

# Unifying Multimedia Player and Presentation System With Utilizing Dual-Display Feature

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**Abstract-** In the future, utilization of dual display tends to be more popular. Optimizing the use of this feature, and designing a specific control panel user interface (UI), provide a possibility to develop an application that is able to unify the behavior of PC based multimedia player and presentation system. Since the view of the control panel and its output display occupied a different monitor, it is possible to create a single-compact control panel UI. Each multimedia element (video, image, slide, animation) have a particular controller and to be integrated in one window. This paper presents the Integrated Multimedia Player (IM-Player) an application that has been developed based on channel controller model and exploits the dual-display feature. We examined that the IM-Player has inherent double functions i.e. as a multimedia player and a presentation system simultaneously. Lastly, the IM-Player enable to unify the behavior of multimedia player and presentation system in single application

**Keyword:** *integrated multimedia player, presentation system, dual display*

## I. INTRODUCTION

Nowadays there is an indication that many students tend to prefer utilizing dual (multiple) display to single one. Whether with a laptop or PC desktop, they extend their computer's primary monitor to the secondary monitor. Dual display (or also mentioned as extended desktop, dual view, dual screen or dual monitor) feature is a standard feature in modern laptop which enables the user to extend the computer's desktop twice of its length, so the computer seems to have two monitors separately. In the future it seems that the dual-display feature will be commonly used. Steward G, the CEO of GScreen (a computer laptop corporation), recently released a new product of a special laptop with dual monitor feature [1] (Fig.1).



Figure 1. Laptop with dual monitor feature

In dual display mode, the primary monitor is usually used to show the main desktop and important applications such as word processors. The other one is the secondary monitor. It is usually used to display other supporting and alternative applications. It is also employed to extend the display of a main application in the primary monitor to secondary monitor. As an example, first monitor shows a word processor that used by user to write a paper, while the second monitor shows a multimedia player that playing some multimedia file or pdf reader to show some reference papers. Thus the user can write a paper in word processor application with more comfortable and enjoyable.

Another exploitation of the dual display feature is the presentation system. Presentation system considers not only how some slides are made, and presented to the audience. It involves how to deliver the detail content of the information to the audience. So that it can improve the understanding of the audience. Some researchers have studied about presentation system, for instance MultiPresenter [2], EPIC [3], Educational Presentation System [4][5], and Most of the presentation systems have similarity, i.e. use a separate view mechanism between presenter and audience. Presentation system assumes the presenter as the author that has full authority to control, and maintain the flow of information while delivering it to the audience. In other side the interest of the audience is what and how the entire information can be received completely and easily. This difference implies that a presentation system should have a different view between presenter and audiences to bridge the gap.

Almost all of presentation systems are slide-oriented and utilize multi (at least dual) display. The primary display is for controlling, authoring, maintaining and managing all element of presentation while the secondary display is specially provided to support the output display of the system (slide show area). Since most slide-based presentation also contains various multimedia elements (video, audio, and animation), often the presenter needs to control independently each multimedia element. It is better and reasonable because embedded multimedia element inside a slide may create problems for the presenter e.g. file size become bigger, linked file does not exist, mismatch destination linked file and the media file can not be played back. Moreover, the presenter has to use several types of media player when he or she needs to present varying video file formats. It emerges a new problem for inexperienced presenter.

An idea is proposed to overcome this matter, by providing a separation controller for each main multimedia elements (video, audio, image, e-slide, animation and live video). All the controllers are integrated by a main application based on channel controller model. The main UI of the application is shown at primary monitor and the output of each controller is consistently and persistently shown at secondary monitor.

Since the proposed system supports e-slide controller and multimedia player, it should be able to be a presentation system and at the same time also can be operated as a multimedia player. This paper describes the prototype of the proposed system which has ability the characteristics that are owned by multimedia player and presentation system simultaneously.

## II. RELATED WORK

### A. Multimedia Player Review

Many types of PC Based multimedia players are available. Each player offers many features, benefits and has specialties but it is difficult to find multimedia player that support all of multimedia elements (including text or slide based file format). The popular player such as Windows Media Player© is not support for all video, audio file format moreover animation and image file format. The users that want to play more diverse multimedia file formats must use another particular player. Additionally, the design of the media library user interface is in single file list. Any video, audio, image, and animation files that have been chosen by user will be located into a single file list. From the user's view it is not flexible since it is difficult to switch pleasantly between multimedia elements' file types. Furthermore, while presenting many various multimedia elements' file types, the user often needs to select between each multimedia element's file types quickly and in the right choice. So, it's better to group each multimedia element file types into separate file lists.

This idea emerges a consequence that it needs a wider area for the control panel user interface design. Whereas there are many menu options for choosing, managing, and controlling the multimedia files. It implies since these players have been designed for single display so the output screen and the control panel window of the player are displayed into one monitor. Consequently it makes the user somewhat confused and inconvenient. An alternative solution has been issued by separating between control panel user interface and its output screen [6][7]. It can be realized by utilizing dual-view feature.

### B. Presentation System

As a matter of fact, PowerPoint is only a slideware tool to support a presentation [2]. According to [8][9][10] as cited by [2], PowerPoint was designed for particular, slide-by-slide, linear presentation and still difficult to perform nonlinear slide-based presentation although it supports dual display. PowerPoint needs another advanced controller to enhance the performance of presentation to be user-centered presentation [2].

From these, some researchers have been interested to research and develop presentation system since a few years ago. Schnepf et.al. [11] have introduced a Flexible Interactive

Presentation Synchronization (Flip). Flip works by event-based model that support inclusion of various media displayer and user interaction. Then, Bailey et al. [12] have proposed a multimedia synchronization toolkit, named by the Nsync. Chiu, et.al.[13] developed ModSlideShow, a presentation system that is based on a discrete modular model to manage the slides to show onto multi displays. The slides also can be manipulated and annotated in simply and flexible way. Liu et.al.[3] proposed a framework to employ multi-display environment in more effective. A presentation system called EPIC is introduced to implement the framework. EPIC views and treats all type of multimedia elements as a (hyper) slide. Since it uses multi-display, Epic also considers the quality of views to the audience members through a model. Turban et.al.[4][5] have proposed a categorization and framework to develop a presentation system in educational area such as classroom presentation. There are some criteria to develop an educational presentation system. Importantly, the categorization distinguishes between the information stream and information unit while presenting each of multimedia elements. Thus, both information stream and information unit can be presented independently by its own style. The other interesting criterion is the separation of views between the presenter and the audience.

Meanwhile, another flexible presentation tool for diverse multi monitor has been presented by Kurihara et al.[14]. This presentation system will separate the contents from the views. For instance, if there are three monitors, the first for displaying previous slide, the second is current slide and the last monitor to show the next slide. Lastly Lanir et al. [2] have introduced MultiPresenter. MultiPresenter is a presentation system that approached by slide-oriented. It considers presenting slides in a large and multi display environment. Various presentation styles and the way to deliver each component of slides are stressed and highlighted by MultiPresenter. It views that a slide which consists of other multimedia elements can be shown as another slide independently.

The proposed idea in this work was initially inspired from [3][4] but in reverse way and different manner. A PowerPoint file is considered as a "metamedia" since it consists of some slides where each slide comprised from any multimedia element file types. By separating each multimedia element file types with its particular controller, each file type of multimedia element can be played back independently [7]. Finally, the behavior of multimedia player and presentation system are unified by developing a system that can integrate some types of multimedia players and power point controller.

## III. THE PROTOTYPE

The initial model of expected system has been successfully developed and tried in some kind of areas [6][7]. It's named as IM-Player (Integrated Multimedia Player). IM-Player supports all of multimedia files and playback it by controlling in single-compact control panel. The major idea of the single-compact control panel is the entire multimedia file is grouped by the type of multimedia element. Refer to the existing players it can be grouped into four players: audio/video (DVD included) player, image viewer, flash player, power point viewer. From this there are four groups of multimedia files type, i.e.

audio/video group, image file group, PowerPoint group, and flash group. Each group is presented in a file list, so there are four major file lists: audio/video file list, image file list, e-slide file list, and flash file list. All file lists are placed in a single window that equipped with its navigator. Finally all of it performs a single-compact control panel [6][7].

Since there are additional features such as audio processing, slide time line, and video controlling, the design of the control panel needs to be updated than [6][7]. The picture below depicts the updated single-compact control panel of the prototype.

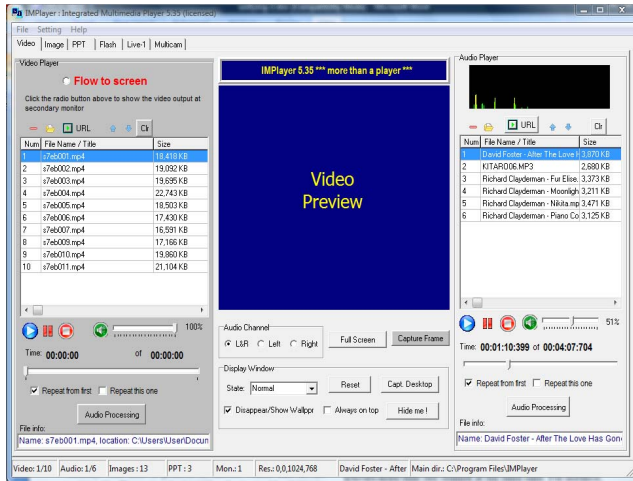


Figure 2. The updated Single-compact control panel

Displaying all the list of each file type in a single-compact control panel provides the facility for the user to choose multimedia files simply and freely. By this approach the user can choose and switch between file lists easily and more flexibly. The user is pleased to choose which one of the multimedia files to be displayed by freely double clicking a selected item in the appropriate file list. After choosing and running an item of the multimedia file types, the output will be displayed into secondary monitor.

The above discussion explains that there are five groups of multimedia elements that represented by the four file lists, and one live video streaming controller. It will impact to emerge the five multimedia streams. Each multimedia stream would be flown to the secondary monitor via particular channel. A channel is as like conceptual path for particular multimedia stream. Since the IM-Player has five multimedia streams, at least it needs five channels.

The system architecture has been developed based on the channel controller model (CCM) [7]. The CCM is a design modeling that has main purpose to control and manage the output display of all multimedia streams. It works with hide-show technique that will be realized by a particular algorithm [15]. To improve the performance of the slide controller, a simple rendering process has been added in the system architecture. To enhance the quality of the audio output, some audio processing features are provided. Fig.3 illustrates about the updated system architecture based on the CCM.

The channel-1 ( $Ch_1$ ) is assigned to serve the multimedia stream 1 (audio/video stream). The other channels ( $Ch_2$ ,  $Ch_3$ ,  $Ch_4$ , and  $Ch_5$ ) are assigned to serve the other multimedia streams (i.e. image, e-slide, flash animation and live video stream respectively). As a case example, when user activates  $Ch_1$  (by selecting a video file) the channel controller routine will command the video controller routine to play the selected video file and also manage the output display of that video. The channel controller has authority and responsibility for the showing of the output display at the secondary monitor.

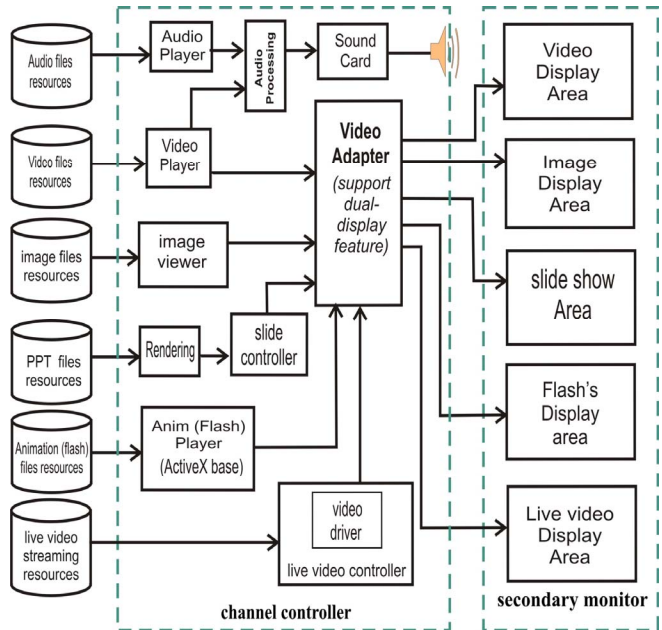


Figure 3. The updated system architecture

The CCM with hide-show technique provides a possibility to activate more than one channel at the same time. For instance, the user has chosen the image channel to be activated. At the same time, the user wants to hear a music that exists in audio/video file list. In this case, by the IM-Player, it is possible the user activate the audio/video channel. In this way, the audio/video controller is running, but on the other channel (the image channel) is still active. The channel controller will manage and arrange the both process of channels.

#### IV. OPERATING AS MULTIMEDIA PLAYER

In this case, IM-Player is regarded as common multimedia player. IM-Player is mainly used to play back some multimedia file types including any common video file formats, audio file formats and flash animation [6]. As multimedia player, the IM-Player is considered to be used and operated by single user (primary and secondary monitor are assumed for single user).

Tabel 1 explains a brief comparison of features between IM-Player and other common multimedia players. In addition, IM-Player has additional features that are unavailable in common multimedia player such as images slide show, video recording, multimode player and dual display supported.

The additional features make the IM-Player differs from the other multimedia player. When running in a computer with supported dual display feature, the secondary monitor is specially provided for displaying the output of players, and the control panel will always exist in primary monitor.

TABLE I. THE COMPARISON OF SOME POPULAR MULTIMEDIA PLAYERS AND IM-PLAYER

Multimedia File Types	WMP (Vers.9)	MPC	Winamp	AllPlayer	IMPlayer
Common Video (AVI, MPEG, VCD)	Yes	Yes	Yes	Yes	Yes
Common Audio (MP3, wav, wma, mid)	Yes	Yes	Yes	Yes	Yes
Flash animation (SWF)	No	Yes	No	No	Yes
Common Image file (bmp, jpg, and gif)	No	Yes	Yes	Yes	Yes
e-slide (powerpoint)	No	No	No	No	Yes
Live video streaming	No	Yes	No	Yes	Yes
<b>Additional Features</b>					
Dual display	No	No	No	No	Yes
Video recording	No	No	No	No	Yes
Image capturing	No	No	No	No	Yes
Motion Detection	No	No	No	No	Yes
Multimode Player	No	No	No	No	Yes
Image slide show	No	No	No	No	Yes
File lists separation	No	No	No	No	Yes
e-slide controller	No	No	No	No	Yes

Some common modes of multimedia players such as VCD, MP3, midi, Flash player, and images viewer (with slide show mode) can be performed by IM-Player. The user has feel freer to select a multimedia file that the user wants to be presented [6]. Fig.4 illustrates when IM-Player operates as video (vcd) player or mp3 player. When playing a video file, the video output will be displayed on the secondary monitor (right picture).

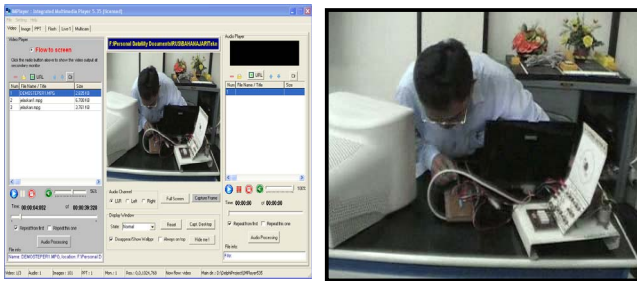


Figure 4. IM-Player is operating as a video or mp3 player

To switch from video player to mp3 player or image viewer simply click a radio-button then the output will be displayed in the secondary monitor. Since the IM-Player supports multimode player, thus the IM-Player is enable to play vcd or mp3 files while IM-Player is viewing images.

## V. OPERATING AS PRESENTATION SYSTEM

As we know, PowerPoint actually is just a presentation tools that has behavior of a linear slide presentation. The presenter is difficult to change between slides freely and flexibly. It will be more difficult when the presenter has some

file types of multimedia elements (for instance, some video or image file formats) that must be presented in the same session. By embedding all multimedia elements into slides sometimes a new problem and difficulties will be raised while representing them at other place in the next time.

Since the IM-Player has additional features: e-slide controller, video capturing, support dual display and multimode player, IM-Player can be operated as a presentation system. It means that IM-Player is not replacing the existing presentation software tools such as PowerPoint, but it can be used to support and overcome the weakness of presentation software tools. The expectation of this work is the IM-Player can be used to improve the overall performance of presentation.

As a presentation system, the IM-Player is considered to be run by multiple users, namely: direct user (presenter) and indirect users (audiences). Direct user is just the presenter, usually single person that has the main responsibility to the success of the overall presentation. The presenter concerns with the primary monitor by driving the overall steps of presentation. The indirect users are the audiences that mainly focus to the secondary monitor. Since the indirect users can be one or more person, so the secondary monitor should be an LCD projector or TV monitor.

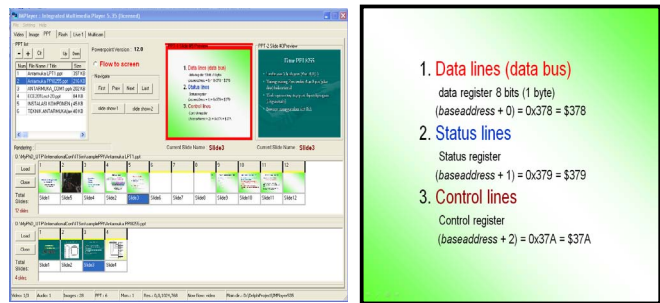


Figure 5. (a) The control panel and slide-timelines at primary (presenter) monitor, and (b) is the selected slide show that displayed at the secondary (audience) monitor.

Fig.5 illustrate the IM-Player operates as a presentation system. User can select two PowerPoint files from the file list to be rendered. The two rendered PowerPoint files will be laid on the slide-timelines (Fig.5.a). Using this way, user can select freely each slide from the two PowerPoint files to be presented for the audience. This feature provides a non-linear way of presentation. Furthermore, user can change the loaded PowerPoint file that currently exist in one of both slide-timelines with another PowerPoint file in the file list. This process is fast and invisible from the audience view.

In the mid of presentation, often a presenter needs to present other multimedia files such as video, animation and image files. Actually, by IM-Player the presenter can switch freely between video or animation player, image viewer and slide controller just by a simple way.

## VI. DISCUSSION

The use of IM-Player either as a multimedia player or a presentation system actually based on the feature of multimode player. As it was mentioned in section 3, by improving the system architecture with channel controller model, the IM-Player can be operated as many modes of multimedia player (including e-slide viewer).

The number of possibilities ( $P$ ) of multimedia player depends on the number of channels ( $n$ ) that can be activated and inactivated. Address to the probability theorem [15][16], the number of possibilities (probabilities) of multimedia player is the combination of existing channels, and calculated by:

$$P = \sum_{r=1}^n \binom{n}{r} = \frac{n!}{r!(n-r)!}, \quad r = 1, 2, \dots, n \quad (1)$$

Since there are five channels, originally the total number of possibilities of multimedia player ( $P_{tot}$ ) is 31. Because  $Ch_2$  is always activated and never inactivated, so the total actual possibilities ( $P_{act}$ ) are:

$$P_{act} = P_{tot} - \sum_{r=1}^4 \binom{4}{r} = 16 \quad (2)$$

Table 2 describes the overall sixteen possibilities of multimode players.

While comparing the IM-Player with other presentation systems, such as Multipresenter, Educational Presentation System and EPIC, the difference between IM-Player and the others is that the IM-Player can be operated in many types of multimedia player and also as a presentation system simultaneously. Both are inherent behavior in the IM-Player and cannot be separated independently each other.

As an example, suppose a presenter has two PowerPoint files, three image files, one swf file, two flv files, and one mpeg file that must be presented in a same session. All that files are interrelated, and the presenter often needs to jump forward and backward freely among all slides, and also play other multimedia files at the same time. Meanwhile, embedding the additional multimedia files inside slides sometime raise accidentally problems in the time of presentation such as missing link, linked file not exist, or not enough storage memory. Another alternative way, the presenter can arrange the presentation of all files by IM-Player.

The above task can be performed by placing the two PowerPoint files into PowerPoint file list, the three image files into image file list, the swf file into flash file list and the two flv and one mpeg file into video/audio file list. By clicking the "Load" button in the first slide-timeline, IM-Player will start to render the selected PowerPoint file. After completing the rendering, each slide of that file will be located in the first slide-timeline and the first slide will be appeared in the secondary monitor. For the second file, just click "Load" button in the second slide-timeline, and each slides of the file would be placed in the second slide-timeline. User can freely select each slide of both files just by double-clicking the

selected slide and the slide will appear in the secondary (audience) monitor. The presenter can start his presentation by explaining the associate slide.

When the presenter needs to play a video in the mid of a presentation, he or she just double clicks the selected video in video/audio file list. Then, change the direction of flow selector into video, and the video output will be shown in the secondary monitor. When the presenter needs to present the second PowerPoint file, he just double clicks the second file, and immediately the first slide of the second file will appear at the secondary monitor. The flow of story likes the continuation from the previous slide in the first PowerPoint file. Basically, each movement from the showing of one to other multimedia files the audience's view will not be disturbed by the processes of the movement itself.

TABLE II. SIXTEEN POSSIBILITIES OF MULTIMODE PLAYERS

No	Activated channels					Description, System behaviors	Secondary monitor
	Ch <sub>1</sub>	Ch <sub>2</sub>	Ch <sub>3</sub>	Ch <sub>4</sub>	Ch <sub>5</sub>		
0.	0	1	0	0	0	Default, viewing image file(s)	Show an image
1.	1	1	0	0	0	Playing Audio/video file(s) and viewing image file(s)	Show Ch pointed by FSell
2.	0	1	1	0	0	Showing a Powerpoint file and viewing image file(s)	PPT has priority
3.	0	1	0	1	0	Playing SWF file(s) and viewing image file(s)	Show Ch pointed by FSell
4.	0	1	0	0	1	Live video streaming and viewing image file(s)	Video streaming has priority
5.	1	1	1	0	0	Playing audio/video file(s), viewing image file(s), and showing a ppt file	Show Ch pointed by FSell
6.	1	1	0	1	0	Playing audio/video file(s), viewing image file(s), and playing SWF file(s)	Show Ch pointed by FSell
7.	1	1	0	0	1	Playing audio/video file(s), viewing image file(s), and live video streaming	Live video streaming has priority (on Full screen mode), else display both
8.	0	1	1	1	0	Viewing image file(s), Showing a PPT file, and playing SWF file(s)	PPT has priority
9.	0	1	1	0	1	Viewing image file(s), Showing a PPT file, and live video streaming	Live video streaming has priority (on Full screen mode), else show video streaming and Ch pointed by Fsell
10.	0	1	0	1	1	Viewing image file(s), playing SWF file(s), and live video streaming	Live video streaming has priority (on Full screen mode), else show video streaming and Ch pointed by Fsell
11.	1	1	1	1	0	Playing audio/video file(s), viewing image file(s), showing a ppt file and playing SWF file(s).	PPT has priority at first time, next show Ch pointed by Fsell
12.	1	1	1	0	1	Playing audio/video file(s), viewing image file(s), showing a ppt file and live video streaming	Live video streaming has priority (on Full screen mode), else show video streaming and Ch pointed by Fsell
13.	0	1	1	1	1	Viewing image file(s), showing a ppt file, playing SWF file(s) and live video streaming	Live video streaming has priority (on Full screen mode), else show video streaming and Ch pointed by Fsell
14.	1	1	0	1	1	Playing audio/video file(s), viewing image file(s), playing SWF file(s) and live video streaming	Live video streaming has priority (on Full screen mode), else show video streaming and Ch pointed by Fsell
15.	1	1	1	1	1	Playing audio/video file(s), viewing image file(s), showing a ppt file, playing SWF file(s) and live video streaming	Live video streaming has priority (on Full screen mode), else show video streaming and Ch pointed by Fsell

Furthermore, the availability of some features like dual-display supporting, video recording, image capturing and motion detection make the IM-Player can be utilized in other

areas such as security, medical (dental imaging), and entertainment[6][7].

One of the benefits from the separation between control panel and its video output is the IM-Player has possibility to be used as a karaoke application. To support this function, some audio processing features are available such as stereo channels selection, channel assigning, pitch increasing or decreasing, 10 channels graphic equalizer, and bass/treble enhancer. Fig. 6 shows the IM-Player operates as karaoke system. The right picture is the video output of a vcd karaoke that displayed on a TV monitor.



Figure 6. Karaoke with IM-Player.

Meanwhile, when IM-Player is operating as video player (Fig.4 and 6), simultaneously it can be operated as audio player such as mp3, wav and midi player. Consequently, it can be used like a tool to substitute the audio part from a video file with another one on the fly.

## VII. CONCLUSION

The extended desktop feature (or dual-display feature) can be optimized to develop a multimedia application (IM-Player) that has ability and behavior as a multimedia player and also a presentation system. Based on the CCM, the IM-Player can be used as multimode multimedia player (included e-slide viewer and controller). Consequently, IM-Player has inherent two behaviors that are as multimedia player and also a presentation system simultaneously. By this feature, the IM-Player is able to unify the characteristic of multimedia player and presentation system.

For future works, the user interface will be improved so that the IM-Player can be utilized by many users' domain such as: class room presentation, entertainment, disability persons, medical, etc.

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