Chapter 50
Applying Augmented Reality to a Mobile–Assisted Learning System for Martial Arts Using Kinect Motion Capture

Wen-Chun Hsu
National University of Tainan, Taiwan

Ju-Ling Shih
National University of Tainan, Taiwan

ABSTRACT

In this study, to learn the routine of Tantui, a branch of martial arts was taken as an object of research. Fitts' stages of motor learning and augmented reality (AR) were applied to a 3D mobile-assisted learning system for martial arts, which was characterized by free viewing angles. With the new system, learners could rotate the viewing angle of an image freely in a three-dimensional space, zoom in or zoom out the image, and adjust its playback speed. The experimental participants were divided into two groups, i.e., the experimental group (EG) and the control group (CG). The same coach instructed the EG through the 3D mobile-assisted learning system with AR capability while the CG was taught through a 2D video-based learning system on common mobile devices. Finally, a one-way ANOVA was performed to investigate the differences in learning performance between the two groups. Also, questionnaire surveys and interviews were conducted to understand whether the 3D free viewing angle of AR was helpful to cognitive learning of motor skills, learning motivation, learning satisfaction, and conditions of technology acceptance. It is expected that the findings herein will contribute to mobile-assisted learning and martial arts teaching in the future.

INTRODUCTION

Owing to ever-changing computer technology and lifestyles, technological development of smartphones has become much rapider and more widespread. According to a survey by the International Telecommunication Union (ITU), ownership of mobile phones worldwide grew from 15.5% to 77.1% from 2000 to 2010. After 2010, multi-touch large-screen tablets based on two mainstream operating systems, namely, IOS and Android, were released successively, which changed people's reading habits as well as learning habits. According to the statistics released by the marketing research company eMarketer, the global population who owned smartphones would reach 1.75 billion in 2014 ("Smartphone Users Worldwide", 2014). The learning method formerly relying on traditional books and personal computers (PC) has been drastically transformed because of the rise of handheld devices. Since the feature of handheld devices is that they are not restricted by time or location, research on mobile learning and ubiquitous learning has become extremely popular.

In addition, as a part of the traditional Chinese culture, martial arts can not only enhance physical fitness and conditioning but also function as a way of self-defense. In modern society, which lays great emphasis on good health, an increasing number of people get involved in practicing martial arts. After comparing martial arts and traditional sports, Lakes and Hoyt (2004) found that martial arts improved children's cognitive, emotional, and social behaviors significantly. Likewise, after exploring the effects of martial arts on old people's health, Brudnakc, Dundero, and Hecke (2002)indicated that both soft martial arts, whose movements are slower like taijiquan, and hard martial arts, which are faster and require more physical strength like karate and Taekwondo, provided training for old people's endurance as well as contributed to their physical fitness, and a short training in Martial arts fall techniques could reduce hip fracture risk in the elderly (Weerdesteyn, Groen, Swigchem, & Duysens, 2008). A study indicated that a martial arts program for children with epilepsy may influence parental perceptions of their child's well-being, particularly in relation to memory, attention, and concentration (Conant, Morgan, Muzykewicz, Clark, & Thiele, 2008).

However, traditional teaching of martial arts in the past was required coaches to instruct students face to face. Alternatively, films and written texts were employed to learn martial arts. In either way, learning time and learning location were limited. Besides, the real-time viewing angle could not be adjusted to satisfy learners' needs. Admittedly, 2D multimedia images of mobile devices are not restricted by learning time or learning location; additionally, the coach's standard movements can be shot from all orthogonal viewing angles, such as the side viewing angle, front viewing angle, and back viewing angle. But these are, after all, 2D images; in such a situation, users need to convert images of different viewing angles into 3D images in their heads. Compared with 2D images, 3D images are more intuitive.

Therefore, this study selected the routine of Tantui, an easier kind of martial arts, as the object of a case study. With 3D augmented reality and the advantages of mobile devices combined, a mobile-assisted learning system for martial arts was developed. The system was not limited by viewing angles, time, or location. Furthermore, learners (participants) could adjust the viewing angle of a movement by rotating an image, switch between different martial movements by pressing virtual keys on the images, and select the desired playback speed by pressing the corresponding key. Finally, the experimental results were examined through one-way ANOVA to investigate the differences in learning performance between the mobile 2D system and the mobile AR system. Meanwhile, a questionnaire survey was conducted to understand whether 3D images are helpful to cognitive learning of motor skills, learning motivation, learning satisfaction, and conditions of technology acceptance.

15 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/applying-augmented-reality-to-a-mobile-assisted-learning-system-for-martial-arts-using-kinect-motion-capture/163567

Related Content

Effectiveness of Digital Tools to Support Pupils' Reading in Secondary School: A Systematised Review
Danlei Chenand Gale Macleod (2021). *International Journal of Mobile and Blended Learning (pp. 1-17).*
www.irma-international.org/article/effectiveness-of-digital-tools-to-support-pupils-reading-in-secondary-school/274503

Questioning Prompts to Examine Blended PK-20 Learning Environments
Neal Shambaugh (2020). *Emerging Techniques and Applications for Blended Learning in K-20 Classrooms (pp. 1-20).*
www.irma-international.org/chapter/questioning-prompts-to-examine-blended-pk-20-learning-environments/242210

Situated Learning with SketchMap
Sosuke Miura (2009). *Innovative Mobile Learning: Techniques and Technologies (pp. 216-231).*
www.irma-international.org/chapter/situated-learning-sketchmap/23837

The Use of Mobile Devices in University Distance Learning: Do They Motivate the Students and Affect the Learning Process?
Sean B. Eom (2021). *International Journal of Mobile and Blended Learning (pp. 1-20).*
www.irma-international.org/article/the-use-of-mobile-devices-in-university-distance-learning/289364

Cooperative Learning as a Blended Learning Strategy: A Conceptual Overview
Chantelle Bosch, Elsa Mentzand Gerda Reitsma (2020). *Emerging Techniques and Applications for Blended Learning in K-20 Classrooms (pp. 65-87).*
www.irma-international.org/chapter/cooperative-learning-as-a-blended-learning-strategy/242214