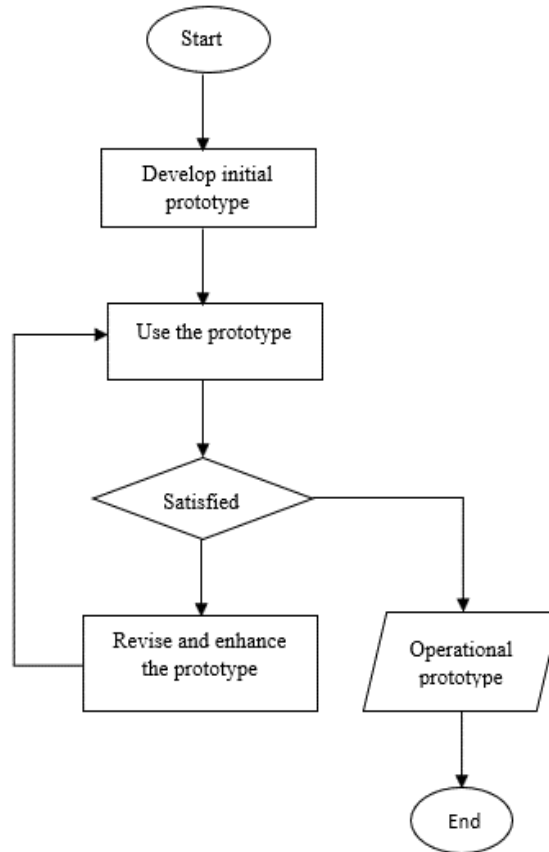


Fig. 2. Conceptual architecture of V2Sim prototype

### 2.3 Construction

The construction phase focused on the system development task and the related functions of the V2Sim prototype. As mentioned by [18], the approach was modified as part of the construction phase in the RAD method. This technique consists of three sequential steps: developing the initial prototype; using the prototype; and then revising and enhancing the prototype. These steps were implemented to produce the first version of the prototype which was then used to identify its ability and adequacy. All the identified shortcomings were then upgraded to further enhance the prototype. Fig. 3 shows the steps of the Laudon and Laudon approach implemented in this study.



**Fig. 3.** Steps of the Laudon and Laudon approach

Fig. 3 shows the steps that must be accomplished by the V2Sim before a higher fidelity prototype is realised. In this phase, an avatar was created as one of the important parts of the construction phase. The avatar could be developed in several ways. Voki.com and sitepal.com provide the tools that can be used online. While the background control and text-to-speech technique can be used from the gadgets supplied by these websites. For the present study, the first avatar was created by the provider. We then created another avatar to make the prototype appears more realistic like a real examiner in a viva session. The second avatar was created to be identical to the image of an academician. In creating the avatar, an image of a lecturer was created and then modified using Photoshop CC [26]. Three dimensional (3D) modelling tools such as 3DS Max and Blender can be used to generate the avatar [27].

In addition, the BB FlashBack software which is a screen capture software was used to record the twenty-two questions for each viva voce session. These twenty-two questions produced a total output of twelve videos for the whole session. A decision tree was developed using a PHP programming language. PHP is a general-purpose scripting

language suited and mostly used for server-side web development [28]. PHP is mainly run on a web server. In this case, we had to install the server to run the PHP code. WampServer is free and compatible with the PHP codes. The outcome of this process was a decision tree PHP script, which was used to determine the proper session for each candidate through his/her data entries.

The V2Sim prototype has three main domains namely; Information Management, Artificial intelligence and Network on the main page as shown in Fig. 4. It allows post-graduate students to choose one of the main domains. Then, the simulator will display the sub domain, for example the sub domain for artificial intelligence is shown in Fig. 5. When the student selects any sub domain from the displayed list, the session will immediately begin. Fig. 6 shows some samples of the session page.

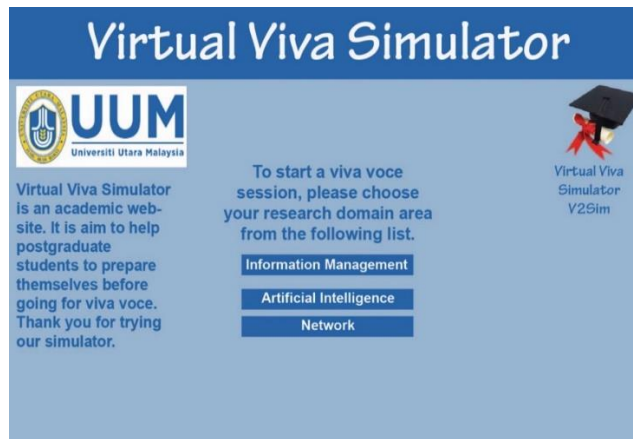


Fig. 4. Main Page of V2Sim

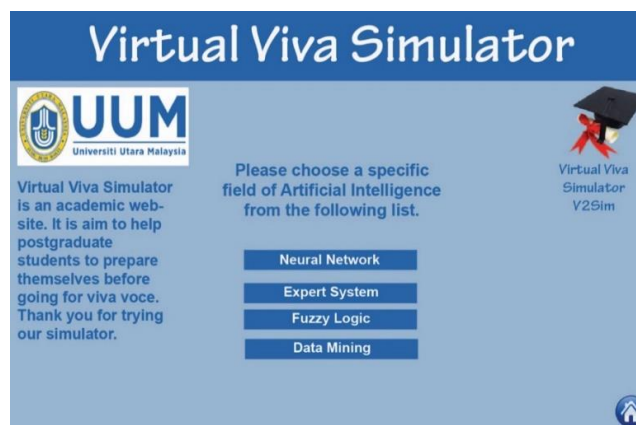


Fig. 5. Sub Domain Page of V2Sim



Fig. 6. Samples of the session Page

## 2.4 Cutover

The cutover phase was the fourth phase of the RAD methodology. This phase involved the carrying out of a comprehensive test for the V2Sim prototype. The test was to ensure that all the functions and activities stated in the requirement analysis were correctly implemented. In the final step, the V2Sim was uploaded to the global host. The cutover phase was considered the best approach for assessing the construction phase. The phase involved testing the V2Sim coaching system among postgraduate students. For that purpose, semi-structured interviews were conducted with the PhD students of Universiti Utara Malaysia. No rules were applied in selecting the sample



size in a qualitative interview inquiry as the size would depend on information-rich cases [29]. A small number of people with in-depth information can be very useful [30]. Also, when a researcher asks straightforward questions to solve a problem in the applied field, a small number of interviewees can be considered sufficient [31]. Accordingly, this study aims to select an adequate number of PhD students with in-depth information. The participants were chosen based on the following criteria: (1) interest in participating and the ability to communicate in English; and (2) able to bring their own tablet or laptop to practice using V2Sim and use it for about 20–25 minutes.

### 3 Results and Discussion

A total of 30 PhD students were involved as participants. They were pursuing their studies in information technology, networking, information management, and artificial intelligence. Most of the questions for the evaluation were adapted from [7] and [23]. The questions are specific to viva voce session and are as follows: (1) What is your overall impression on the V2Sim coaching? (2) Do you consider the process worth doing and would use V2Sim coaching to improve your skills in a viva session in the future? (3) Do you find the coaching useful to other students? (4) Do you believe that the V2Sim coaching supports you when you need it? (5) Do you like the avatar examiner who assesses your viva voce session particularly in learning? (6) What was your experience of the viva voce session? (7) What was your concern after using the V2Sim coaching for the viva voce session? (8) Were the questions asked by the avatar examiner logical? (9) How long did you need to answer the questions? And (10) What is your advice to other students with regard to using the V2Sim coaching?

Based on the interviews conducted, the response of the participants to the V2Sim coaching experience was very encouraging. The participants for the validation stage consisted of those aged between 25–29 years (4, 13.3%), 30–39 years (19, 63.3%), and 40–49 years (7, 23.3%) as shown in Table 2.

**Table 2.** Age group of participants

Age	Frequency	Percentage (%)
25-29	4	13.3
30-39	19	63.3
40-49	7	23.3

Participants were postgraduate students from various countries including; 9 (30%) Iraq, 7 (23.3%) Nigeria, 5 (16.6%) Yemen, 5 (16.6%) Pakistan, 3 (10%) Malaysia and 1 (3.33%) Somalia as shown in Table 3.

**Table 3.** Country of origin of participants

Country	Frequency	Percentage (%)
Iraq	9	30
Yemen	5	16.6
Nigeria	7	23.3
Pakistan	5	16.6
Somalia	1	3.33
Malaysia	3	10

The participants who participated in the assessment were divided into two groups. The first group consisted of those who have completed their proposal defense (17; 56.7%) and the second group consisted of those who have not completed their defense (13; 43.3%) as shown in Table 4.

**Table 4.** Participants’ proposal defence status

Proposal defense	Frequency	Percentage (%)
Complete	17	56.7
Not complete	13	43.3

All the participants believed that the proposed avatar in the V2Sim was acceptable in imitating the actual examiner in a viva voce session. The students also preferred a simple avatar using a computer-generated video recorded by a virtual viva simulator. As stated by one participant, “It is clear that the avatar is a computer and not a person, so I do not have any fear or anxiety”. Therefore, he found the simple avatar to be acceptable and valuable for practicing a viva voce session thus enabling him to overcome his anxiety. The participants also reported that the V2Sim coaching was easy to use, helpful, effective, learnable, and in some cases, entertaining. They described that the proposed avatar possesses characteristics similar to an examiner. One of them stated, “He is kind and asks me really practical and helpful questions” and another remarked “He speaks to me directly in an academic way and the questions are logical and properly expressed.” Other respondent noted, “V2Sim coaching is a good way to test my knowledge on the issues of thesis and it is a good way to prepare myself for a real viva voce session.” One of the participants reported, “It repeated the question if I did not answer it, so it gave me an opportunity to answer spontaneously.” Other participants recommended that using the V2Sim coaching as an interactive and highly educational experience would assist not only PhD students but also master’s students.

The findings indicate that the participants were satisfied with the V2Sim coaching. Consequently, all the participants were motivated to express their thoughts about issues related to anxiety while using the V2Sim coaching. However, two of the students took a longer time to complete the viva voce session as they had difficulty communicating in English and they looked quite stressful in answering the questions. So, they expressed their disappointment and need for more time to practice using the V2Sim coaching. Their comments were as follows: “Our personal anxiety was significantly related to how we express the answer in proper English.” However, they felt that they would get used to the system after learning to use it over time. These findings are consistent with

the results of [32] which indicate that learning is better in training and practice. Accordingly, the V2Sim can be seen as a facilitative tool in assessing a viva voce session as it can improve the skills of the PhD students.

The development of the proposed V2Sim coaching was proven to offer both practical and theoretical contributions to the body of work in this field. The system can serve as a tool for doctorate students to predict questions from their thesis. As indicated in the study, all the students who used the V2Sim coaching reported the system to be a powerful tool that allows them to demonstrate their skills and knowledge. It was shown that a computer-generated interactive design such as the V2Sim might be persuading the PhD students to learn more about a viva voce session. Hence, researchers should recognise that the mere perception of human in an avatar can be adequately powerful to convince participants in learning environments. In other words, this study will provide avenues to prove that the current findings might be generalizable to other fields of research.

Several limitations nevertheless have to be noted. First, the participants were not selected based on their anxiety, but were specifically chosen within the fields of information technology, networking, information management and artificial intelligence. Second, the participants were only selected from PhD students of Universiti Utara Malaysia. Third, this study does not know whether the V2Sim coaching will produce the intended outcomes that seek namely; reduction in anxiety or fear, treatment of self-distrust, and enhancement of the English speaking proficiency. The V2Sim coaching was utilized only for one day by each participant. Finally, most of the questions asked during the evaluation were related to the viva voce session and none about the design layout of the system.

## **4 Conclusion**

Studies on the use of virtual simulators to train graduate students to cope with viva voce sessions are still scarce. The utilisation of VR for viva voce preparation in higher learning institutions is new particularly in Malaysia. As such, this paper has looked into the possibility of introducing a new concept of viva voce preparation through the use of VR technology. The paper proposes a persuasive V2Sim coaching, a new technique for viva voce preparation. The study focuses on the virtual training environment approach. A V2Sim prototype was created to simulate a real viva voce examiner by using an avatar. The prototype was developed using a decision tree principle to determine the proper questions for a student. The main contribution of this paper is the design and evaluation of a persuasive V2Sim prototype. The V2Sim prototype was evaluated by interviewing 30 PhD students from Universiti Utara Malaysia, and the feedback received indicates that the use of the simulator is very promising. The V2Sim coaching is able to simulate the viva voce session hence reducing students' anxiety and increasing students' confidence in facing the real viva voce session. If the students continue to practice using the V2Sim coaching, they will be able to reduce stress and anxiety progressively. Albeit the evaluation was succeeded with the students, there is still some room for improvement particularly pertaining to the usability of the V2Sim coaching

in the future. Some of the potential future works include the utilization of speech recognition and text mining technologies. The key benefit of these technologies is to allow the avatar examiner to provide real-time performance feedback. In addition, a thorough investigation has to continue in developing a much efficient decision tree algorithm to be used in the design of the V2Sim coaching system.

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## 6 Authors

**Mustafa Moosa Qasim** is a lecturer in the Computer Science Department at the University of Basrah, Iraq. He has a bachelor degree in Computer Science, a master's degree in Information Technology and Ph.D. in Information Technology. His research focus is in the field of Software Engineering, specializing in software architecture. He finds himself consistently tend to the theories that investigate the behavior, persuasion, motivation, and education, within the construct of mobile architecture and mobile application design. He has won several awards and medals through research grant. He is also considered as Ambassador in Journal Recent Patents on Computer Science from 2019 to present. His recent publications could be reached at SCOPUS ID, ORCID, Google Scholar, Researchgate, Academia, Publons.

**Ali Raad Abdulkareem** is an associate lecturer in the college of physical education and sport science at University of Basra, Iraq where he has been a faculty member since 2017. He obtained his master's degree in Information Technology from Universiti Utara Malaysia in 2013. He is interested in information system, mobile applications, control system and IoT. [ali.raad@uobasrah.edu.iq](mailto:ali.raad@uobasrah.edu.iq)

**Mohamed Abdulrahman Abdulhamed** is an assistant lecturer at University of Basra, Iraq. He has a master's degree in computer science since 2017 from the Computer Science department, College of Science, University of Basrah. [Mohamed@uobasrah.edu.iq](mailto:Mohamed@uobasrah.edu.iq)

**Abdul Nasir Zulkifli** is an Associate Professor at the School of Creative Industry Management & Performing Arts, Universiti Utara Malaysia. He has been teaching in various fields including Mechanical Engineering, Manufacturing Engineering, CAD, CAM, Management of Technology, Multimedia, Virtual Reality and 3D Animation for the last 34 years. His research areas include Virtual Reality, Augmented Reality, and Mobile applications in training and education. [nasirzul@uum.edu.my](mailto:nasirzul@uum.edu.my)

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