

An Innovative Activity Design for Game-Based Learning on Interactive Whiteboard Space

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Abstract: In a traditional classroom environment, it would not be enough to enhance the interactions between instructors and learners. Many studies argue that multimedia has the potential to create high quality learning which actively engage the learners promoting deep learning. In this paper, the architecture is proposed to integrate hardware devices (Multi-touch screen, handwriting pane, and multiple mice) and software teaching materials for an instructor can decide an interactive learning process easily and simply.

Keywords: Interactive learning, Whiteboard, Multimedia, Multi-touch, Multi cursor

Introduction

In a traditional classroom environment, it would not be enough to enhance the interactions between instructors and learners. Cairncross and Mannion (2001) argue that learning materials with interactive multimedia has the potential to create high quality learning environment which actively engage the learner, thereby promoting deep learning. The key features of interactive multimedia, various media representations, user control over the delivery of information, and interactivity can be used to enhance the learning process through creating integrated learning environment. To realize interactive learning, it must be considered about hardware devices (eg. Interactive whiteboard, Multi-touch screen, handwriting pane) and teaching software. It is too hard for an instructor to decide an interactive teaching process with this technology nowadays. We propose an architecture which integrates with physical devices and software layer. Furthermore, we build an editor which contains an interactive layer above for an instructor to combine interactive activities easily according graphic user interface.

1. Cognitive Benefits and Technologies of Interactive Multimedia

1.1 Interactive Multimedia

The representations presented in the physical environment would not only involve the printed text, spoken text, and pictures (static graphics). In a traditional classroom environment, it would not be enough to enhance the interactions between instructors and learners. Many studies argue that multimedia has the potential to create high quality learning which actively engage the learners promoting deep learning. In general, one of the main cognitive benefits of multimedia information presentations is that contents can be customized according to the cognitive needs of users. Cairncross and Mannion (2001) argue

that learning materials with interactive multimedia has the potential to create high quality learning environment which actively engage the learner, thereby promoting deep learning. The key features of interactive multimedia, various media representations, user control over the delivery of information, and interactivity can be used to enhance the learning process through creating integrated learning environment. The interactivity means to give users the opportunity to decide on what and how of the information presentation (Schwan & Riempp, 2004). These can help learners come to a deeper understanding through supporting conceptualization and contextualization of the novel material being presented; actively involving the learner in the learning process; and promoting internal reflection. Therefore, presenting the various representations by improving the interactivity of learning materials has been widely used in the multimedia instruction

1.2 The Benefit of Interactive Whiteboard

Interactive whiteboards (IWBs) are becoming very popular information and communication technologies (ICTs) in computer-supported in-class courses. IWBs provide a range of benefits in terms of increasing interaction with learning activities and increasing student interest, resulting in increased motivation of students (Kennewell et al., 2008; Schmid, 2008; Warwick et al., 2010). The technological capabilities of the IWB and the corresponding software are found to be highly compelling for attracting the attention of students (Kennewell et al., 2008; Torff & Tirota, 2010). Various recent studies have made use of IWBs in different domains, such as mathematics, science and languages (Miller et al., 2003; Thomas, 2003; Wiggins & Ruthmann, 2003; Gillen et al., 2008). IWBs in these studies have been used to present various multimedia resources on IWB for different learning needs. However, the use of IWBs with a limited display space has potential to confuse students due to the crowding of rich multimedia information on the board (Levy, 2002). IWBs enable new ways of interactions among teachers and students in the classroom. In terms of the benefits for teaching, IWBs allow teachers to teach with flexibility, effectively and interactively, using various presentation media, and multimedia (Smith et al., 2006). In terms of the benefits for learning, IWB can increase learners' motivations and provide them various multimedia and multi-sensory presentations (Smith et al., 2005). IWBs allow students to observe the manipulation of activities, write out procedural instructions, and reduce time spent in repeating explanations (Smith et al., 2005; Smith et al., 2006; Kennewell, et al., 2008).

2. An Innovative Activity Design for Interactive Learning

2.1 Architecture Overview

Our goal is to help an instructor who not master at programming can create various scenario of interactive learning without knowing too much hardware and software knowledge. To implement the goal, there are some key points below:

- What kinds of multiple input devices support?
- How to integration of these different multiple input device
- What kinds of interactive act ivies have?
- How to combine interactive using GUI without any programming?

Firstly, we define an abstract Layer between Physical Devices and Education Layer to integrate different input devices to transfer to the same abstract definition. Almost

instructor does not know how to programming. Secondly, we build a combination between Education Layer and Abstract Layer to transfer the programming view to the education view. Finally, we transfer the interactive actives at Education Layer to GUI element for an instructor can create various scenario of interactive learning easily.

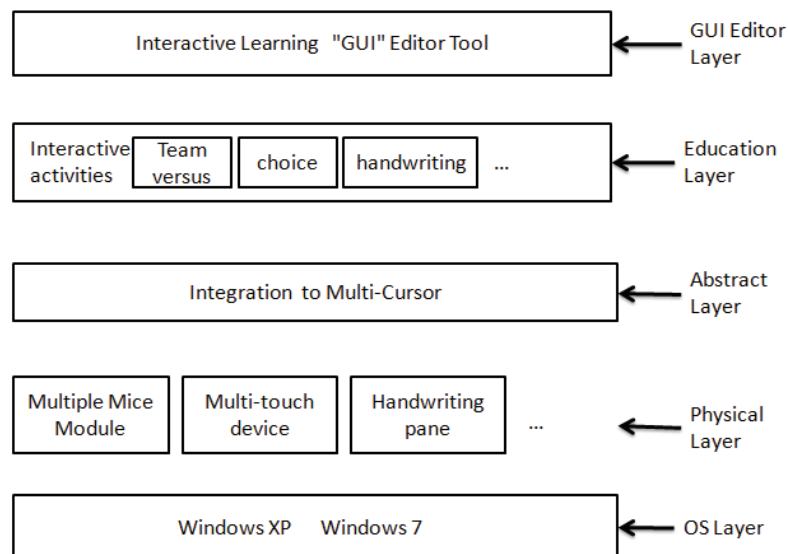


Figure 1: the architecture overview

2.2 Integration with Physical Devices and Software Layer

We integrate three kinds of input devices (multi-touch device, handwriting device and mice). Multi-touch devices can provide multi input at the same time which is useful for competitive learning, but it only support on Windows 7. It can have only one cursor on the screen at the same time even you use multiple mice on Window 7 or Window XP. To Support competitive learning without window 7 or multi-touch derives, we write a Multiple Mice Module to simulate multi cursor on the screen at the same time. A teacher and students can use mice instead of multi-touch devices. We also support some handwriting devices which are useful for painting at art and math. Finally, all different input device are described the same as multi-cursor to prepare integration with Education Layer.

2.3 Education Layer and Interactive Learning Process GUI Editor

After integrating hardware input devices, there are two goal need to be achieved.

- Define interactive activities as general as possible for different domain knowledge.
- Create various scenario of interactive learning without programming

To achieve the goals above we define three kinds of learning materials.

- Static material (text, picture, sound and movie) which are used for general presentation. These are general materials of multimedia learning. For none programming, GUI editor is decided that an instructor to drag a touch area to put the material. The sound and movie materials are played while a teacher click the touch area.
- Interactive activities which are used for interaction between a teacher and students. We devices various kinds of interactive touch areas such as choice, interactive choices, handwriting, score, learning feedback and award. For different domain knowledge and complete learning this material are decide as general as possible. These entire have

some attributes for integrative and can be combination to many kind of interactive activities. All of this element support up to 10 group for complete learning at the same time. For combination example, an instructor can use text or picture material to describe a math question, and use two handwriting area one's attribute set to team1, other attribute set to team2, then a scenario are created that 2 team solve a problem by writing at the same time.

- Flow control units which are use to provide process while creating a scenario. After interaction, some flow control are needed, such as learning feedback, score add, scene reset and so on. We define three kinds flow control link and some action block to achieve this without an instructor to programming. For example, an instructor can set a learning feedback picture and add score automatically after a learning answer correct. The figure of following shows a flow control means if choice 1 answer is correct then score add automatically and then go to choice 2 or if choice 1 answer is wrong then show a "X" picture feedback and then go to choice 3.

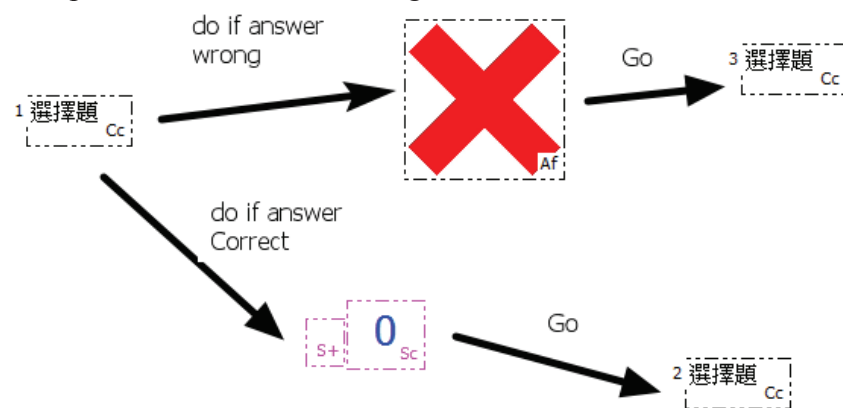
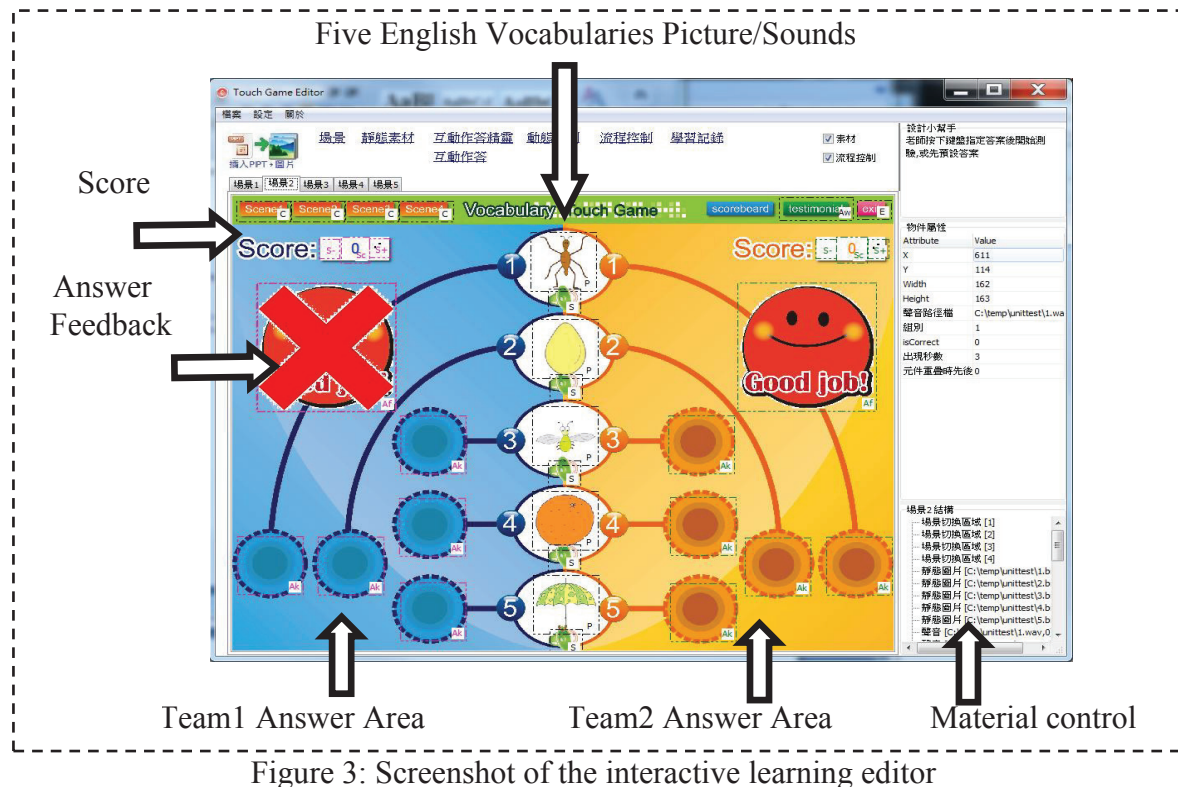


Figure 2: Screenshot of flow control

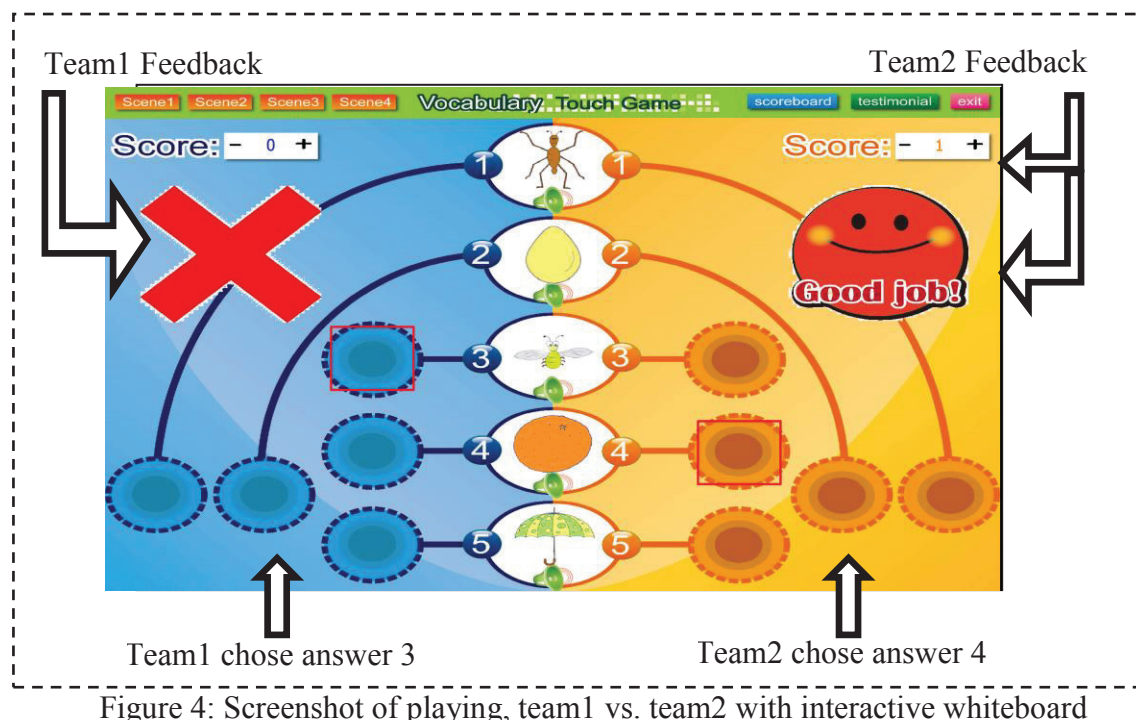
By the combination of three kinds of learning materials, it can construct various interactive activities at linguistics, mathematic, music, sport and so on, to promote deep learning

3. Example of English Teaching with Competition

An instructor uses the GUI editor to create a scenario of competitive learning with team1 and team2 easily.



While teaching, a teacher can use keyboard to control which answer is correct. The teacher says “orange” and then learners of team1 and team2 to touch the answer area at interactive whiteboard. Team1 answer is wrong then system shows “X” picture feedback and team2 answer is correct then system shows “Good Job” picture feedback and score add .



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