

# Mobile Phone 3D Animation Plot Auto-generation Based on Ontology

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**Abstract.** The phone 3D animation generated automatically system is to achieve the goal that users sent the information to the server. After a serial of process information extracting, plot planning and scenario planning. The system would finally generate and send a video animation which is related to the information contents to the receiver. Plot design is an indispensable part of this system. It extracts the appropriate models and other related information from the ontology based on the information extracted result and generates a scene used the 3D animation software. In this passage, we will mainly studies animation plot automatically generate with the help of 3D animation software. We described the plot information in ontology. Aim at the computer has the ability to understand the semantics of knowledge.

## Introduction

With the rapid development of artificial intelligence, computer graphics and hardware technology, computer animation has penetrated into the fields of engineering, entertainment, scientific research and education. The current animation industry occupies a very important position in the world of entertainment economy, and its visual appeal, derivatives permeate daily life has brought huge interest for animation developed countries. But how will the artificial intelligence technology used in computer animation, it's a higher challenge in improving animation generate automation and intelligence.

CAS academician R. Lu in the 1990s for the first time put forward the "whole process of automatic generation of computer-aided animation techniques" in the world [1]. It is a technology for translating a story written in limited natural language into beautiful animation automatically, and after years of efforts, an automatic 3D animation generation system named SWAN has been completed by our research team In 2012[2]. Mobile phone 3D animation automatic generation for Chinese SMS was proposed by the CAS researcher S. Zhang which applied this technology on the Chinese message. This system will generate and send a video animation which is related to the information contents to the receivers. The process is divided into four parts, including information extraction of natural language, plot designing, scenario planning, sound synthesis and render the scene.

In an animation, plot plays a pivotal role. Animation shows unreal world, needs to play endless imagination. The animation plot makes the animation looks more meaningful and makes the picture more imaginative. It has a profound impact on the audience. So the plot handled properly, can play a finishing touch.

## Research Status

Automatic generation of the plot has a certain research at home and abroad. Abroad, Message Understand Conference (MUC) [3] attracts a lot of animation designer's eyes, MUC conference proposed plot template design. Trauma [4] and Si [5] and Julie [6] and others did with the character-centered planning approach to the plot planning related work. It emphasized the character-driven plot plan; Mei and her colleague put forward comprehensive story as center and character as centers [7]. It was first performed the role center planning for each role, then evaluated

and corrected the role's planning through specific story. Julie Proteous, Marc Cavazza and Fred Charles raised the overall plot structure, introduced from the point of character view to define the behaviors of the characters. And base on a series of action of characters to design the plot development [6].

### Plot Generated Automatically Design

**System Designed.** Plot generated automatically which input is information extraction result, on the basis of the ontology to create a new scene. The plot designing based on analyzing the topic and template atoms of the information extraction results, then look for knowledge which consistent with message's theme or template atoms in ontology. According to these contents, creates a new 3D animation scene from scratch.

So far, we have been established model library, music library, action library and plot template library etc in the ontology. According to the result of information extraction, we get the models which related to the message contents in the ontology. As the same time, extracts the plot template including relevant models, time, characters and season from the ontology. Put these models into an empty scene, and then add lighting, effects, camera in this scenario to form a new animation. The process is as shown in Fig. 1.

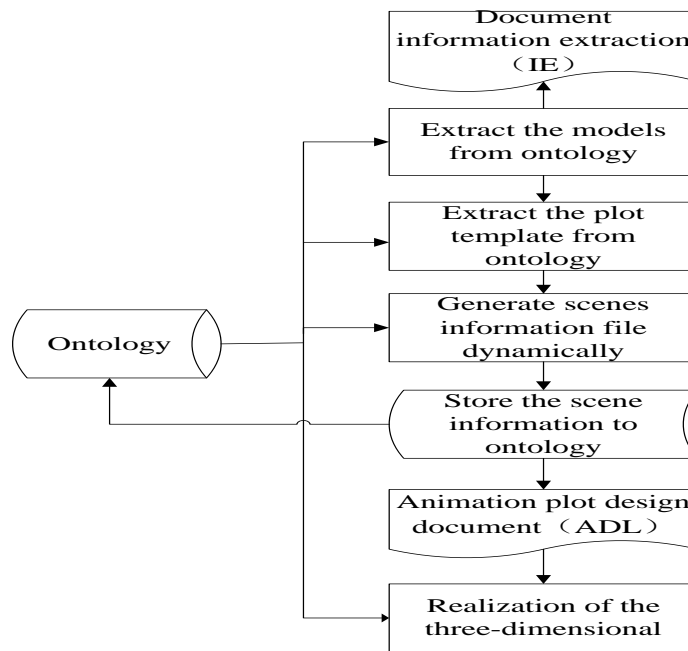


Fig. 1 Plot designing system flow chart

We get the information extraction result document through the word segmentation technology. In this document, we will know this message's topic and template information. As shown in Fig. 2.

```

<nemessage value="刮风了" />
<segmessage value="刮风#vb 了#ax" />
- <topic name="" key="">
  <root name="天气" flag="" value="风:风:刮风" color="" />
</topic>

```

Fig. 2 information extraction document

From Fig. 2, we know the topic is null but we get the template and template atoms information. In the plot template we define the models through the "hasmodel" property. In the windy plot template defines trees, buildings, trucks and benches. So in the new scene should be included this information to express this message.

**Ontology Designed.** Ontology designed with SUMO as the supper ontology. In this ontology, we built the model library, music library, action library, layout library and plot template library and the properties. Properties include date type property and object property.

The classes in ontology include:

- (1) Object: three dimensional animation models
- (2) Action: action library
- (3) Plot template: plot template library and etc.

The properties in ontology include:

- (1) Actionsuitablefortopic: define this kind action suitable for what topic
- (2) hasFloor: define the type of floor for the plot template
- (3) hasmodel: define the models for the plot template and etc.

Plot template is designed to two classes: one class is relevant to the topic of the message; the other is relevant to the template. TopicRelatedPlot is the supper class of TopicRelatedActivePlot, TopicRelatedStaticPlot and TopicRelatedActiveAndSaticPlot. And every subclass also includes several kinds of subclasses.

**Scene Space Design:** Fig. 3 is a scene spatial planning flowchart.

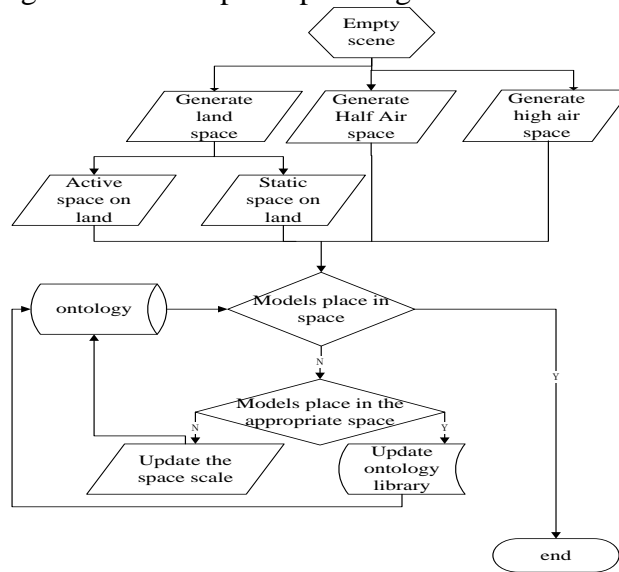


Fig. 3 Scene spatial planning flowchart

From Fig. 3 an empty scene is divided into several different spaces. The supper classes of the models determine they should be placed in what kind of spaces. Maybe a model has multiple classes. For example: car ~~carMidM carOnLand carOnLand~~ shows that the model should be placed on the ground. In the class of Car, we have many individuals, so the selected car maybe different every time.

According to the information extraction result and plot template description, system will generate an animation plot design xml document. In this document, there is the topic of the message, and the selected music according to the topic. And some rules indicate these selected models should be put in what kind of spaces. This information must be described in ontology as shown in Fig. 4. We will extract this information in the plot realization section. Fig. 4 is a description of the windy in the ontology.

For Individual: <http://www.owl-ontologies.com/Ontology1290308675.owl#WindPlot.ma>

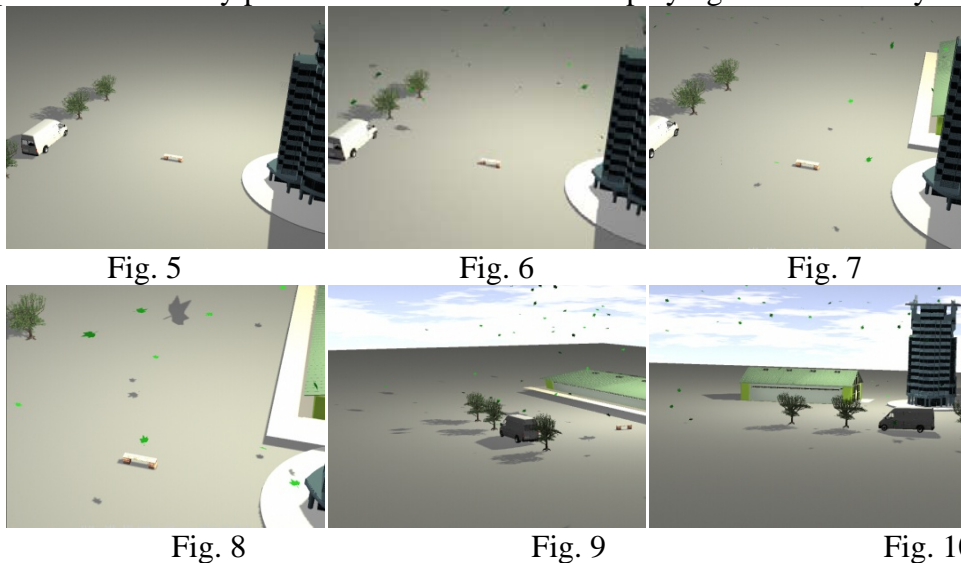
Property	Value	Type	Lang
backgroundPictureType	3	int	
hasBackgroundPicture	sky03.jpg	BackgroundScenePicture	
hasSceneSpace	SP_WindPlot_InRoomOnTable	PlaneSceneSpaceInsideRoc...	
hasSceneSpace	SP_WindPlot_OutInAir	PlaneSceneSpaceOutsideRi...	
hasSceneSpace	SP_WindPlot_OutOnLand	PlaneSceneSpaceOutsideRi...	
hasSceneSpace	SP_WindPlot_OutInHalfAir	PlaneSceneSpaceOutsideRi...	
hasSceneSpace	SP_WindPlot_ActiveSpaceOnGround	ActiveSpaceOnGround	
hasSky	true	boolean	
maFrameNumber	462	int	
rdf.type	PlotMa	owl:Class	
scenerotatex	0	string	
scenerotatey	0	string	
scenerotatez	0	string	
usedSpaceInMa	SP_WindPlot_OutInAir	PlaneSceneSpaceOutsideRi...	



Fig. 4 WindPlot.ma

From Fig. 4, we know the 3D scene includes scene spaces, scene frames, scene rotate data and other information. This information connects with classes through a variety of properties. Moreover, we will generate some spaces data automatically in the ontology according to these models. In these spaces, we generate the spaces center data including x axis, y axis and z axis data, generate the spaces scales data, generate the spaces depth and width data and generate models should be put on this space. As the same time, get the space's layout.

From Fig. 5 to Fig. 10, we see an overall design of the scene. The falling leaves in this scene are a kind of expressions of windy plot. And it is a method of displaying the SMS windy.



## Conclusion and Future Work

In this paper, we use the semantic network knowledge to build the ontology and complete the Mobile phone 3D animation plot auto-generation. So that the message content and the animation effective combination, and the message into colorful 3D animation.

Julie Proteous, Marc Cavazza and Fred Charles proposed the structure of all plot to define the people actions. It designs the plot according to a series of actions of the characters [6]. But the message is brief and maybe no character. So it is not entirely suitable for message plot generate.

Message content is changing. Only the plot template set up perfect and with more details of the plot description, expression of the content of the message can be more accurate.

For the above problems, the following work is needed to depict the model's space in the ontology. For example, we describe computer, fruit, books, cups and others can be placed on a table in ontology. When we get a table and fruit through the information result and the plot template, we know the fruit should be placed on the table rather than on ground.

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