

# An Approach to Mixed Reality and Massive Open Online Courses (MOOC) in Learning the Military Decision Making Environment

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**ABSTRACT**--- *In teaching and learning of making the decision in military environment require an efficient and effective interaction and control in order for learners to actively participate in conducting an operation. In this day and age, people are exposed to mixed reality concept in line with the growth of software application technology where people started to demand on their needs for applications used. In fact, software application has shown a rapid development in computing technology world regarding processing power, memory capacity and battery life simultaneously with the new technology supplied such as improvement of the connectivity, external peripherals, GPS and location-based services. This paper proposed the implementation of mixed reality technology specifically on 3 Dimensional (3D) geospatial terrain and Massive Open Online Courses (MOOC) as the tool and platform to conduct the learning of military decision making in an operation. The research was carried out to determine the appropriate elements and features of mixed reality for this application consists of virtual elements; mixed reality space and interaction; reaction and interaction within 3D mixed reality object. The technology of mixed reality is considered to provide an effective and efficient 3D map that learners can interact and control for military operation using the platform of MOOC.*

**Index Terms**— *Massive Open Online Courses (MOOC), military decision making, mixed reality, 3 Dimensional (3D).*

## I. INTRODUCTION

Learning and teaching in military operation usually takes place in the coordinate on the map. The implementation of map is crucial in military operations since military officers and sub ordinate need to communicate during the making of military decision. The map is important as a survival tool in a terrain in military and adding to this point the interaction elements during communication is highly demanding. The 3D map is as important as other weapon in an operation as a tactical weapon for the military to counterintelligence and political propaganda [1]. Army needs to record everything when they discover new thing in a terrain into a map. Accuracy and details are also the important elements in sketching the map. Map is also used as a strategist planning

for military to locate the position of opponent forces, planning operations, accuracy of two distances, places, heights and selecting the best route.

Information such as locations and distances about a places is great for travelling and communication in a battlefield [2]. Direction selected must vary with time and location when an operation is planned. To make sure that the operation is precise in term of time and place, all military officers must have the ability in map reading. By giving some significance on the infrastructure during military operation, it can minimize the losses [3]. It is important that every military officers/learners need to have the knowledge to understand and use map since it can help in knowing the route and their current position.

In learning the military operations, it is important for learners to know how to plan a tactical movement and making decision. Terrain map especially in 3 Dimensional (3D) object will enhance the visibility of decision makers' specifically on the physical features of an area which highlight the locations or geospatial topography; shape of mountains, valleys, network streams, river banks and the locations of man- made features such as trails, roads, towns, boundaries and physical buildings.

By applying the technology of mixed reality and 3D terrain, primary goal is to describe the state-of-the-art for a typical digital terrain modelling workflow that starts with data capture, continues with data pre-processing and modelling object generation. The 3 Dimensional map should be same as the physical environment to make it easy to use and understand. Also, learners will be able to manage the instruction given by the map and aware of the surrounding scenario. The 3 Dimensional object should follow the physical rule which mean the object should have weight, effect and depth like the physical object.

This such information will enhance the abilities of learners to project how the situation is going to evolve into the future [4]. By using 3 Dimensional modelling object, all data recorded from the real world experience will helps the learners to visualize which path do they preferred in the terrain.

The decision made will be precise and have strong argument and data support. Furthermore, there are difficulties on describing the map terrain using the piece of paper with the limitation of image visualization. Taking these points, the development of 3D Geospatial Terrain on the platform of MOOC will be helpful in terms interaction and

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communication amongst military decision makers' besides eliciting the limitation of visualization. The elements of freezing the camera image (mobile AR view) when desired, while keeping the overlaid graphics live will support the learners to manipulate the interface and visualization without having to keep the device pointed at the scene.

This research was conducted to capture the nature of military decision making and the capabilities of mixed technology and MOOC in order to enhance the effectiveness interaction and communication amongst decision makers'. The crux of this research is to provide an effective way of comprehending the 3D Geospatial Map Terrain, while applying the technology of mixed reality and MOOC in the process of learning and teaching in military decision making.

## II. RESEARCH QUESTIONS

This research has been conducted based on the following research questions which are:

- i. How these elements or features in mixed reality can boost up in decision making process for military in a terrain?
- ii. What are the appropriate elements or features in mixed reality in developing the new model of 3D geospatial terrain?
- iii. How effective is the platform of MOOC on mixed reality for 3 Dimensional (3D) geospatial terrain in teaching and learning of military decision making?

## III. RESULTS & DISCUSSIONS

A study has been conducted on students in Universiti Pertahanan Nasional Malaysia that take Computer Science Course. The aim of this study is to know the exact knowledge and experience of the students with mixed reality technology. In the meanwhile, the respondents also are the cadet officers that studying the state-of- the- art in military decision making. There are two section in this questionnaire which are Section A and Section B. Section A is about the general questions to the respondent while section B is about the main survey questions. Below depicted the analysis from the questionnaire that have been distributed.

### A. Section A: General Questions

Question: Have you heard about mixed reality before this?



Fig. 1: The responses on mixed reality and experiences of using it

Majority of the students knew partially about mixed reality which is 44% of them. The amount of 39% of the students with a brief knowledge about mixed reality, while 17% of them had some experiences with the usage and development of mixed reality.

### B. Section B: Main Survey Questions

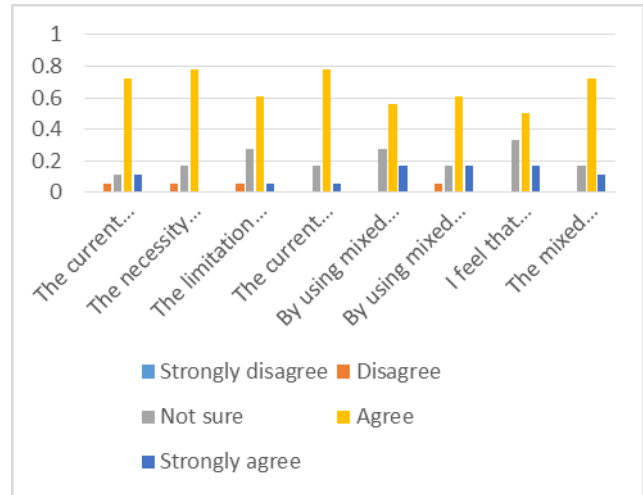


Fig. 2: Comprehending and understanding the map in terrain

There are 72.2% of the cadet officers agreed that the current method of reading, understanding and comprehending map consume a lot of time and works that need to be done. While the amount of 5.6% of them disagree with the statement. Next, majority of the cadet officers think that the necessity of sketching the topography with the limitation of visualization images will be the drawback of the whole process in military decision making.

Meanwhile, the amount of 77.8% and 16.7% of cadet officers are not sure if it will be the drawback of the decision making process. Furthermore, the amount of 61.1% of the responses agreed that the limitation of medium in current scenario will give disadvantages to the military decision makers' in term of emphasizing the major factors in military operations and highly impacted the feature of visualizing the scenarios.

Only 5.6% of the cadet officers contradicted with the statement. This amount reflected the necessity of having the appropriate medium and technology may enhance the capabilities of cadet officers to make decision. The cadet officers agreed that the current method of making decision can affect the situational awareness when cadets in a terrain which are 77.8% and 5.6% of them strongly agreed with the statement. The amount of 55.6% of the cadet officers agreed that by using mixed reality with an appropriate element and features, it can help in decision making process for military in a terrain while 16.7% of them strongly agreed to use mixed reality with the suitable element and features.

In fact, 61.1% of them agreed that by using mixed reality with an appropriate elements and features can enhance the visibility of decision makers and only 5.6% of them disagreed on it. While the amount of 16.7% of the cadet officers strongly agreed with the statement. Finally, 72.2%



of the cadet officers agreed that the mixed reality application is an effective way in enhancing the interaction and communication amongst military decision makers.

#### IV. LITERATURE REVIEW

##### A. Mixed Reality (MR)

Mixed reality or known as hybrid reality is the combination of virtual and physical world to make a new world where both medium can exist and interact in real time. Mixed reality device include the gaze of both real object and virtual object that generated by computer control [5]. Sometime, mixed reality is misunderstood as augmented reality. Augmented reality is referred as mixed reality [6].

The difference between these two technology is mixed reality is the combination of AR and VR which is the 3D object is exist, interactive and live in the real world. Mixed reality is the area of which the unmodeled real environment and modelled virtual environment exist together in a real world with the help of mixed reality head mounted display to see the virtual object [7]. MR is aim to looks like they are placed within this world. While, AR is existed overlay with the real world and it need marker to project the 3D objects. MR needs a head mounted display to view the objects. HMD is important for MR user, whether to develop, play, see, hear and interact with the hologram objects within the environment space.

##### B. Three Dimensional (3D)

3D is the object that have height, depth and width. 3D object must have height, depth and width and it can be produce by using combination and manipulating the polygons [8]. It is produced by manipulating polygons, edges and vertices. Modelling and design is often used in motion control, industrial equipment, aerospace and automotive applications. 3D is produced by using specialize software like 3D Blender, Autodesk Maya and 3Ds Max. 3D model that have been render may have photorealistic effects or non-photorealistic rendering.

Basically, the three steps in making 3D modelling is by placing the basic polygon on the canvas such as square, sphere or pyramid. Some software already gives the ready-made model such as human body, bone and doughnut shape. Next, adjust the polygon into shapes that the developer wants. Adjust the polygon by using the tools given such as rotate, extrude, and mirror effect. Lastly, try to combine two or more polygons to make the required design. 3D is vital technology for VR, AR, and MR because these three technology is living in virtual world. In virtual world, 3D actually looks like a real world where it can have depth, width and length. Also, user can manipulate and interact with it such as if the user throws a virtual ball, it can bounce back. VR allow user in engaging the interaction with the virtual object by making some motion and vibration for weight [8].

##### C. Military Decision Making

Military decision making process (MDMP) is a seven step decision making for tactical and garrison environment. MDMP is for tactical, operational and strategically for the military to have successful output<sup>9</sup>. The basic seven steps are receipt of mission, mission analysis, course of action

(COA) development, COA analysis or as known as Wargaming, COA comparison, COA approval, and orders production, dissemination and transition. This process is suitable for large group of army which battalion level.

##### D. Massive Open Online Courses (MOOC)

Massive open online course or known as MOOC is an online learning for student to deliver knowledge around the world to make sure that it focusses on community, connectedness and student engagement. Learners from all over the world interact and connected with the courses in the MOOC<sup>10</sup>. Students that excited, inspired, motivated and challenge when learning something is the meaning of meaningful learning, not by their grades. MOOC need to support student that are still learning and challenge the best student [9]. MOOC is created to help students around the world to experience to be a student everywhere. This open learning system is driven by philosophy of student being active like creating, discussing and reflecting, not just memorising and repeating. This platform is not for student only. Teachers and lecturer around the world also can use this platform to teach. They can put videos, images, slides, and forum. MOOC is like the current social media. The enrolment and completion of student in MOOC is like a social media in participating the courses [10]. It can be liked and commenting the topic discussed if they have their own opinion or questions. As an educator, this open learning system will provide tools for them to teach and give the best experience for their students. MOOC is the best platform for online learning, according to the website, they have achieved 18-time engagement, productivity, motivation, completion, and happier students, than other online learning platform.

#### V. CONCLUSION

The research that has been conducted mainly the analysis of Interaction and Communication in military. The concept of mixed reality and MOOC have also been imposed in this research. The effectiveness of elements and features in mixed reality are analyzed based on 3D geospatial terrain. Moreover, the research objectives such as analysis of the appropriate elements or features in mixed reality, the validation of elements or features, the development of the new model based on interaction and communication in military decision making, and lastly designing a prototype based on the proposed model.

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