

# A Framework for Developing General Live Multimedia Presentation Applications

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**Abstract**— Presenting various multimedia elements in different domain areas usually use specific live multimedia application. However, currently the standard framework for developing live multimedia presentation (LMP) applications (at implementation level) is unavailable. This paper presents a proposed framework that can be used as a guidance or direction while developing an LMP application by taking into account to some features such as live-integrated media displayer and view separation. To support the framework, a prototype of package library of media displayer classes has been developed. Finally, we developed some LMP applications that are especially designed for particular domain area based on the framework. Three models of LMP application have been developed with the purpose for educational, entertainment and medical domain areas.

**Keywords**- framework, live multimedia presentation, multimedia application, package library

## I. INTRODUCTION

Nowadays multimedia is emerging as the pervasive and ubiquitous tool in a wide area of applications. In some domain areas such as health care, education, entertainment, environmental monitoring, security and surveillance, the application of multimedia is almost indispensable. In order to be ubiquitous applications, the multimedia applications must be smart and efficient [1]. Thus, the growth and development of the multimedia applications (need multimedia presentation) tend to tailored to the specific requirements of the particular user domain. In order to enhance its performance, the requirement specifications of the special multimedia application should be satisfied. The smart and efficient multimedia applications are mainly needed to be realized.

On the other side, presenting some multimedia data in real time (live) events are very important role in multimedia presentation area. For instances, in class room tutorial, a teacher or lecturer must present e-slides, videos, images and other text materials to their students in live presentation. In business presentation, a marketing staff often present their company profiles and products to their customers live using e-slides or animations. In entertainment, a user who wants to perform karaoke must present video and audio data

live [2]. In security, live video streaming is used when monitoring indoor or outdoor surveillance using CCTV system. In medical area, a dentist is able to show the intra-oral condition of their patient live using dental intra-oral camera during examination. In live multimedia presentation (LMP), constructing, authoring, synchronizing with constraints are performed on the fly during presentation.

In this paper, we did further analysis to our previous model development of a LMP application [3-6]. Based on those previous works, thus a packages library of media displayer classes has been developed and a framework for developing general live multimedia presentation has been proposed. By this framework, development of any LMP applications is simpler, easier since it has a guideline and direction. In future, there is an expectation that by this framework the development of any LMP applications can be standardized formally.

## II. STUDYING THE UTILIZATION OF MULTIMEDIA

Multimedia users in various domain areas utilize the combination of multimedia elements such as video, audio, image, animation and text in various manners. The characteristic of the utilization of multimedia elements in a domain area is specific and unique since each domain area has its own characteristics and user's behaviors.

However, the multimedia application that is specifically developed for particular domain area has similar basic features and behaviors. Our preliminary study reveals that the multimedia user in education domain area utilizes all multimedia elements [4]. Meanwhile for other domain areas the utilization of multimedia element is not complete as in education area. Some researchers have performed research in multimedia application in those domain areas. In entertainment area, a Karaoke application needs some feature to playback video [2], In medical, a Dental Digital Radiographic System has been developed [7]. As a part of the system uses image processing such as zooming, rotating, and brightness adjustment. Other a dentist often using dental intra-oral camera to examine intra-oral condition of their patient in live presentation [8-9]. In security area, multimedia users usually require video previewing, video recording, and video player feature. Various CCTV software systems are available and all of those CCTV systems use

video previewing and video recording feature. Particularly, in physical disability area, we concern to the multimedia users with visual impairment person. Empirical study shows the multimedia users in this domain area need video and audio player with additional (multi modal) user interface.

Table 1 shows the summary of a preliminary study about the similarities of some basic features of SLMP applications in five domain areas. *Vp* is video displayer with standard features i.e. play, pause, stop menu and media library management. *Ap* is audio displayer with standard features like the video displayer. From Table 1, it can be seen that video displayer (*Vp*) is the most common basic feature. Then followed by Audio displayer (*Ap*), slide displayer (*Sv*), Image displayer (*Iv*), animation displayer (*Fp*), and video previewing/capturing displayer (*L*) respectively. The additional feature is optional, and can be viewed as an additional function or attribute that *inherited* from the basic feature.

TABLE 1 THE SIMILARITIES OF SOME BASIC FEATURES OF MULTIMEDIA APPLICATION IN VARIOUS DOMAIN AREAS

No.	Domain Area	Application	Basic Feature	Additional Feature (optional)
1.	Security	CCTV system	Video preview, Video capturing, Video player menu (play, pause, stop)	Motion detection, Auto videocapturing, Multi camera, Video processing
2.	Entertainment	Karaoke Application	<i>Vp</i>	Dual Display, Audio Processing
		Personal home entertainment	<i>Vp, Ap, Image viewer</i>	Audio Processing
3.	Medical	Dental Intra Oral Monitor	Video preview, Video recording, Image capturing, Video player menu (play, pause, stop)	Dual display
4.	Education	Many	<i>Vp, Ap, Image viewer, Flash player, and Slide viewer</i>	Dual display, Audio and video processing
		Training	Animation (Flash player), Slide viewer and controller	Audio processing
5.	Disability	Multimedia Presentation for Blind	<i>Vp, Ap, Slide viewer</i>	Text to speech feature, multimodal UI

### III. DEVELOPMENT OF THE MEDIA DISPLAYERS LIBRARY

#### A. Feasibilities

Although there are various multimedia applications in many domain areas, principally they have basic features (or base functions). Further additional function and attributes can be added to the basic features tailor to the domain area requirement. This condition leads to emerging an idea to build a library of those media displayers. Some benefits that are resulted from the development using this library are [10]:

- *Software reuse.* The library can be used by other programmer as a core component to develop any other

multimedia application to present any multimedia element in a particular domain area.

- *Integration.* All of multimedia application for presenting any multimedia element is integrated in one library.
- *Effectiveness.* Since, the package library was created based on object oriented design, hence improving and updating an existing class or generating other classes is easier without paying more attention on codes at lower level.
- *Personalized UI.* Designing and implementing personalized UI for multi-domain multimedia presentation system based on this library are possible to be realized.
- *Flexibilities.* Adding new classes into the library is easy with class inheritance method.

The steps to develop the library start from the most common basic features as the base class (or the base package). Then the other multimedia presentation classes are constructed. The development of the other classes must agree with the requirement to the related domain. The development of the library uses object oriented design and class inheritance in the implementation level.

#### B. The Packages Library

Furthermore, all essential classes are realized at application level. The classes are implemented by Rapid Application Programming (RAP). As a result, the content of the (prototype) library is packages of such classes. The packages are shortly listed in table 2.

TABLE 2 THE PACKAGES LIBRARY

No.	Packages	Function description
1	<i>UFrmVideoAudio</i>	Video player and audio player
2	<i>UFrmImageViewer</i>	image viewer with slide show feature
3	<i>UFrmFlashPlayer</i>	Animation (Flash) player
4	<i>UFrmSlideController</i>	e-slide controller, features included: eslide list, eslide renderer, two e-slide timeline, linear and non-linear presentation supported
5	<i>ULiveCam</i>	live camera for dentist or other, feature included: video preview, recording, screen recording, broadcast to LAN, TV tuner
6	<i>UFrmMultiLiveVideo</i>	CCTV system, security team, feature: motion detection with sensitivity adjustment
7	<i>UDSPmenu_Video</i>	Digital Signal Processing for video data, included: stereo channel assigning (for karaoke), 10 channel graphic equalizer, pitch control, bass booster, treble enhancer and echo
8	<i>UDSPmenu_Audio</i>	Digital Signal Processing for audio data (mp3, wav, midi, wma), included: stereo channel assigning (for karaoke), 10 channel graphic equalizer, pitch control, bass booster, treble enhancer and echo
9	<i>Ucapimg</i>	To grab and capture an image from video streaming to an image file (JPG)
10	<i>Usetdesktop</i>	To display desktop setting dialog
11	<i>UAdvVideoControl</i>	advanced video controller

The table shows that these packages of classes in the library are re-usable. It means that if other programmers use the same RAP they can use the package library to support the development of the LMP applications.

#### IV. THE FRAMEWORK

Carter, in 2002, has proposed a framework for multimedia development that also included a framework for developing multimedia system for utilization in engineering education [11]. The framework was developed by conforming and satisfying the ISO 14915 standards [12]. However, the framework is for general multimedia system and rather close to design level rather than application level. Thus, as inspired by such framework and our previous results, a framework which is especially intended for developing the general LMP application, should be developed and proposed.

According to [6], there has been proposed four items of LMP concept. In this paper, we derive and extend such LMP concept towards a framework for developing general live multimedia presentation applications as follow.

##### A. Live-integrated media displayer

Some LMP applications need to present more than one multimedia data (media) type. For this matter, controlling the play out of each media type is performed directly, spontaneously and instantaneously. All types of media i.e. video, audio, image, text, animation and e-slide should have particular (independent) controller in an integrated system.

##### B. Two groups of users

All users that interact with any LMP applications can be identified into two main groups namely the presenter and target user (see Figure 1).

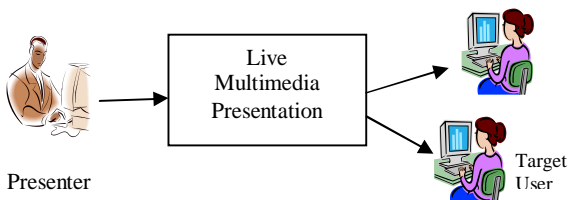


Figure 1. Two groups of user concept

The first user group is author or presenter. This user has main task that is authoring, constructing, synchronizing and delivering content of the presentation (one or more multimedia data) to the second group that is the target user. The target user is one or more people as the target while delivering the multimedia data that under control by presenter [13]. Both presenter and target user can be a single or multiple persons. In the simplest case, both presenter and target users can be a single person.

##### C. View separation

Since the authoring, constructing and controlling of the

presentation are done directly and instantaneously, therefore separation of view (or screen monitor) between the author/presenter's monitor and the target user's monitor is needed [14].

##### D. Library usage

The development of the LMP application can be done more effectively by exploiting the package library since it provides all of media displayer packages, dual-display feature package (to realize the view separation) and additional feature packages [10]. The rationale is that the library was developed using object oriented design. This means that each media displayer is an independent object which has various properties and methods. Developers can pick and use one or some objects from such library as the base to build their LMP application. Moreover, they can enhance or derive the objects from the library in order to provide more features and facilities. Apparently, using this package library, the development of the LMP application becomes easier. Furthermore, the features and facilities of the product are also enhanced.

##### E. Support database management system integration

Common LMP application requires an integrated database management system such as: *playlists*, karaoke menu system for karaoke application, captured image/video files for dental intra-oral camera system, and other database management system that is specific for a particular area. Hence, the integration of database management system should be considered during the development of LMP application.

##### F. Temporal and Spatial Constraint consideration

In LMP application that has more than one media displayer, the application of temporal constraints should be considered. Thus for LMP applications that has non-slide based presentation feature, the parallel synchronization with spatial constraints should be considered as well.

In reality, the designer and developer of the LMP application must not use all the six basis of the framework. In practical, the framework may be presented in graphical representation as shown in Figure 2. In this figure, the development of LMP application is classified into five types:

1. Type A: LMP applications in this category would not support view separation between presenter and audiences. Hence it will not distinguish between presenter and target user. However this LMP application uses database management, live-integrated media displayer, package library, and constraints consideration.
2. Type B: the development of this LMP application will not use the library of media displayer; however it will use other five basis of framework.
3. Type C: this LMP application will not utilize live-integrated media displayer (only one media displayer)

and also it does not consider the temporal and spatial constraints. However it will support database management, view separation, two groups of user and using the library of media displayer during its development process.

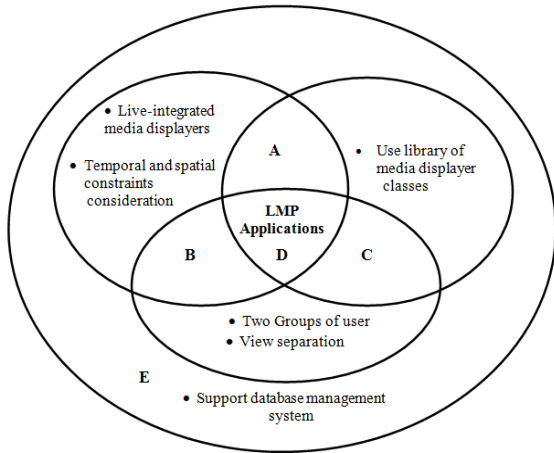


Figure 2. Framework for developing LMP application.

4. Type D: the development of the LMP application uses all six basis of framework. Hence it will have complete feature and facilities.
5. Type E: the LMP applications only use database management and ignoring the other five bases. The conventional media player applications are the examples of this category.

The application of the proposed framework to develop several LMP applications for various domain areas will be discussed in the next section.

## V. DEVELOPING SEVERAL LMP APPLICATIONS IN VARIOUS DOMAIN AREAS

As the proof of concept, several LMP applications in various domain areas were developed based on the framework. Each LMP application is discussed in detail in the following subsection.

### A. Educational area

As described in previous section, educational area involves all multimedia data displayer. All base classes are included, i.e. video, audio, image, animation, e-slide and live video base classes. An application (called as IM-Player) that also as a prototype of presentation system has been developed based on such framework. This result has been published in other paper [3].

### B. Entertainment area

In this domain area, we develop an augmented-waiting room (AWR) with multimedia presentation. Commonly, in conventional waiting room only available newspapers or magazines that provide the users to chase away their boring.

We proposed an idea to augment the waiting room with LMP such as movie, music clips, and karaoke system. User in this waiting room enables to select watching movie, hearing favorite music, or karaoke.

The design of this LMP application conforms to the frameworks. For the live-integration, it should integrate the video displayer, audio displayer, DSP class, and database management routine (see Figure 3).

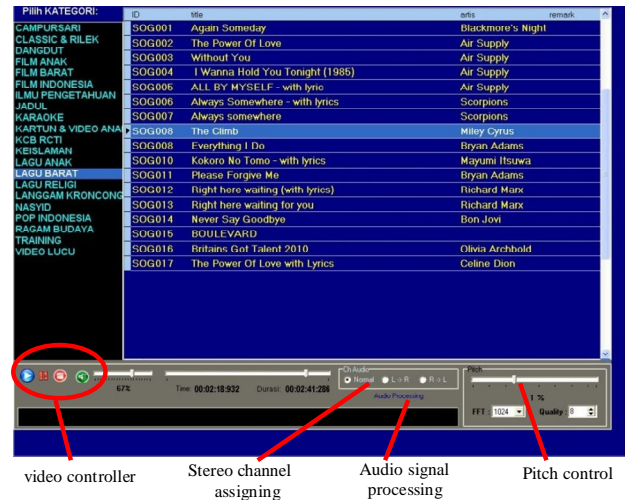


Figure 3. Screenshot of the Augmented Waiting Room with multimedia application (Presenter's view).

The AWR provides a view separation, that is the main control panel is shown at the primary (presenter's) monitor and the output is displayed at the secondary (target user's) monitor. Next the development of this application involved video, audio and some digital audio signal processing classes. The digital audio signal processing class is to support karaoke since in karaoke system needs pitch control and stereo channel assigning.



Figure 4. Augmented Waiting Room with multimedia

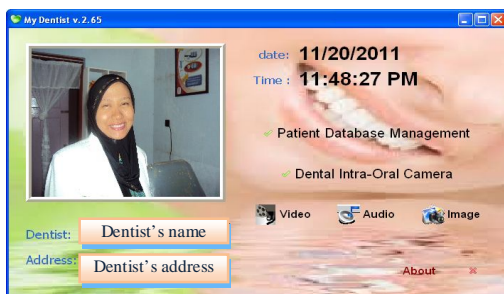
In addition, this application involved database management routines to manage thousand of video files and numerous categories of the video data. Figure 3 depicts a screenshot of such application when running in karaoke

category. This screenshot was captured from the appearance at the primary monitor. Using this interface, the user in a waiting room can select his/her favorite video file (by double-clicking), then the video output will appear at the secondary monitor. In order to provide further comfort, we designed the system as shown in Figure 4. We use TV monitor as the secondary monitor.

### C. Medical Area

In medical area, we developed an integrated application that would be utilized by a dentist. This application integrates some functions and routines such as: dental intra-oral camera routine, patient database management, video displayer, audio displayer and image displayer. The differences between the conventional intra-oral camera is our model using dual display feature to make the dentist more comfortable and easier while examining a patient's mouth. Moreover, since it uses the packages library, this routine is easy to be integrated with other features. The application involves *ULiveCam*, *UAdvVideoControl*, *Ucaping packages* and (in addition) we also used the *UFrmVideoAudio* packages. Lastly, we developed an integrated application named by MyDentist. Figure 4 depicts the screenshot of the operation of the MyDentist.

Figure 5.a is screenshot of the main control panel of MyDentist. We collaborate with a dentist to apply this application in her practice room. In this application, we integrated patient's database management (Figure 5.b), multimedia application (video, audio and image displayer) and dental intra-oral camera. Figure 5.c depicts a screenshot while the dentist was utilizing MyDentist (Dental intra oral camera) to examine her patient's teeth.



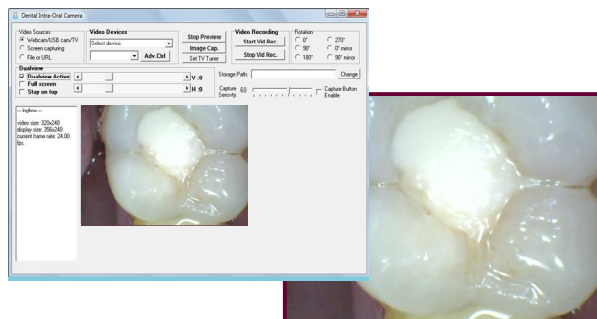
(a)



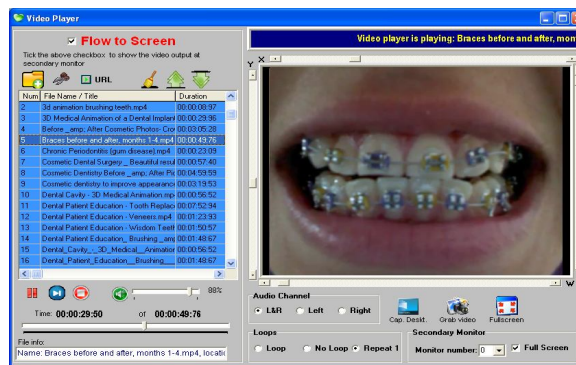
(b)



(c)



(d)



(e)

Figure 5. MyDentist, an integrated application for dentist's private practice

Figure 5.d is screenshot of the control panel of dental intra-oral camera program while the dentist was examining her patient. It is a dental restoration picture with clearer images that displayed at the secondary monitor (the back image one). Figure 5.e is screenshot of the control panel of the MyDentist video displayer. This is at the presenter's monitor, while at the patient's monitor only shows the video output in full screen mode. The dentist installed the LCD monitor (as the secondary monitor) attached at her cuspidor's pole.

## VI. DISCUSSION

The framework has been applied successfully in developing three LMP applications (IM-Player, AWR, and

MyDentist) in different domain areas. All the three LMP applications are type D, it means that all six bases of the framework were used to develop those three LMP applications. Apparently, the temporal and spatial constraints can be applied for constructing the sequential and parallel synchronization in IM-Player [3][4] and also in MyDentist. The AWR only support sequential synchronization with simple temporal relationships (as temporal constraint) i.e *meet* and *meet inverse* [6].

Meanwhile, as mentioned in Section IV, the examples of type E of LMP application are common-conventional media player such as Media Player Classic, Windows Media Player, and so on. The type of LMP applications only supports database management for playlist and media library. They are not able to separate between presenter's view and audiences' view. The appearance of control panel and the output (video/image) is displayed at the same monitor. This will impact at the both presenter's view and target user's view would be disrupted each other.

The dual display feature has been utilized to realize the view separation between presenter and target user. So the LMP application has two groups of user. By this feature and facility, the presenter in all three LMP applications is able to control and manage the output of the media displayer at presenter's monitor without disrupted by its output. Also while watching the output at secondary monitor, the target user will not be distracted by the appearance of control panel of such media displayer.

Another result using the framework is that the task of developing the three LMP applications was much easier and simpler. The ease of using the framework opens up the opportunity for developing many more LMP applications. Notice that each media displayer class of the library can be exploited individually to develop a particular player. For example, the video displayer class of the library can be exploited to develop a stand alone media player application. Of course the media player application will support view separation and it can be realized and applied using dual display feature.

## VII. CONCLUSION & FUTURE WORK

In this paper, a framework for developing general LMP application has been proposed. To prove our concept, we have developed some applications based on such framework for various domain areas those are for educational area, augmented-waiting room with multimedia application for entertainment area and MyDentist for medical area. Finally, designing and developing other LMP applications are better and more effective since it was guided and directed by the framework. Moreover there is an expectation that in future the framework can be used as an initial step towards a standard framework for general LMP application.

This is a continuation from our previous work about modeling the live multimedia presentation.

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