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IUCEL 2019

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“Inspiring Innovations for Sustainable Futures”

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ABOUT IUCEL 2019

The 2019 edition of International University Carnival on E-Learning (IUCEL) will be held for the first time in the island of Borneo on 21 and 22 August 2019. Universiti Malaysia Sarawak (UNIMAS) is proud to be hosting the event. IUCEL acts as a platform to promote, explore, and share best practices and global expertise in e-Learning applications at all levels of learning institutions from all over the world. This year's theme "*Inspiring Innovations for Sustainable Futures*" signifies the call for future-proof practices and innovations that are impactful to the community at large.

Proceedings of International University Carnival on E-Learning (IUCEL) 2019

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VIRTUAL REALITY AND VISUALISATION IN IMMERSIVE LEARNING ENVIRONMENT (VR&V)

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Highlights:

The Virtual Reality And Visualisation In Immersive Learning (VR&V) was developed to leverage the elements of teaching and learning process. These elements include: imagination of learners, further exploration and developing the depth understanding of new knowledge. Mastering the course of Virtual Reality and Visualisation in online and immersive learning environment may foster the new realm of interactivity and reconceptualisation of the relationship between learners and knowledge. The learners may be provided with the concept of "Do It Yourself" (DIY), step by step in order for them to develop the prototype of VR headset during the course. This may overcome the high cost of VR technology, since this headset is compatible with smartphones. In the 21st century learning context, these attributes are significant in order to open the possibility for shared classroom experiences using low cost solutions and creating a culture of VR usage.

Keywords: virtual reality, learning environment

HUMAN COMPUTER INTERACTION PRINCIPLES: DESIGNING WITH THE MIND IN MIND

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Highlights:

This HCI course is included as one of the National Defence University of Malaysia's (NDUM) Massive Open Online Course (MOOC) subjects. The main objectives for this course are to introduce some of the fundamental concepts, principles and guidelines concerning in designing the effective interface in application or system development. Besides, this HCI course introduces students with the aspects of user-centered design process besides usability principles and evaluation. The redesign of this course has won several awards including Gold Medal at e-Learning Carnival (eLC) Universiti Teknikal Melaka (UTeM), and Bronze medals at e-Content Development (eCondev), Universiti Teknologi Mara (UiTM), International University Carnival on E-Learning (IUCEL), Universiti Sains Islam Malaysia (USIM), and International e-Learning Carnival & Conference 2019 (eLCC), Universiti Teknologi Melaka (UTeM).

Keywords: Human Computer Interaction, User Interface Design, Interaction

Introduction

The Human Computer Interaction was developed to support the learning and teaching process on how to design users' interface application and interaction involved in technologies. By understanding the techniques such as the rapid prototype design, the learners can implement it during the prototype development. Besides, the learners will be leveraging with knowledge acquisition on how to gather meaningful feedback from end users then evaluate it. Learners will also learn the principles and rationale of visual design selection; perception and cognition of learners and manipulation of informative feedback that come from users. This may give an effective contribution towards interaction design.

Content

Computer technology has evolved to suit the human usage. The way for human to interact with the computer is by the medium of User Interface (UI). The first ever interface that human used to interact with computer was Batch Computing. It consists of the input of a punched card. Thus, humans had no interaction with these early batch computers in real time. Then the UI changed to Command-Line (CL) that provides real time interaction by having request-response transactions. From CL, the interface gradually evolved to what UI look like nowadays which is Graphical User Interface (GUI). The main purpose of GUI is to provide a user-friendly or human-centered usage of computers. Thus, the term Human Computer Interaction (HCI) is coined. HCI is focusing "on the snapshot of the interaction at the moment, usually on an individual, centered on the human-machine dyadic relationship itself." (Kuutti & Bannon, 2014). Thus, to expose the students with HCI, a course about HCI was created.

This HCI course is included as one of the National Defence University of Malaysia's (NDUM) Massive Open Online Course (MOOC) subjects. The main objectives for this course are to introduce some of the fundamental concepts, principles and guidelines concerning in designing the effective interface in application or system development. Besides, this HCI course introduces students with the aspects of user-centered design process besides usability principles and evaluation. With the guidelines, the students can have an idea to develop a better HCI for any given system as sustainability is a bane to HCI (Silberman et al, 2014).

There are several benefits of learning this course. Firstly, to produce students with preferred way of interactive online learning. Students will also benefit from the way of learning by connecting and sharing knowledge together. Furthermore, the modules are provided with the elements of multi-fusion such as video, animation, graphics and interaction to enrich learning process. Lastly, this module also leveraging the students of GEN-Z onwards to collaborate amongst themselves. With all the knowledge acquired, students can either update the existing UI of a system or they can also develop a new system that is user-friendly that well-equipped for future technology. As said by Vines et al (2015), the developing a new system is also a configuration for the user.

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LEARNING AL QURAN COMPREHENSION, TRANSLATION AND USAGES USING A 'MULTIPLAYER' GAME (PAHLAWAN QARIN)

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Highlights: The Quran is the holy book for Muslims. Reading the Quran has become a daily practice or ritual for most Muslims (Islam religion believers). The Quran may be recite well by many but, very few understand what they recite. One will actually know when to use the Al Quran verses in certain situations if they know and understand the meaning of the verses. There are many verses of the Quran where Allah demands the believers to 'read', 'understand' and 'implement'. It is worth studying it at a young age because learning the Quran needs reasonably good memory. Commonly known, children love to play especially with their peers, 'digital game' is one of the popular choices of these 'new age' children. Thus, we developed a 'multiplayer' desktop game called **Pahlawan Qarin** to attract the youngsters to learn the Quran meaning and usages. Digital games can be an attractive and engaging learning tools, motivators and generators of curiosity and as a result an effective means of optimizing student learning and performance in daily educational practice. **Pahlawan Qarin** can be used as an assisting tool for teachers in the Quran recitation and education topic that is also taught in Islamic Studies subject in schools. This game incorporates collaborative learning game (CLG) in which more than one player is able to play simultaneously (multiplayer feature) in a group or room using the internet connection (network). Based on observation and result gathered, students are proven to be interested in learning the Quran using this approach which is the digital 'multiplayer' adventure game.

Keywords: collaborative learning, desktop game, Al Quran, multiplayer, Islamic game

Introduction

In a Hadith Qudsi, Allah says: "Those that remember Me in their heart, I remember them in My heart; and those that remember Me in a gathering (i.e. that make mention of Me), I remember them (i.e. make mention of them) in a gathering better than theirs." An effort to expose children at an early age to 'Halaqah' (religious gathering and study) is commendable. Without such effort, the children's future in understanding and learning Al-Quran is uncertain. Our children may stray from the path of virtue and excellence without the guidance of Al-Quran. Researchers have indicated that educational computer games could be an effective way of providing a more interesting learning environment for acquiring knowledge (Cagiltay, 2007; Papastergiou, 2009; Tüzün, Yılmaz-Soylu, Karakus, Inal, & Kizilkaya, 2009). Several studies have reported that educational computer games could enhance students' learning interest and motivation (Burguillo, 2010; Dickey, 2011; Harris & Reid, 2005; Liu & Chu, 2010). It was further indicated by Hwang, Sung, Hung, Yang, and Huang (2012), that well-designed educational computer games might have great potential for improving the learning achievements of students. Children need to be occupied with 'edutainment' that not only fulfill the academic needs but moral aspect as well. Otherwise, there is a tendency for these children to be exposed to undesirable and negative activities and influence. 'Collaborative' learning environment has been a popular choice amongst teenagers nowadays. Learning through playing 'for' or 'against' each other seems to attract them tremendously. Collaborative 'game based learning' (GBL) involves more than one player in gameplay with the pedagogical intention to promote cooperative learning between those engaged in the game. Following Dickey (2007), collaborative games play an important role as engaging learning environments.

Background of the Product

Pahlawan Qarin aims to promote a 'collaborative learning' environment for Al Quran education which focuses on teenagers from age 11-15 years old. This age range was selected based on the understanding that Muslim children around this age, mostly has completed their Al Quran recitation studies. The issue that has been brought to concern was that these children may have completed their recitation obligation, but most of them have not immerse themselves into the understanding of the meaning of the verses as well as the usage of those verses in daily lives. Current Al Quran based games focuses on educating users on how to recite the verses with the correct 'tajweed', and displaying the translation of the verses such as Quran Puzzle published by Mizan Apps Publisher, Muslim Kids Quran published by Osratouna.com and Marbel 'Mari Belajar' Mengaji published by Educa Studio. These games lack (i) collaborative element (multiplayer feature) and (ii) adventurous game playing concept. As learning Al Quran for

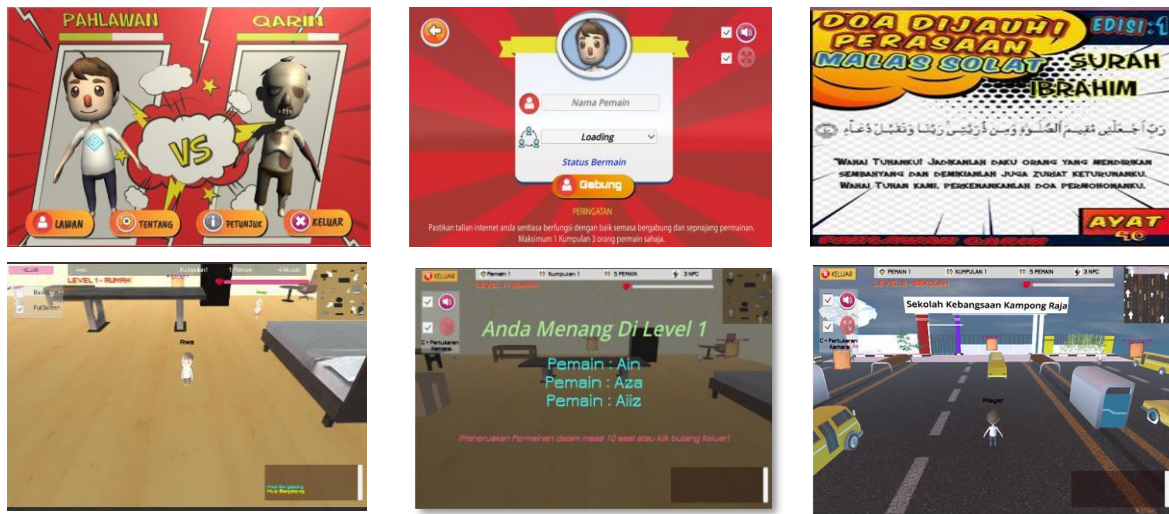
Muslim is a must, the conventional approaches have always been the common way chosen by parents and teachers, which is by using printed paper based or 'hardcopy'.

Methodology

The study was conducted amongst standard 6 (12 years old) students from a public primary school in Pagoh, Johor, Malaysia. Sekolah Kebangsaan Kampong Raja which is situated in the rural district of Johor was selected for this purpose. Fourteen students and one Islamic subject teacher participated in this study. **Pahlawan Qarin** was developed based on the concept of 'multiplayer' game (using internet connection) that incorporates learning section (AI Quran recitation and translation) and after that, quiz or test section in the form of adventure playing. The story line of the game revolves around the player who is called 'Pahlawan' (user/player themselves) that will receive bad/evil seditions from a 'being' called 'Qarin Djin'. Throughout the game (3 levels), the player will have to fight those seditions by finding the correct paper (containing the name of AI Quran verse and line number). All players have to destroy the 'Qarin' by colliding with the paper, which symbolizes the action of the player reciting those verses. Although this game actually has a wide specification to be fulfilled, due to time constraint, the implemented product is considered as the first version (basic version).

Based on the designed storyboard as well as the concept of 'multiplayer' game that we intended to incorporate, we had identified the technology and tools needed. For the game development, we mainly used Unity (version 2019) which is known as a cross-platform three-dimensional (3D), two-dimensional (2D), virtual reality (VR), and augmented reality games (AR) game engine developed by Unity Technologies. Photon Unity Networking (PUN) was used to accommodate the need for 'multiplayer' feature. PUN is a Unity package for multiplayer games which is known for its 'flexible matchmaking', meaning that it can get your players into rooms where objects can be synced over the network. Figure 1 shows the design of **Pahlawan Qarin** starting with the Main Menu, Login or Player's Registration, AI Quran Recitation section, Game Play Level 1, Result After Game Play and Game Play Level 2.

Figure 1: Scenes in **Pahlawan Qarin**



The tools needed to implement the game is a personal computer (PC) with Windows operating system (OS), internet connection, keyboard and mouse as the input controller. As the game introduces 'multiplayer' concept, all students played simultaneously in their selected 'room' (5 groups consist of 3 persons each). Once they get connected by joining room, they were taught the AI Quran verses, recitation and translation in which they have to remember these important elements; (i) the negative criteria, (ii) verses name and (iii) verses line number. After the AI Quran recitation session ended, the game level started. Each level has their own AI Quran recitation session. Only the player that is still alive in the game (won the level) may continue to the next level.

Results and Discussion

Data collection was conducted using Google Form on the same day that the game was implemented which was on 21st May 2019, situated in the computer room of SK Kampong Raja. Two sets of questionnaire (pre-usage and post-usage) were presented to each of the students and teacher to gathered responses on the level of interest and engagement of students in learning AI Quran using digital multiplayer game, **Pahlawan Qarin**. Discussions were made with the teacher beforehand, regarding criteria to measure 'student's interest' aspect. Based on the agreement made, we decided that these criteria will be used; (i) body language, (ii) facial expression, (iii) enthusiasm shown and

(iv) level of participation. Table 1 proved that 'collaborative' learning game indeed has a big impact towards students. The average increase of interest defined by the students themselves was as much as 20%, while teacher agreed that an average increment of 15% was spotted in the implementation session. Other elements that were measured as displayed in Table 3 (student's feedback) are (i) usability of the product particularly in teaching and learning Al Quran, (ii) attractiveness of the product (user interface, color and graphic aspect, animation, visual design) (iii) user friendly feature, (iv) preference in 'multiplayer' feature and (v) originality of the product.

Most of the questions asked in the questionnaire require an Agreement answer based on values 1= Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree). Overall, the responses received were mostly positive which include value 3 and 4. Ultimately, the students enjoyed the 'multiplayer' game by expressing their enthusiasm throughout the entire playing session. They also informed that this is the first time they had encountered an Islamic 'Djin' concept game which highlights the usage of Al Quran verses. Not only that **Pahlawan Qarin** exposes these students to a 'being' called 'Qarin' but also the importance of knowing Al Quran translation as well as showing them how and when to apply those verses according to certain situations.

Table 1: Level of interest in Al Quran teaching & learning session.

Samples	(1) Teacher Observation on students	(14) Students Feedback
Average %		
Before using CLG	75	68
After using CLG	90	88
Increment (%)	15	20

Importance to Education

1. Cultivating Al Quran reading, recitation and comprehension culture amongst teenagers.
2. Educating users on the usages of Al Quran verses in daily lives through *Qarin Djin* 'being'.
3. Assisting tool for teachers in Al Quran recitation and education topic in Islamic Studies subject. As well as assisting tool for parents at home.

Advantages of the Innovation

1. Promote a 'non-violent' game that cultivate total reliance in Allah SWT (The Almighty's words/verses) to overcome negative situations in live.
2. Teenagers may spend their time learning Al Quran along with their friends in a fun way.

Commercialization Aspect

Copyright for **Pahlawan Qarin** has been applied from MyIPO, Malaysia. As this is a desktop game, it can be downloaded from a website (pay per download), installed and be played with internet connection. As this product language is in Malay Language, it can be marketed to Malay speaking countries such as Malaysia, Singapore, Indonesia and Brunei. However, the development in English Language will soon be done named '**Qarin Warrior**' so that it can be reached by more Muslim children around the world.

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HEROPRENEURSHIP ON MOOC AND E-CAMPUS AT UNIVERSITI MALAYSIA KELANTAN

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Highlights: Creating "Heropreneurs" in this course has a unique learning approach where the students are taught on the value of social impact. Heropreneurs are required to take workable value creation models and use the theories learnt in the course. Next, they need to transfer the theory into the practice by generating ideas to form social enterprise. The practical aspect of learning using powerful tool to plan meetings, virtual discussions and collaborate both virtually and physically was conducted. Some 179 students with 1,064 comments were captured from those who participated in MOOC OpenLearning.com platform; and another 94 students who used Facebook closed group. The team-based and "the build to think" co-creation model combining the Design Kit of IDEO; and the Social Enterprise Test based on a Malaysian perspective are used where the students are required to work on the social impact projects featuring on how social entrepreneurs make their entities more self-dependent. The immersive learning requires a methodology of a cohesive process of creativity, risk taking and planning. The course is conducted systematically and offers transferability and scalability.

Keywords: *social entrepreneurship, e-learning, heropreneurship, blended learning, design thinking.*

STEMPRENEUR IN ROBOTICS AND COMPUTATIONAL THINKING

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Highlights: A number of STEM educators were found not being trained extensively to deliver STEM education into a high-end solutions and knowledge to students in school. Furthermore, students and teachers in Malaysia are heavily dependent on foreign educational software tool for STEM education. To enhance STEM education in schools, STEmpreneurs are being groomed to enhance robotic education, and computational thinking. CORE is a self-funded, proudly Malaysian home-grown innovation that offers a Pick-n-Place Flowchart block based on the Interactive visual software tool. The visual software tool offers activities for developing programming algorithm, testing, data collection, processing, visualization with IOT/IIOT (Industrial Internet of Things) capabilities. The blocks are designed in an appropriate flow and logic blending with mathematics, text, timers, media and IOT functions. CORE works either by using built in on-screen model or physical model. The model can be connected to a plug-n-play microcontroller board like Arduino Uno via the PC's USB communication ports. The innovation offers its own uniqueness and values as it is also engaging OKU learners (students with disabilities) and turns them into STEmpreneurs. The OKU will later be groomed and engaged into income generating activities to deliver STEM education and learning to a wider market. Malaysia will benefit sufficient number of qualified OKU STEmpreneurs in meeting the Industry 4.0 talent to grow. The innovation fits the startup and Green SME promotion agenda in Malaysia.

Keywords: *Stempreneur, Robotics education, STEM, Computational thinking IOT.*

GAMIFIKASI GLOBAL HALAL GAME (GHG) DALAM e-PEMBELAJARAN

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Highlights: Inovasi gamifikasi Global Halal Game (GHG) telah diperkenalkan untuk menjadi bahan bantu mengajar kepada guru dan pelajar dalam proses pengajaran dan pembelajaran termasuk secara atas talian. Objektif GHG dibangunkan adalah untuk meningkatkan kesedaran dan kefahaman masyarakat terhadap kepentingan ilmu halal serta meningkatkan kemahiran guru dan pelajar melalui medium e-pembelajaran yang interaktif. GHG dibangunkan berdasarkan sukatan pendidikan Islam sekolah dan Manual Prosedur Pensijilan Halal Malaysia yang juga sesuai dijadikan kaedah latihan kepada agensi berkaitan untuk mempelajari prosedur pensijilan halal secara menyeluruh. GHG diyakini mampu menjadi platform bahan bantu mengajar yang terkini berkonsepkan e-pembelajaran, interaktif dan efektif.

Keywords: Gamifikasi, e-pembelajaran, Global Halal Game (GHG)

Introduction

Tahap kesedaran masyarakat terhadap kepentingan ilmu kepenggunaan dan pensijilan halal masih belum mencapai tahap yang memuaskan. Menurut Dewan Perniagaan Melayu Malaysia (DPMM) Negeri Sembilan, hanya 10 daripada 30 usahawan produk makanan yang berdaftar di bawah DPMM mempunyai sijil halal (Sinar Online, 2016). Justeru, kesedaran dan kefahaman terhadap kepentingan ilmu kepenggunaan dan pensijilan halal perlu diterapkan di setiap peringkat umur bermula seawal di bangku persekolahan. Bahan bantu mengajar merupakan salah satu permasalahan yang perlu diatasi khususnya dalam menghasilkan inovasi baharu yang boleh menjadi medium alternatif kepada guru dan pelajar dalam mempelajari ilmu halal. Menyedari hal ini, inovasi gamifikasi Global Halal Game (GHG) telah diperkenalkan untuk menjadi bahan bantu mengajar kepada guru dan pelajar dalam proses pengajaran dan pembelajaran termasuk secara atas talian. Objektif GHG dibangunkan adalah untuk meningkatkan kesedaran dan kefahaman masyarakat terhadap kepentingan ilmu halal serta meningkatkan kemahiran guru dan pelajar melalui medium e-pembelajaran yang interaktif. GHG dibangunkan berdasarkan sukatan pendidikan Islam sekolah dan Manual Prosedur Pensijilan Halal Malaysia yang juga sesuai dijadikan kaedah latihan kepada agensi berkaitan untuk mempelajari prosedur pensijilan halal secara menyeluruh. GHG meliputi soalan-soalan uji minda yang mampu menilai tahap kefahaman dan kemahiran ilmu halal dalam kalangan pengguna. GHG diyakini mampu menjadi platform bahan bantu mengajar yang terkini berkonsepkan e-pembelajaran, interaktif dan efektif. Produk ini telah dikomersialkan untuk pasaran Malaysia dan luar negara sebagai bahan bantu mengajar di sekolah-sekolah dan bahan latihan untuk institut latihan halal di Malaysia.

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TEACHING COMPLEX MATHEMATICS OPERATION USING AUGMENTED REALITY

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Highlights: The aim of this innovation is to provide an engaging, meaningful and technological way in real-time environment for the teachers to teach complex mathematics operation through mobile application with the aid of augmented reality (AR) technology. This application can help teachers to give real-life examples when explaining the mathematics concepts. Equation can be selected from the list of the equations available and use the camera to scan a real 3D object. The AR activity of the scanned object will be triggered and answer(s) will be produced based on the equation, scanned object and the value of dimensions that entered by the teachers. A visualisation of the result will also be displayed after applying the selected equation.

Keywords: *Augmented reality, mobile application, teaching mathematics.*

Introduction

Mathematics is a compulsory subject for every student in primary, secondary and pre-university program. Learning mathematics is very important in our lives because it can nurture our power of reasoning, creativity, abstract or spatial thinking, critical thinking, problem solving ability and even effective communication skills [1]. However, most of the students found that mathematics class is very boring and stressful. Some students even have math phobia as they move on to the higher class. This is because the teachers do not implement the right way to teach mathematics concepts to students. Rather than being taught in a way that is applicable to real-life situations and more engaging for students, mathematics is taught as strictly paper-and-pencils subject with no dimensions whatsoever. Most of the teachers prefer the students to memorize the formula or equation and give them a lot of homework so that they can remember the solving steps and score well in the exam. Therefore, the students cannot get the importance and practical application of the math concepts especially the complex mathematics operations and they are forced to learn and master it, so they could start to dislike mathematics.

Augmented Reality is a technology that takes the world around you and adds virtual content on top such that it looks like it is there in the real world [2]. The complex mathematics operations that are involved in this project are first order differentiation and second order differentiation. This application can help the teachers to give real-life examples to their students when they are explaining the mathematics concepts. Teachers can select one equation from the list of the equations available and use the camera to scan a real 3D object from their surrounding environment. The AR activity of the scanned object will be triggered. An answer will also be generated based on selected equation, scanned object and the value of dimensions that entered by the teachers. A visualization of the result will also be displayed after applying the selected equation. There are few existing applications in the market which also focusing on teaching calculus for example Calculus Pro[3] and Calculus Course Assistant[4]. Calculus Pro is a mobile application that contains a set of calculus topics in the form of examples, tutorials and solvers. Calculus Course Assistant is a mobile application that helps the students to solve calculus problem by providing the step-by-step guidance. However, they are only providing the explanation in text form. Therefore, the aim of this project is to provide an engaging, meaningful and technological way in real-time environment for the teachers to teach mathematics.

Proposed Solution

An Augmented Reality (AR) app is proposed to solve the problem. The user can select one equation from the list of equations. Then, the user can use the camera to scan the real 3D object. A brief visualisation of the equation on the scanned object with explanation will be displayed using AR. The app will calculate the answer according to the object, selected equation and the value of dimensions that entered by teachers. A detailed visualisation of the objects with explanation will be displayed after calculation is performed.

The application is divided into three modules:

Object detection module

This module basically responsible for detecting and tracking the 3D objects using the camera. Vuforia SDK[6] will be implemented in this application for the object detection and tracking. The 3D object must be opaque, rigid and contain few moving parts for the object detection to work well. Pliable or deformable objects are not supported. Only 1 object target can be tracked simultaneously in Vuforia. Besides, the object should be viewed under moderately bright and diffuse lighting. To the extent possible, the surfaces of the object should be evenly lit and do not contain shadow caused by other objects and people. When the target is in the field of view of the camera, the AR activity will be triggered. For the object detection to perform well, the 3D object should be in static position.

Calculation of equation module

The user can select one equation from the list to perform calculation. An answer will be displayed after performing calculation based on the selected equation, scanned object and the value of dimensions entered by teachers.

The list of equations that are involved in this project are shown as below:

- a) First Order Differentiation Equation
 $y' + P(x)y = Q(x)$
- b) Second Order Differential Equation
 $y'' + p(t)y' + q(t)y = g(t)$.

Result visualisation after applying equation module

This module is responsible for visualising the result after applying the selected equation to the scanned object. The result will be visualised either in 2D or 3D. A brief visualisation of result with explanation will be displayed using AR once the object is tracked and detected by the application. A detailed explanation of result will be displayed after the calculation.

Background of the Innovation:

The current existing applications that teaching mathematics using AR are relying on 2D flashcards to activate the augmented reality activity. Some applications for example Aug That! requires specific target images to use the applications. Therefore, the applications cannot be used anymore if the flashcards/ target images are lost or damaged. Besides, the current applications also do not allow the teachers to utilise the surrounding 3D objects to make the class become more interactive as the information is not available in the database. They also mostly are focusing on teaching simple mathematics concepts to early learners instead of high school students. Besides, most of the calculus learning app is also focusing on providing the explanation in text form without any animation and audio. So, it makes the students feel boring and not interested in using the app for their learning.

Mathematics is very important subject for all students throughout their study lives. It develops their reasoning and analytical thinking and quickens their minds. However, majority of students always think that math is boring, lack of creativity and very difficult to understand especially complex mathematics operations. Hence, they start to hate math when they move on to the higher class since the math concepts become more complex. By having this application, the class will become more interactive and increase students' understanding on how complex mathematics can be applied on. Besides, teachers also face a lot of difficulties in teaching mathematics because they do not have an interactive medium to explain the concepts and get attention from the students. Therefore, the teachers also will be demotivated and lose their passion in teaching.

The objectives of the system are:

1. To apply object detection and do model target for augmented reality application
2. To develop an interactive application for Mathematics teaching and learning with augmented reality technology
3. To demonstrate the 3-Dimensional visualisation of real objects from selected Mathematics equations

Benefits and Uniqueness of the Proposed Solution:

This project able to transform the teaching through latest technology. A 3D visualisation with dimensions displayed and brief explanation by augmented reality can be produced based on the selected equation and object captured by the camera. Therefore, students will have deeper understanding on the mathematics concepts through the demonstration of real-life examples. The uniqueness of this project is the teachers can scan a 3D real-life examples instead of scanning a 2D flashcard. They can make full use of surrounding environments to give examples to their students for example magic cube, ball and others. Besides, the result will also be visualised in either 2D or 3D after applying the equation on the scanned object.

Advantages of the Innovation towards Education and Community:

1. This application allows teachers to teach mathematics in a more interesting and interactive way.
2. This application allows teachers to utilize 3D objects to give real life examples on the mathematics concepts to their students.
3. Can be introduced as a common teaching assistant tool in teaching mathematics subject to all high schools.

Commercial Value:

It can be offered as downloadable program in application store such as Google Play Store.

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EDUCATION INSTITUTION INTERNET OF THINGS (IOT) ONLINE DASHBOARD FOR ACADEMIC DATA SHARING

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Highlights: Various Internet of Things (IoT) devices are currently being developed by academicians and students wise for various type of research. However, platform for sharing the results and data in form of visualisations and raw data is limited, while some involve commercial elements which restricts the freedom as academicians. This project proposes an Education Institution IoT Online Dashboard for academic data sharing. Academicians and students have the freedom to share the results of their research using the dashboard, thus increasing public exposure for their academic projects.

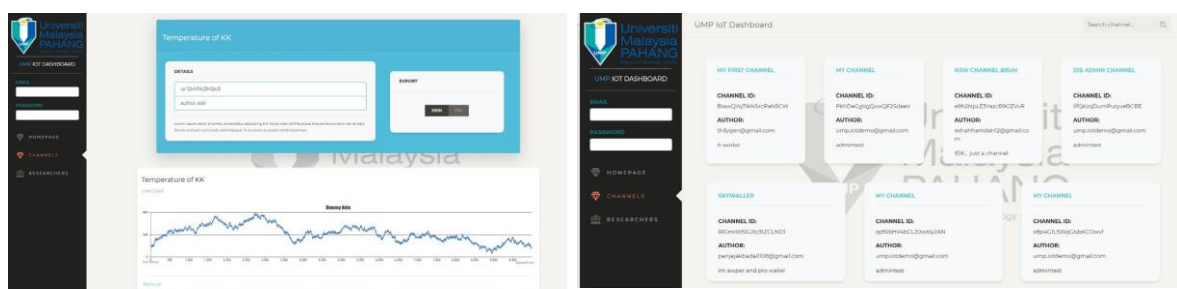
Keywords: Internet of Things, Online Dashboard, Big Data

Introduction

Internet of Things (IoT) has become a niche area within many disciplines of research. As a method of efficient real-time data gathering, IoT devices have been developed and implemented for the purpose of surveillance, analysis, maintenance and education. However, current trends of IoT devices restrict the users to individuals who are deploying such device, limiting access to information by other parties, while others involve commercial elements. Current trend in multidisciplinary research involves academicians and students to dive into information that diverse from their main discipline. For example, agriculture researchers and students might require data obtained through sensors developed by engineering researchers. However, not every researcher has access to such a big network of academicians to obtain such data, while some might not be as reliable due to questionable sources.

This research intends to provide a platform for sharing research data, with reliable sources, which is the education institution itself, towards public inform of visualisation and data bank dashboard. The Education Institution Internet of Things (IoT) Online Dashboard will provide data sharing, in form of visualisation and data, while providing public feedback to the source researchers themselves. Through this dashboard, researchers and students may increase public exposure for their projects, encouraging access to multidisciplinary research to indulge in. Data can be monitored and downloaded through this dashboard, providing real-time credible data supplied by credible source within the education institution itself.

Design



The dashboard supplies information of research in form of channels. In the developed dashboard, UMP researchers may register to the website with the UMP id. General description of the channel will be described by the researcher himself.

The channels will form a list, where public visitors can search the relevant channels for their references. Visitors will be able to vote for likes and favourites to describe how important the data provided impact their activities. Through this voting method, the source UMP researchers will understand the significant of the data provided to the public.

Once the visitor accesses the channel, the visitors may observe any graph visualised by the researcher. The researcher needs to include the API key provided by the dashboard system inside the IoT device as publish target. Once the connection has been established, the data will be transmitted to the dashboard and displayed according

to the graphs generated based on the researcher settings. Through this dashboard. The visitors may copy the figures and they are allowed to download the raw data provided by the researcher.

A WAY TO FUTURE: DISCOVER AND LEARN WITH MOBILE AUGMENTED REALITY (AR)

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Highlights: Have you ever wondered in bringing Tyrannosaurus into your classroom? Is it possible? Yes, with mobile augmented reality it is very possible to combine the real and virtual world by only using handheld devices such as tablets and smartphones. In this study, an AR application was developed based on the elements of the self-recorded video in order to promote students' learning. The learning application was designed using the HP Reveal platform which is a free application available for iOS and Android devices that allow users to create an Aura (3D overlays). HP Reveal platform also supports multimedia elements such as video and images that will be triggered based on an image.

Keywords: *augmented reality, educational technology, higher education innovative pedagogy, HP Reveal, collaboration*

Learning Facts and Concept: The challenges

There are many empirically evident from the past studies that traditional teaching technique such as memorisation and recitation yield positive result in students learning. Even though there are successful results from these methods, students are still facing challenges of acquiring skills and knowledge for deep learning, apply problem-solving and work collaboratively as a team to achieve common goals. The situation seems to be more critical and oblivious among the first semester undergraduate students who are having a hard time grasping declarative knowledge such as facts, concepts and apply it to a solve real-world problem. Thus, lead to a misconception about the topic learned. Initially, learning declarative knowledge is very important before students will be able to proceed in learning procedural knowledge of learning discrimination, concrete concept, defined concept, rule, and problem-solving (Gagne, 1971). Hence it is very crucial that lecturers recognise a suitable pedagogical approach in order to minimise misconception among the students (Endo, Yasuda, Mouri, Urata, & Tian, 2014). When students are unable to relate to the content taught during the class, they perceive that learning task activities are very boring and not engaging. As a result, students have concentration issues and a lack of motivation towards learning. Therefore, learning a learn factual knowledge and concepts can be fun and meaningful through visualisation and modeling that allow the students to explore the combination of real and virtual object through technology such as AR

Project Description

In this study, a learning application in the form of AR was designed using the HP Reveal platform. HP Reveal platform is a free application that is available for iOS and Android devices that allow users to create an Aura (3D overlays). This platform also supports multimedia elements such as video and images that will be triggered based on a real object. The AR application designed are mainly for learning factual and concept of the topic "Cybercrime". First, a content focus on "Cybercrime" based on AR video was created using the free version of the HP Reveal platform. After registering for an account, the real object is uploaded. The real object used in this study is two infographic posters based on "Cybercrime". The account was set to be "public" to allow the students to "follow" to access the AR created. Figure 1 shows the procedure of creating the AR application with HP reveal.

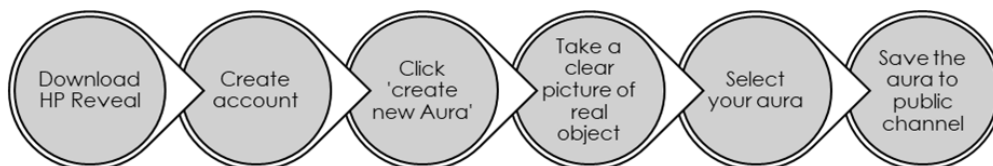


Figure 1: Summary of procedure in creating AR application with HP Reveal

Background

The "Cybercrime" AR application was implemented to facilitate learning facts and concepts among undergraduate students. The context is the undergraduate course in the Faculty of Education at a public university. The course participants were enrolled in a Bachelor of Counselling Programme Semester 1, Year 1. The rationale behind selecting

the undergraduate course is because of their digital native and familiarity with digital technology from a young age. However, digital technology familiarity is mainly for socialisation and entertainment with less usage for learning purposes. Hence, forty students participated to experience learning via AR based on voluntary bases.

AR application is very important in education from the context of learning the topic "Cybercrime". Teaching and learning in higher education should focus more on acquiring skills for interacting, applying, evaluating and creating new knowledge as well as problem-solving (Martin, 2006; Ronen & Pasher, 2011) rather than just the transmission of knowledge (Dewitt, Alias, & Siraj, 2015). Hence, higher education institutions are moving away from didactic and traditional pedagogies towards learning new knowledge and skills in an interactive way. This is because AR technologies have the potential to engage and motivate students to explore learning in a fun way rather than listening to a lecture (Baloch, Qadeer, & Memon, 2018; Majid, Mohammed, & Sulaiman, 2015). AR technology creates learning to be more effective and interesting since AR trigger student's creativity and curiosity while learning (Kesim & Ozarslan, 2012). Learning via AR has the benefit of developing students thinking skills and problem solving. While working on AR, students also learn collaborative skills to work as a team on certain task either face-to-face or remotely through the merging of the virtual world and the real world (Kesim & Ozarslan, 2012; Wang, Callaghan, Bernhardt, White, & Peñaríos, 2018)

Advantages

AR application developed for the topic "Cybercrime" has many advantages for the students, lecturers and greater impact to a larger audience. From the student's perspective, there were several advantages in using the AR application, namely, it is a user-friendly tool for learning; engaging students, enhance learning motivation and promote collaboration. Based on the pilot results, students were satisfied by learning with AR since the application is effective and efficient in learning factual knowledge and concepts in an engaging and interactive way. AR also promotes collaborative learning among peers by allowing them to work together by applying, creating new knowledge and problem-solving. Since collaborative skills are among one of the vital skills students needed to have before entering the marketplace, AR application created the opportunity for the students to experience and learn while at the University.

From the lecturers' point of view, by creating own lesson/topic via AR creates the culture of innovation in the use of emerging technologies rather than using direct-instruction for the teaching and learning process. Through AR application, lecturers are able to design more engaging and interactive learning task which will encourage students to learn factual knowledge and concepts in a fun way through visualisation rather than memorising and recitation techniques. In addition, AR also serves as an on-going feedback and assessment where lecturers can instantly provide students with real-time comments and responses on their task and progress.

From the greater audience perspective, AR can be applied in many disciplines such as Engineering, medical, computer science as well as in social sciences from the aspect of training and teaching. The AR platform also offers educators with readily available activities if self-designing one will be time-consuming. Besides, instructional designer, as well as module developer, can work along with educators to design learning activities with AR based on content the educators are teaching. The most important aspect of AR application is convenient, portable and inexpensive to use, the users only need to have handheld devices such as tablets and smartphones to download the AR application.

Commercial Potential

At the moment the AR application for the topic "Cybercrime" is freely available for all users because HP Reveal platform itself offers a free application for the users. The aim of the product is not for commercial, it solely for education purposes.

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