A Low-Cost Wireless Multi-Presentation on Single Screen in Classroom Using Raspberry Pi

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ABSTRACT

Smartphone has become a daily necessity in supporting the mobility of users, including teachers and students. The need of users to make multi-presentation via a smartphone wirelessly does not fit with the cost and multiplatform support. This study aims to produce a solution by using Raspberry Pi as a wireless digital media player that will be applied to educational institutions to make multi-presentation wirelessly at efficient cost. The results obtained from this study is a wireless digital media player application that is installed in Raspberry Pi, a credit-card size single board computer, and an Android application whose features of sending image, presentation, splitting screen, and able to give control and access grant. The conclusion is an application can augment user mobility within the presentation in teaching and learning effectively.

KEYWORDS
Multi Presentation, Raspberry Pi, Smartphone, Wireless Digital Media Player

INTRODUCTION

In the mid of 1800s, teachers used blackboard and chalk as learning tools. In 1990s, blackboard and chalk began to be replaced by whiteboard and marker. Along with the development of technology, classrooms in 2000s are equipped with computer and projector (Yulianto, 2013) (see Figure 1). The development of learning tools and instructional media are progressing rapidly. It is expected to have positive impacts in delivering more effective learning to students (Bochicchio, 2004). A teacher in the classroom is required to create a comfortable learning atmosphere for his students, so that they can learn in expected quality (Eggen, 2012). A teacher must be also able to control the flow of materials delivered in his class.

There is a phrase states “if learning content is a king, then infrastructure is a god.” Infrastructure in teaching-learning is important because having adequate technology as learning tools is already become a requirement (Muhson, 2010; Anderson, 2004). Nowadays, teachers are able to present not only through their computers but also through their smartphones (Anderson, 2005; Ha, 2014). Problem arises when a teacher or group of students want to display multi-presentation (can be from many devices) to a single projector screen simultaneously, so there is no need for switching the screen and students can see at once. There are many courses that need the multi-presentation mechanism, such as drawing, architecture, fashion, game, multimedia, and design.

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Currently, there are limited expensive devices produced on the market that support multi-presentation in a single screen. For example, WePresent (WIPG) is available on the market that cost between US$400 and US$940 depends on the specification (Amazon, 2016). Many educational institutions have to pay dearly for implementing multimedia classroom technology to support multi-presentation. Not all educational institutions can afford or willing to pay it (Yulianto, 2011). Apple TV is cheaper that costs US$70 but only can support single presentation and relies on Apple platform (Amazon, 2016).

Previous related researches shown that teachers can connect multiple-devices to a single whiteboard with GUI but not multi-presentation (Rekimoto, 1998; Rekimoto, 2000), single-display groupware for co-present collaboration (Stewart, 1999; Anderson, 2006; Greaves, 2009; Turunen, 2013; Lim, 2013; Suppers, 2014; Chandra, 2014), presenting through Tablet-PC integrated with PowerPoint (Anderson, 2004; Simon, 2003), presenting with laser-pen/led-pen and camera/sensor (Choi, 2003; Yulianto, 2014), implemented digital ink (Anderson, 2005; Anderson, 2007; Wilkerson, 2005; Cao, 2014), recordable (Yulianto, 2014; Wolf, 2007), optimized connection through Wi-Fi (Hsu, 2014; RaoT, 2015) and integrated with NFC (Nagasawa, 2014). There is no study conducted found for wireless simultaneously multi-presentation from smartphone.

We had conducted a survey of 640 respondents (20% lecturers, and 80% students) and shown that 92% tend to move their position while presenting. They are using wireless digital media player such as WePresent or AppleTV for presenting from their smartphone, or by using remote presenter for their PC/laptop (Lindquist, 2007). Another side, teachers are faced with taking more time when setting their smartphone connection to the device. Presenting via smartphone can be done with the device that allows them to send images presented to the projector wirelessly (Caputo, 2006). Based on those problems, we offer a solution to implement Raspberry Pi, a credit-card size single board computer (Upton, 2012; Brock, 2013), that can be customized (implemented with application) (Ali, 2013) to make presentation wirelessly via smartphone (see Figure 2). Raspberry Pi is cheaper and affordable for educational institutions (Severance, 2013; Edwards, 2013) that costs US$30 (Amazon, 2016).

There are limited related studies on the use of Raspberry Pi. Chheda had used Raspberry Pi for storing files and presenting directly to projector. He used smartphone to screen-remote wirelessly to Raspberry Pi (Chheda, 2013). Another researcher, Wei, can also transmit smartphone screen to monitor through Raspberry Pi wirelessly (Wei, 2014). No study has been found on wireless simultaneous multi-presentation from smartphone through Raspberry Pi.

**PROPOSED SYSTEM**

By utilizing Raspberry Pi and Android smartphone, presentation can be done wirelessly. Teacher can open the presentation files on his Android smartphone then using the Wi-Fi network, displaying slides to the projector via Raspberry Pi (with additional Edimax EW-7811Un Wi-Fi USB Adapter).
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