

# Using Interactive Video Technology for the Development of Game-Based Learning

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## Abstract

*Interactive video technologies are developed for providing interactions for users to get better interactivity in watching TV programs. Since receiving TV programs is a common affair for general users, many systems with interactive TV technologies are implemented for educational or commercial purposes. Learning by playing game is a hot topic in current distance learning systems. Most of game-based learning systems designed by computer programmers and domain experts. Generating interactive game courses is hard for content providers since they are not computer experts. The interactive game authoring tool proposed in this paper provides a friendly interface to help the users to create their educational games easily. The students will be attracted in such learning platform with entertaining elements.*

## 1. Introduction

There are many e-learning systems proposed in various field. Some game-based learning systems have been also implemented in recent years for motivating the students to enhance the learning performance. Video game is an effective factor to attract the students' attention. The traditional game-based learning systems integrate learning materials into video games. There are many types of game implemented in such game-based learning systems. Most of these systems require programmers and specified domain experts to design games with adequate contents together. It is necessary for developing a video game-based learning system with powerful content authoring tools to help the content providers to generate gaming content for educational purpose.

The purpose of this interactive video game-based learning system is to provide a friendly interface such that the general users can produce their own video

games with educational elements. Comparing with the proposed game-based learning systems, the interactive video system for game-based learning provides a flexible interface to generate interactive video games with unspecified contents. The content providers can produce educational games without understanding details of computer graphics, video and even flash technologies.

## 2. Related Work

There are many systems about interactive TV proposed in recent years. Most of them are PC-based systems; the developers implemented these systems by integrating network, video encoding and transmission technologies. Various devices are adopted to provide manipulation to audiences. Remote control, PDA, tablet, keyboard and mouse are used for delivering the control made by users. Some game-based learning systems are also implemented to help students in learning concepts in various domains. Most of these systems are web-based; students can easily access these resources via network. In the follow sections, interactive video and game-based learning issues will be fully discussed.

### 2.1. Interactive Video

Interactive video is a way to provide users interactivity and feedback in the browsing process. Playing order of traditional video is linear; users can only make simple decisions to control the flow of video playing. Simple interface are supported to help users to switch scenarios in DVD as menus.

The basic idea of interactive video is to divide the video file into several small video segments as scenarios. Each scenario is considered as a series of continuous shots with the same place or characters.

In the proposed interactive video game-based learning platform, video segments are the basic unit used for presenting scenarios. Buttons and objects on the video frame can be triggered to change the play sequence of a video. Other resources like text messages, images and webpage are also popped up by the users' interaction.

## 2.2. Game-based learning issues

Many game-based learning systems are implemented for help the students to focus on the learning material. The students can get experience from making interaction with objects in the game-based learning platform. Comparing with the traditional e-learning systems, game-based learning systems provide more attraction to the students.

Games can be classified into several categories: action, strategy, role play and adventure games. There are different features and characteristics in such kinds of games. In the proposed interactive video game-based learning platform, the design concepts of adventure games are adopted to construct the game platform. The most important idea in adventure game is, the players find clues and try to solve problems by exploring a specified scenario and investigating objects there. According to this mode of game play, video is used for scenarios and the interactive objects provide players to get experience by examining and operating them.

## 3. System Architecture

In the interactive VGBL platform, there are three major components need to be provide to help design games and integrate educational materials with it. Interaction, knowledge delivering and rewarding should be included in the VGBL game authoring tool and runtime environment.

### 3.1. Interaction

Interaction is the most import part of a video game. The interactions in games provide means to players to change states in game play. The players can get information from scenarios by making interactions and triggering events. There are different interactions and devices in various games. Without much difference from other adventure games, mouse and keyboard are responsible for delivering users' interactions to the interactive VGBL runtime environment.

Players can examine and move objects in a scenario by clicking or holding their mouse keys. Like ordinary

adventure games, the players have a backpack to collect items in game. An inventory window is used for displaying what items the player owned. The players can get these items from a scenario and use them in an adequate scene to trigger events. Interactive objects in video provide information to players. Users can get descriptions when they try to examine these items. There are also non player characters to give fixed conversation to guide players.

### 3.2. Interaction Knowledge delivery

The ultimate goal of game-based learning systems is to deliver knowledge to students. Actually, it is not easy to design games with educational materials. Course designers can produce scenarios by shooting videos and defining relationship between objects in it. By creating interactive objects and setting the events, the designers provide means to players and deliver knowledge in the process of solving a problem. For an example, in a classroom in game, the NPC told players a computer was not worked and order players to fix it. Players examine the computer in video first and find a broken component inside. Finally, players move to another scenario, markets, to get the components they needed and return to classroom and fix the computer.

Students can obtain knowledge from the process of making decision and interaction. In the example, students get the instruction first, and then find the problem by investigating objects in game. Students will get different feedback after they install components into the computer by the content providers' authoring.

### 3.3. Rewarding

Rewarding for students is an important factor to motivate them to participant such games. Like general games, the rewarding mechanism is also applied in the platform. Players can get bonus if they make the right decisions which the content providers set in the authoring system. In this section, real rewarding is not discussed here because the lecturers will decide how to reward students themselves. In the interactive VGBL platform, some objects are considered as rewards. If players complete some requests or missions, they can get special objects in the inventory windows. Such objects differ from other interactive ones in scenarios; they represent the achievements which players have. The courses designer can motivate players to collect such objects by providing bonuses or other kinds of interaction.

## 4. Implementation

We have implemented an authoring tool to generate interactive video games for educational purposes. There are several subsystems implemented as follows:

### 4.1 Scenario Editor

Designing a game is not easy task for general users. The scenario creation is one of the most challenging parts of designing games. We try to use video segments to replace 3D scenarios because they are easy to produce. The users just need to select video files from network or video cameras such that video can be divided into scenario components by the authoring tool.

Figure1 illustrated the interface of the interactive VGBL authoring tool. Courses designers can also insert objects like buttons and images in the authoring tool.



Figure1. The interface of interactive VGBL authoring tool

### 4.2 Object Editor

The other important component of the authoring tools is the object editor. Image objects are mounted on a video scenario. The interactive object plays an important role in the interactive video game-based learning system. The users can make interactions with these interactive objects to trigger corresponding events. An object editor is implemented for such requirements. Users can set the properties and events of objects in video and produce adequate feedback when users' trigger them.

### 4.3 Gaming platform

A runtime environment is also implemented for users to participant the games. The gaming platform is an augmented video player with the interaction functionalities. The users can manipulate the avatar in a game scenario and make interactions with the interactive objects.

Interactive video technology is used to generate feedbacks to the users. By making corresponding interactions, the scenario changes and interactive objects pop out. With such environment, students would be interested in the contents and get concepts from the game play.

Figure2 shows the interface of the runtime environment. An image object with white background is mounted on the video frame. Players can examine the umbrella by clicking it or drag it to inventory window. The buttons also provide players options to switch to other video segments or get information from websites.



Figure2. The interface of interactive VGBL runtime environment

## 5. Conclusion

A platform use interactive video technologies is implemented to design video games for educational purpose. Courses designers can easily produce contents with game factors by this authoring tool. Video segments are used for scenarios in the VGBL platform. These scenarios can be generated by cutting from films. Comparing to 3D scenarios, it's a cheaper way to produce game scenarios. Players can make interaction with objects edited by the authoring tool and get feedback or switch to other scenarios. Playing such games is attractive to students. Students can get experience and knowledge by making interaction and decisions in game play.

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