Design and Implementation of Android-Based Interactive Multimedia Presentation Platform for Multiple Users

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***Abstract*-- With the development of multimedia and embedded system technologies, it gradually becomes the part of our life. The course materials in future classrooms will be presented by interactive multimedia. It is different from the previous traditional teaching. The paper proposed two concepts about multiple users' interaction and multiple users' operating. Our system integrates cloud management system, multiple remote joysticks and android-based presentation platform. This system is divided into two parts: Interactive Multimedia Presentation Platform (IMPP) and Cloud Service Center (CSC). Our Android and Unity3D interactive library are developed for third-party users. Users can develop a multi-user interactive app on our system easily. CSC is a website, which is based on Drupal open source. The Application Store of Embedded Multimedia Network (EMNA Store) was approached. Users can download, install and delete apps on EMNA Store from IMPP. Finally, the multiple interactive presentation system with cloud services was realized.**

I. INTRODUCTION

In a traditional classroom, teachers present their materials and broadcast to all students. The teaching model is lack of interaction and activation. The learning motivation of students is passive. However, in the future classroom, the interactive teaching model is very significant. Students can join the teaching process with interactive materials.

Thus, the paper proposed two concepts about multiple users' interaction and multiple users' operating. Our system integrates cloud management system, multiple remote joysticks and android-based presentation platform. Teachers can download online interactive materials from our Emna Store, and play the materials by our interactive multimedia presentation player. Students can join teaching activities by using the remote controller simultaneously. Moreover, the system design, implementation results and performance evaluation are presented in this paper.

II. SYSTEM DESIGN

The system environment is illustrated in Fig. 1. This system is divided into two parts: Interactive Multimedia Presentation Platform (IMPP) and Cloud Service Center (CSC). CSC is a website, which is based on Drupal open source. The Application Store of Embedded Multimedia Network (EMNA Store) was approached. Users can download, install and delete apps on EMNA Store from IMPP.

IMPP was implemented by the Cubietruck embedded system [1]. The main hardware of Cubietruck is ARM Cortex-A7 duo core CPU and DDR3 2GB. It can present to projector or displayer with VGA and HDMI interface, and connect to internet by using WiFi or wired Ethernet. The operation system of Cubietruck is Android 4.2.2.

In the original Android [2], all remote controllers would be mapped to single mouse cursor. It does not support multi-user interactive operations. Therefore, we have to develop a new input event driver for multiple remote controllers, and silence the signals of student remote controllers to system mouse event in Android framework. The software functional blocks are shown in Fig. 2. The input event driver with JNI (Java Native Interface) [3], multi cursor app module, paint app module, race game demo app and EMNA Sore client module were developed by our team.

III. RESULTS

A. Functional Test

The test results are shown in Fig. 3 and Fig 4. Figure 3 demonstrated that 8 cursors are working at the same time. Students can move their remote controllers and display the

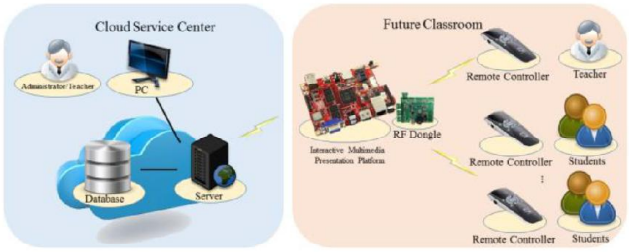

Fig. 1 The system architecture.

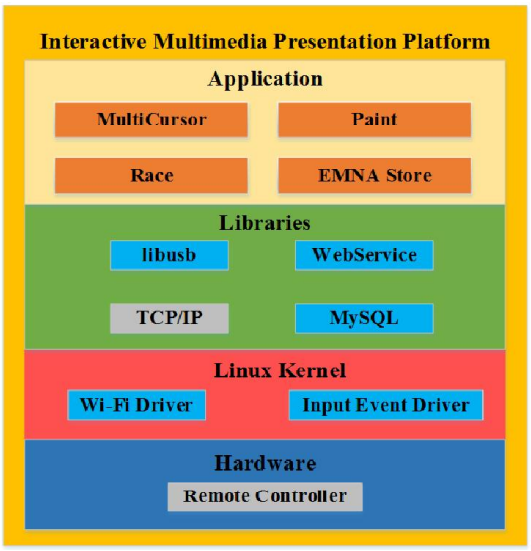

Fig. 2 The software functional blocks.

Fig. 3 The test result for multiple controllers.

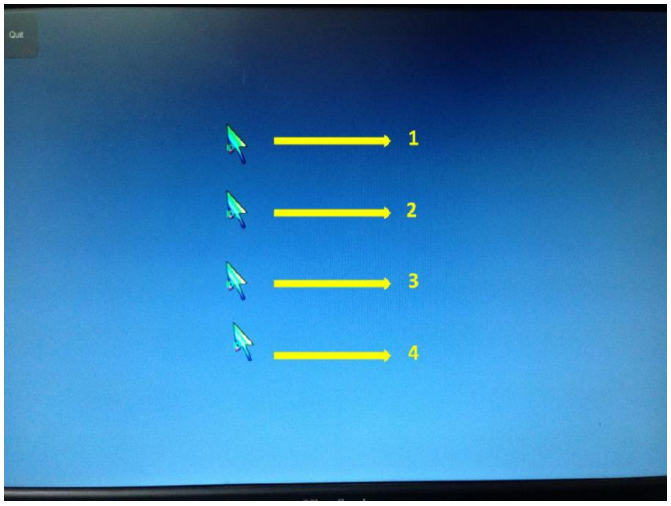

Fig. 4 The test result with Unity3D API for multiple controllers.

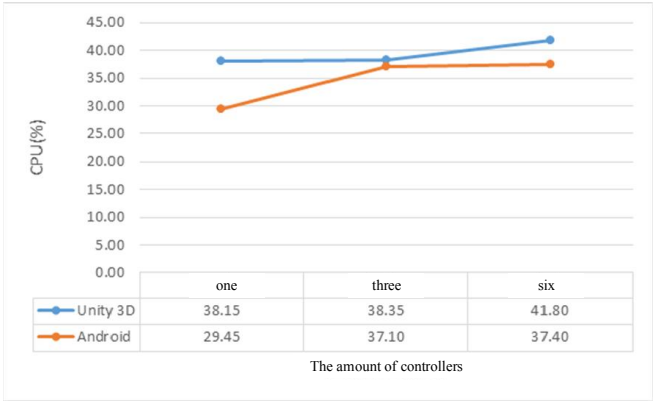

Fig. 5 the performance evaluation of CPU utilization.

cursors with different colors. Moreover, Figure 4 shows that our platform is compatible with Unity3D [4] development software. The material designer can develop a 3D interactive material with multiple remote controllers by using Unity for our platform.

A. Performance Evaluation

In the performance evaluation, we measure the CPU utilization and RAM utilization for different remote controllers

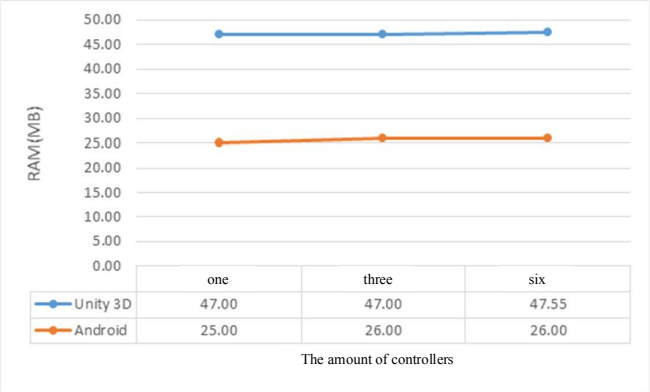

Fig. 6 the performance evaluation of RAM utilization.

simultaneously. The results are shown in Fig. 5 and Fig. 6 separately. While moving one remote controller, and playing a Unity 3D demo material app and a pure-android demo material app, the CPU utilization is 38.15% and 29.45% respectively. The Unity 3D demo material app would spend more resource to deal with additional 3D library than pure-android app. Anyway, the system resource utilization for six remove controllers is acceptable.

IV. CONCLUSIONS

The paper proposed an android-based interactive multimedia presentation platform for multiple users. In the original Android, all remote controllers would be mapped to single mouse cursor. Our system can support multi-user interactive operations currently. We developed a new input event driver for multiple remote controllers, and silence the signals of student remote controllers to system mouse event in Android framework. In our results, the system was achieved and tested. The system resource utilization for six remove controllers is acceptable. In the future, a higher level embedded system platform can be used to support more remote controllers and improve the system performance issue.

ACKNOWLEDGMENT

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