An Intelligent Instructional Tool for Puppeteering in Virtual Shadow Puppet Play

Sirot Piman[1,2] and Abdullah Zawawi Talib[1]

[1] School of Computer Sciences, Universiti Sains Malaysia,
11800 USM Pulau Pinang, Malaysia
[2] Department of Business Computing, Faculty of Management Sciences,
Surat Thani Rajabhat University, Surat Thani Province 84100, Thailand
sirot.cod07@student.usm.my, azht@cs.usm.my

Abstract. Shadow puppet play has been a popular storytelling tradition for many centuries in many parts of Asia. In this paper, we present an initial idea and architecture of a software tool that allows people to experience shadow puppet play in the virtual world. Normally, a virtual puppet show is controlled automatically by the application. However, our tool allows the user to create storyline and control the puppets directly in real-time with a special device that can improve the skill of a puppeteer. This paper focuses in detail on the design and issues of a component of the software tool which is the intelligent instructional tool for puppeteering of virtual shadow puppet play. The result of the preliminary evaluation has shown that the tool is able to help users more beneficially and a higher degree of satisfaction among the respondents which include professional puppeteers and potential users.

Keywords: Shadow puppet play, virtual puppet, virtual storytelling.

1 Introduction

The history of the traditional shadow puppet play in Southeast Asia began several hundred years ago and has been in existence in various forms in both insular and mainland Southeast Asia. The show ranges from large-scale productions associated with classical court traditions to relatively small-size folk-art productions in small rural villages. This multifaceted performing art tradition that combines music, drama, literature and storytelling is presented with dramatic movements and visual effects. Most of the previously published materials on this subject deal with Indonesia (primarily Java and Bali) and to a lesser extent Thailand and Malaysia. Malaysian shadow puppet tradition can be considered as a bridge between Indonesian and Thai traditions since it shares certain characteristics with both [1]. Shadow puppet play is called Nang-Talung in Thailand, Wayang Kulit in Malaysia, and Wayang Kulit or Wangwayo in Indonesia. The word "wayang" is derived from a word meaning shadow or ghost. The puppeteer is called Nai-Nang in Thailand, and Tok Dalang in Malaysia and Indonesia.

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The puppets are carved from cow's or buffalo's hide and painted differently for every puppet in order to portray a different character. These puppets are performed on a silhouette screen and the show is accompanied with dialogues and poetry narrated by the puppeteer. Each puppet is depicted differently. For examples, the main actress is graceful and serene; the main actor is playful and rather dandy; the king is typically powerful; and the queen looks noble and nice [2].

Currently, this tradition is becoming less popular and it is fairly difficult to learn and not easy for young generations to watch, appreciate and explore this traditional art. Furthermore, nowadays there are only a few professional puppeteers for this traditional shadow puppet play. The success of each show depends on the storyteller's ability to present the story to the audience effectively and make them happy throughout the show till the end of the performance. The key element in the performance is how the puppeteer presents the show in such a way that correct expression, intonation and gestures are used so that it looks real, and makes the values and morality behind the story understood and appreciated by the audience. However, nowadays, the traditional shadow puppet play is no longer performed frequently. Lack of expertise, difficulty in getting the traditional musical instruments, difficulty in producing the leather puppets, high cost of maintaining and producing the show, and proliferation of new media entertainment are some of the main factors that contribute to the lack of interest in this traditional show. Therefore, a tool is needed to transform this traditional storytelling into an interactive virtual storytelling environment. In this paper, we describe an initial idea on the architecture of the virtual shadow puppet play and concentrate on the intelligent instructional tool for puppeteering in the virtual shadow puppet play.

2 Related Work

The virtual storyteller, Papous [3] can tell a story and express some facial emotions, happiness, fear, and sadness according to the story just as real human storyteller. This virtual storyteller allows changes of the scene tags according to the environment. Virtual Puppet [4] is a virtual reality application that combines the ability of current graphics systems with creative and pleasant storytelling. Generally, it enables the user to control a puppet with simple movements in different locations. In Virtual Storyteller [5] and [6], the characters are implemented as semi-autonomous intelligent agents. Its advantage includes the incorporation of the narrative and the presentation levels as intelligent agents rather than as text-based story generation system. Furthermore, it uses an embodied speaking agent to present the generated stories using appropriate prosody and gestures.

An intelligent multimedia storytelling system, CONFUCIUS [7] creates human character animation from natural language. One of the advantages is that collision detection, autonomy, and multiple characters synchronization and coordination are

applied to this storytelling system. Besides, it uses Humanoid Animation (H-Anim) and MPEG 4 SHNC for realistic animation. An interactive storytelling using a mixed reality system by Cavazza et al. [8] provides more interaction for the user by allowing the user to take part as one of the roles in virtual storytelling.

From the perspective of shadow puppet play, Hsu and Li [9] utilized motion planning algorithms to generate Chinese shadow animation automatically according to user's high level input. The puppets cannot be controlled directly by the user, and thus the system does not allow interactive real-time play. Zhu et al. [10] used photon mapping to render out the shadow effect. However, the time taken to perform rendering does not allow real-time and interactive play.

Kim and Talib [11] described a practical framework for integrating the elements of the traditional shadow play environment in a virtual storyteller. This includes shadow rendering of puppets, challenges in mapping of the traditional shadow play to a virtual storyteller, and a methodology in undertaking such development. In virtual 'wayang' URL [12], the puppet can be moved anywhere but the arms and legs of the puppet do not swing while the puppet is moving. Lam and Talib [13] and [14], proposed a novel real-time method for modeling of puppet and its shadow image that allows interactive play of virtual shadow play using texture mapping and blending techniques. Special effects such as lighting and blurring effects for virtual shadow play environment were also developed using OpenGL platform.

In summary, we can conclude that most of the existing works on digital traditional shadow puppet play are not interactive, realistic and dynamic enough to allow user to play interactively. Most of the existing digital shadow play systems need the user to predefine the frames offline and in-between frames need to be generated using commercial software. A better way of presenting virtual shadow puppet play is by allowing interaction and real-time play of the shadow puppet play. In this paper, we describe on attempt to overcome these problems and limitations by describing the general architecture of a virtual shadow puppet play system and focusing on the intelligent instructional tool for puppeteering of virtual shadow puppet play.

3 Overview of the Virtual Shadow Puppet Play

The main aim of our work is to develop a software tool for puppeteering shadow puppet play that allows people to experience it interactively in real-time in an intelligent virtual world, creates realistic virtual shadow puppet play and environment, and provides a means of improving the skill of a puppeteer based on the knowledge and expertise of professional puppeteers. Fig. 1 provides a general architecture model of the software tool that enables users to play virtual shadow puppets interactively. It consists of three main components – an intelligent instructional tool for puppeteering, real-time animation and special effects of 3D virtual puppets and multi-puppets controlling and performing using a special device.

Generally, the software tools allows users to create a storyline with the help of the intelligent instructional tool which automatically generates iconic instructions called

"sequential iconic instructions" (SII). Users can control the puppets directly with a special device such as wii-remote device or other haptic devices through Multi-Puppets Controlling and Performing Module and Real-Time Animation and Special Effects of 3D Virtual Puppets Module (see also [14] and [15]) based on SII. The next section describes the main focus of this paper which is the architecture of the intelligent instructional tool for puppeteering in the virtual shadow puppet play.

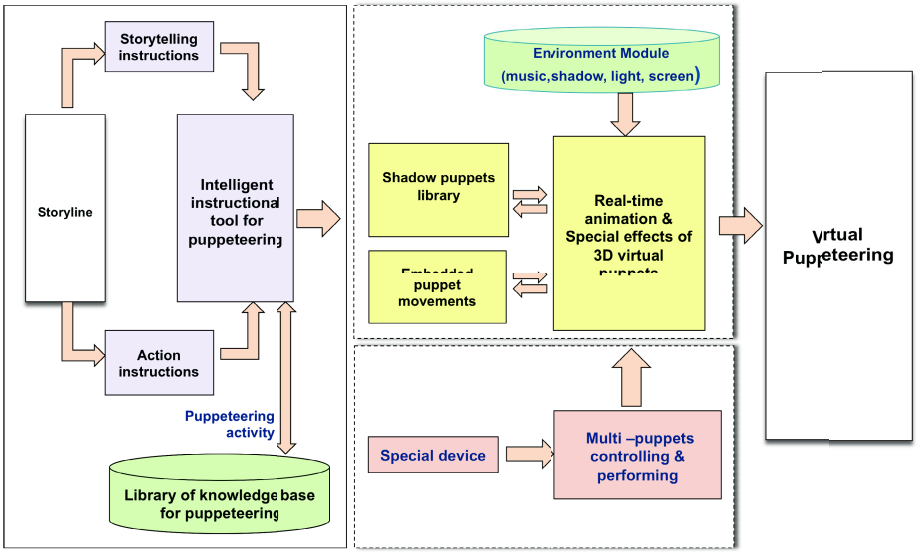

Fig. 1. General architecture model of virtual shadow puppet play

4 The Architecture of the Intelligent Instructional Tool for Puppeteer

This component enables the user to create storyline based on the knowledge bases of puppeteering. The knowledge bases were developed by conducting interviews on professional puppeteers and observing them during their performance. The knowledge base library stores three important database tables namely puppet table, action table and movement rule table. The puppet table stores all the information on each puppet such as its name, its picture, its description and level of its movement. The level of puppet's movement refers to the different movement speed of each puppet. For example, the puppet "giant" moves very fast, the puppet "king" moves normally, the puppet "queen" moves softly and the puppets "tree" and "stone" do not move. We classify this into four levels: 0 – does not move, 1 - slow, 2 - normal and 3 – fast, depending on the character of each puppet. The action table stores the information on puppet movements such as 'move to the left', 'move to the right', 'turn around' and so on. The movement rule table stores all the action rules of the puppet's movement

that we have gathered from professional puppeteers. This table is very important in Storyline Analysis and Action Checking Module of the intelligent instructional tool (Fig. 2). Then, the system automatically generates SII that guides the user to perform actions on the puppets according to the created storyline. The overall process of this component is shown in Fig. 2 and the next subsections describe in detail the modules of the intelligent instructional tool for puppeteering.

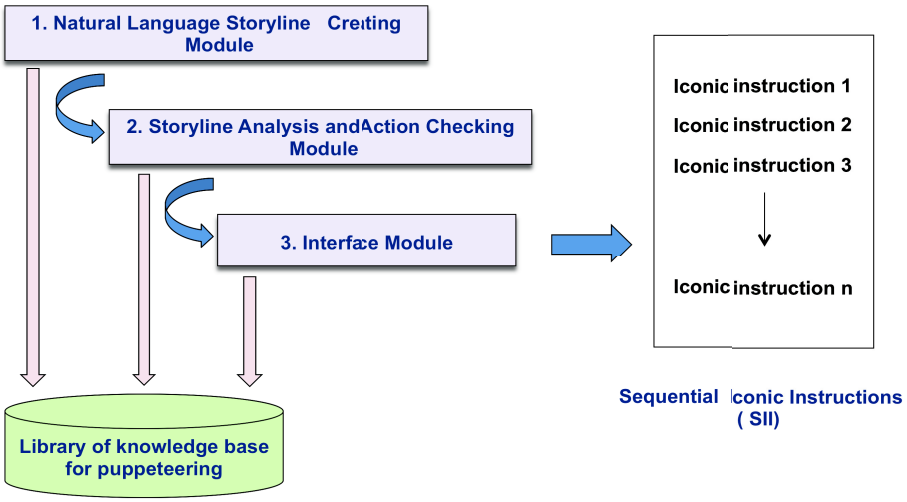

Fig. 2. The overall process of the intelligent instructional tool for puppeteering

4.1 Natural Language Storyline Creating Module

For experienced users, storylines can be created directly using natural language based on the semantic of the storyline sentences as shown in Fig. 3, and for novice and less experienced users, storylines can be created by using a software interface as shown Fig. 4. In the latter, users create the storyline by simply entering the data line by line on the left side of the interface. The storyline will show up on the right side of the interface. After pressing the "Save-F8" button, the system will create the text file of the storyline automatically which is similar to the one shown in Fig. 3.

The semantic of the storyline sentence is designed based on the knowledge base developed by conducting interviews on professional puppeteers and observing them during performance. Each line of the storyline consists of the puppet name and a sentence. The puppet name is separated from the sentence by the symbol ":". There are two types of sentence. The first type is the action sentence which consists of two parts - the action part which is enclosed within the symbols "[" and "]", and the position part which is enclosed within the symbols "{" and "}" as shown in Fig. 5. The second type is the storytelling sentence which consists of also two parts – the action part which is contained within the symbols "[" and "]", and the speech part which is enclosed within the symbols"'" and "'" as shown in Fig.6.

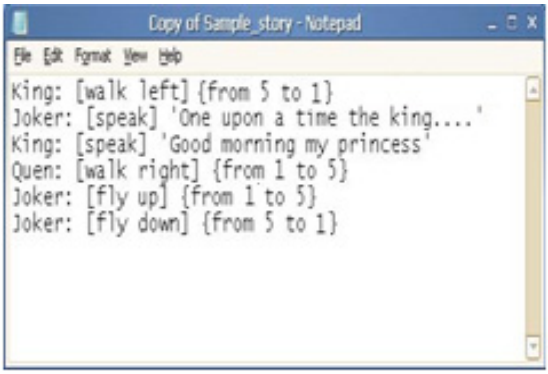

Fig. 3. Creating storyline using natural language (for experienced users)

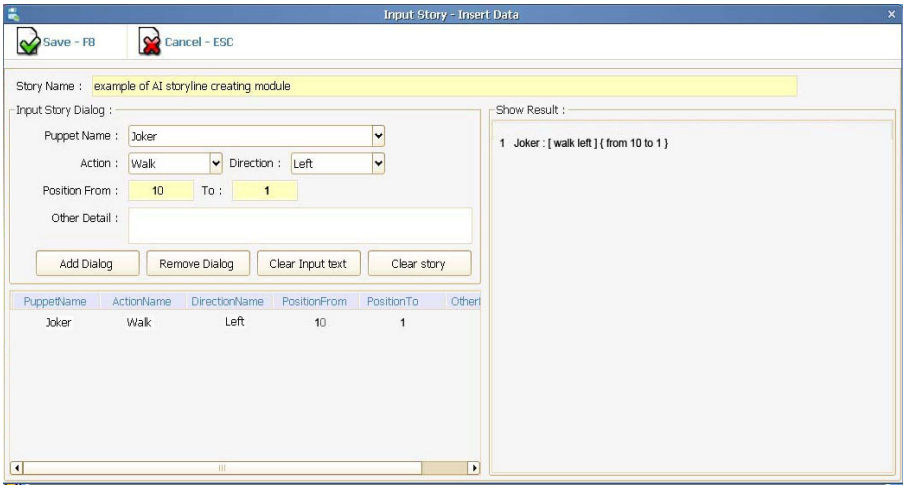

Fig. 4. A software interface for creating storyline (for novice and less experienced users)

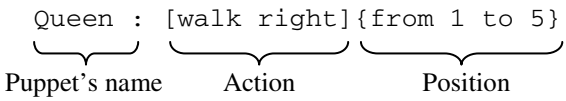

Fig. 5. An action sentence

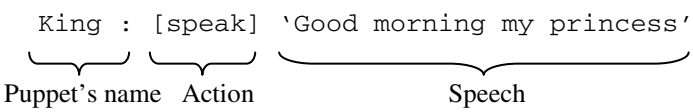

Fig. 6. A storytelling sentence

4.2 Storyline Analysis and Action Checking Module

After the storyline is created, the Storyline Analysis and Checking Module will analyze line by line all the lines of the storyline, and separate them into two groups – storyline sentence and action sentence as described previously (See Fig. 7). For a storytelling sentence, it is analyzed immediately by the storyline analysis module by separating it into three separate information namely puppet's name, action and speech. Then, they are stored in a table called "sequential instructions table". The action sentence has to be processed further in order to ensure that only correct action is put in the table. Incorrect action sentence has to be corrected by the user and further checked by the action checking module. It is then analyzed by the storyline analysis module by separating it into three separate information namely puppet's name, action and position.

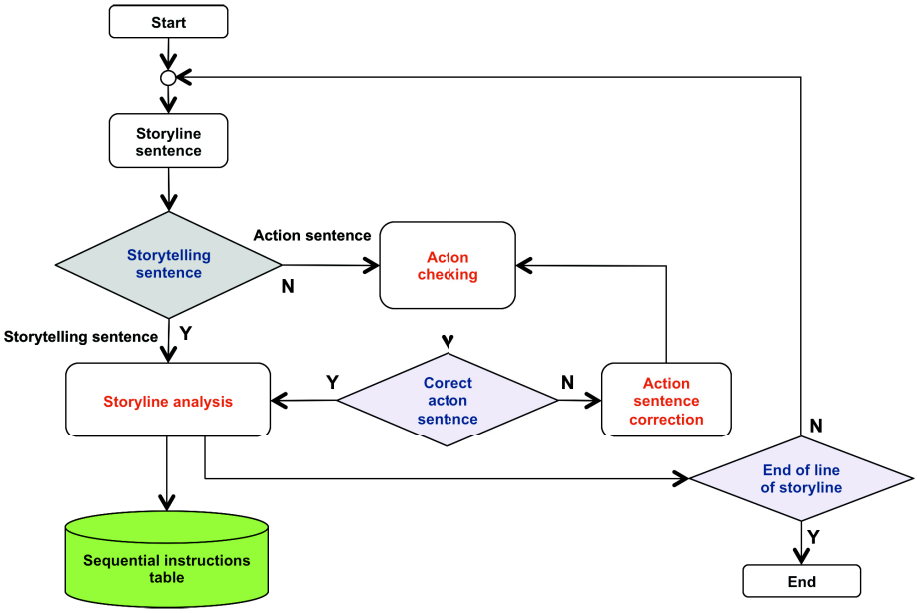

Fig. 7. Storyline Analysis and Action Checking Module

4.3 Interface Module

In Interface Module, all the processed storyline sentences in the sequential instructions table are displayed in Interface Module (Fig. 8(a)) and the table is translated into SII (Sequential Iconic Instructions) (Fig. 8(b)). SII will eventually be used to guide users to control the puppets according to the storyline. SII as shown in Fig. 9 is able to help the puppeteer to perform shadow puppet play and learn the skill needed in order to become a skilled puppeteer.

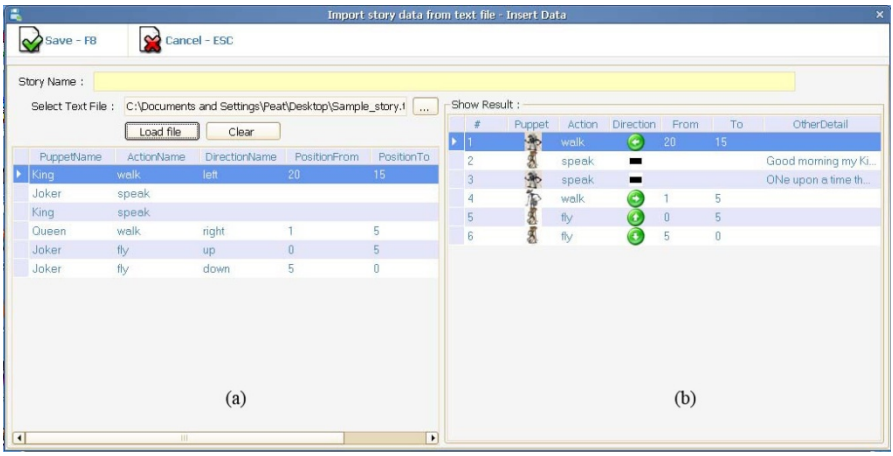

Fig. 8. Interface Module (a) Sequential instructions table, (b) Sequential Iconic Instructions (SII)

Fig. 9. Sequential Iconic Instructions (SII) as a guide in virtual shadow puppet play

5 Preliminary Evaluation and Discussion

In preliminary evaluation of the intelligent instructional tool, a questionnaire has been designed to obtain feedbacks and comments from two parties consisting of professional and experienced puppeteers, and general users. The respondents are required to rate their satisfaction based on a scale of 1 to 7 where 1 is the lowest and 7 is the highest in all of the questions. For the first part of the questionnaire which is on the use of the tool for creating storyline, 93% of the respondents have given a high

rating (6 or 7). It shows that our storyline creating interface helps users in creating storyline more beneficially. In the second part, we focused on the use of the storyline analysis and action checking technique. For this part, feedbacks and comments are only obtained from the puppeteers. Majority of the respondents that is 84% have given ratings of 6 or 7 which means that they are very satisfied with this tool. For some respondents, the outcome is not to their satisfaction. This may be due to the content of the knowledge bases for puppeteering. The last part of the questionnaire which focuses on the usefulness of Sequential Iconic Instructions (SII), 96% of general users have given a rating of 7 which shows that SII is very useful in guiding them to play the puppets according to the created storyline. 55% of the respondents from among the puppeteers have given a low rating on SII which means that for highly experienced puppeteers, SII is not very important and beneficial to them.

6 Conclusion and Future Work

In our work, we have provided a general architecture and an initial idea on the development of an intelligent tool that makes the users become a good virtual puppeteer. We have explored and investigated the possibility of developing virtual environment for puppeteering of traditional shadow puppet play that integrates the elements of the traditional shadow play with a virtual environment. The system includes an intelligent instructional tool that gives suggestions for puppeteer which is the main focus of this paper. The result of the preliminary evaluation has shown that the tool helps users more beneficially and a high degree of satisfaction among both the professional puppeteers and the general users.

For our future work, we are looking forward to improving SII such as by incorporating elements of animation in SII. We also aim to gather more knowledge for the library of knowledge bases for puppeteering. It is also hope that the action checking procedure in Storyline Analysis and Action Checking Module will be able to correct any incorrect action sentences automatically. Other future work includes the development of a complete system for the virtual shadow puppet play. The system is expected to provide a new form of presentation tool and storytelling tool to the younger generations for better appreciation of the traditional art, and promote and preserve the art of traditional shadow play since it provides wider access to the people. Besides, localization of the software tool is also required in order to reach various communities in many different countries.

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