SeGAE: A Serious Game Authoring Environment

Amel Yessad  
Lip6, Laboratoire d’Informatique de ParisVI  
UPMC, Université Pierre et Marie Curie  
Paris, France  
amel.yessad@lip6.fr

Jean-Marc Labat  
Lip6, Laboratoire d’Informatique de ParisVI  
UPMC, Université Pierre et Marie Curie  
Paris, France  
jean-Marc.Labat@lip6.fr

François Kermorvant  
Lip6, Laboratoire d’Informatique de ParisVI  
UPMC, Université Pierre et Marie Curie  
Paris, France  
francois.kermorvant@lip6.fr

Abstract—Game-based learning or serious game is becoming an important trend in e-learning research area because it seems address several typical e-learning problems such as high dropout rates due to frustration and the lack of motivation to continue studying and the cognitive overload of the learner. However, an important problem of serious games is the difficulty for instructors to adapt the storyboard, the scripts and the game levels of the videogame to new pedagogical objectives once the game development is achieved.

This paper presents SeGAE, an author-friendly environment that offers to instructors a set of editors in order to modify the game design by defining new characters, objectives, victory conditions, authorised actions among other objects in the serious games even after the development stage. Particularly, we apply our authoring approach on Blossom Flowers, a serious game developed by Ktm Advance².

Keywords: videogame; serious game; authoring environment; adaptation; pedagogical objective;

I. INTRODUCTION

While e-learning has been on the rise in industry and educational institutions for the past few years, it has also shown a number of limitations. Since the learning process is the result of rich and varied activities, many current e-learning environments propose passive educational models based on storing content that is consumed rather than learnt and constructed.

Most modern e-learning systems have evolved and include more pedagogically features such as student tracking, online assessment or user feedback. This is part of an effort that addresses several typical e-learning problems such as high dropout rates due to frustration, the lack of motivation to continue studying [1], the cognitive overload of the learner. Unfortunately, this effort remains insufficient for the learning communities.

For several years, the videogames have been identified as potential learning tools [2] and there has been a sustained academic discussion of their educational applicability [3, 4, 5, 6, 7]. After years of discussion and debate, the benefits of applying digital games have caught the attention of a great part of the academic community [8].

In this paper, we focus on the adaptation of videogames in order to achieve pedagogical objectives. These videogames, called serious games, are explicitly intended to educate or train.

In our work, we assume that a videogame can be adapted for different pedagogical objectives when we can configure it by modifying some of its characteristics. The depth of modifications depends on the flexibility of the game engine. Following the example of most of videogames, a serious game is organized in missions and the player/learner has to accomplish them in order to achieve game objectives. The game objectives are defined by both the instructor and the game designer in order to provide a list of interesting pedagogical elements: fun, interactivity, problem solving, user involvement, or motivation and creativity, etc. [9, 10].

In this paper, we present SeGAE (Serious Game Authoring Environment), an author-friendly environment that offers to instructors a set of editors in order to modify the game design by defining avatar and character characteristics (role, position, game actions, etc.), mission objectives, defeat and/or victory conditions and the authorised actions in each mission. SeGAE assures the coherence of the theses different objects of the game, for example, a character can be deleted from a mission if it doesn’t appear in any game action specification of this mission. In order to illustrate our approach, we work on a serious game developed by the company KTM-advance for MEAI (the Micro-Enterprise Acceleration Institute). This serious game aims to make sensitive entrepreneurs to the use of communication and management tools in order to improve their business.

---

¹ http://www.get-it-city.com/
² http://www.ktm-advance.com/
II. WHAT IS A SERIOUS GAME?

Reading the literature, the essential features of a game are [11, 12]:
- free action, begun and finished by the player
- imaginary, parallel to the real world, replicating a universe or an activity without any consequence on the real world
- limited, in time and space
- following a set of rules, a specific and private framework
- with an uncertain solution and development, since every run, every play, is different and depends on unpredictable behaviour of players

For a game to be a serious one, some additional features are required [13]:
- it has to start with a problem to be solved
- it has to be unproductive itself; it doesn’t generate any property or wealth. The drive is the gaming activity itself
- it has a correct solution, at least
- it should have something to be learnt by the user/player, while introducing new knowledge, fixing previous acquired knowledge, training skills, sharing experiences, discovering new concepts, developing outcomes

Finally, to be an electronic game the serious game must be run on an electronic platform, such as a computer, an online terminal, a video-player, a PDA, a mobile phone etc.

III. AUTHORING ENVIRONMENT: SEGAE

In order to integrate the authoring environment with the serious game, we specify XML Schema Definition (XSD) file that describe a set of tags in order to describe characters, events, actions, objectives, messages, among other objects of the game. Once, the game designers and the instructors discuss how transform the pedagogical objectives into game objectives and integrate these pedagogical objectives in the game levels, SeGAE allows them to configure and adapt the game by, for instance, defining new missions or changing existing missions. SeGAE generates in real time the game missions corresponding to the instructor specifications. These missions are described in an xml file validated by using the specified XSD. We can also save, undo/redo a mission or load an existing mission.

IV. IMPLEMENTATION

We implement SeGAE in the environment Flex Builder which is an integrated development environment (IDE) built on the Eclipse platform used for developing rich Internet applications (RIAs) and cross-platform desktop applications, particularly for the Adobe Flash platform.

SeGAI is built according to the MVC architecture (model-view-controller) where the views are implemented in XML-based user interface markup language (MXML) and both the controllers and the model proxies are scripts implemented in the ActionScript language. The models are the XML files describing the adaptable game objects (characters, missions, etc.).

The SeGAE architecture integrates proxies in Actionscript and mediators in MXML. For each adaptable object in the game (e.g. a game event, a character), we create: (1) a proxy which generate, save or load the XML description of the object and (2) a mediator which implements the GUI used by the instructor in order to configure the object (e.g. define the spatial coordinates of a character). The mediators are organized in a tree which permits easy and intuitive access to the different GUIs. The proxies inherit from an abstract proxy which describes the generic behaviour of proxies (cf. figure 2).

V. CASE STUDY: BLOSSOM FLOWERS

Blossom Flowers is a serious game developed by the company Ktm-Advance for the benefit of young entrepreneurs of developing countries. It aims to make them sensitive in the use of the modern communication and managing tools. The player learns how much it is useful to use computers, printers, mailing systems and other modern communication and managing tools to improve the work productivity. Blossom Flowers is organized in missions with challenges. In order to perform a mission, the player has to acquire specific skills. The role of the authoring environment SeGAE is to allow instructors to define the mission challenges, the game action sequencing as a finite state machine with events, preconditions and post conditions, etc.

We consider the game as an object that reacts to events by adding game actions like make telling or walking a character, display a message, buying a computer among other game actions. The instructor uses the authoring environment to define in real time the mission scenario. He can modify the mission scenario and visualize at the same time his changes on the game. He can control in real time, without recompilation of the whole project, the evolution of the story board. Moreover, he can define defeat and victory conditions in order to maintain the player motivation and determine the mission end.
In order to easily interoperate with Blossom Flowers developed in flash³ (SWF file format), SeGAE generates and exchanges the game data exclusively in XML format. Therefore, we can use the authoring environment with each serious game using XML files validated by our data model. The SeGAE environment implements different editors:

A. **Character editor**

It allows editing the visual and the spatial characteristics of both the player avatar and the different characters of the mission. The spatial position of the characters in the game is chosen from a matrix of authorized spatial coordinates in the scene. It depends on the calculus of the path-finding in the game in order, for instance, to avoid obstacles.

B. **Temporal scenario editor**

It is used to specify the finite-state machine which models the sequencing of the game actions. The instructor has to define the events in the mission and for each one the preconditions and post-conditions. The order of apparition of events defines the mission scenario. Some events can appear simultaneously whereas others appear in sequence. It depends of the internal game logic. The editor takes into account all constraints intrinsic to the game. In Blossom Flowers, for instance, the player can’t hire an employee before acquiring some management skills.

C. **Message and dialogue editor**

It permits to add messages and dialogues in the game missions. SeGAE take into account different user languages. These messages are then used by the instructor in editing the temporal scenarios (e.g. displaying a message to the player).

D. **Game internationalization**

This editor permits to adapt the language of the game messages and dialogues to the final user. All messages and dialogues are identified by a unique identifier dependant of the language (French, English, Polish, etc.) and stored in XML files. The editor code handles these identifiers and not directly messages or dialogues.

VI. **CONCLUSION**

In this paper, we have presented SeGAE, an authoring environment for serious games. SeGAE offers the possibility to modify and adapt a serious game by defining new missions for the player adapted to his pedagogical objectives. SeGAE interoperate with the serious game via XML files generated in real time by SeGAE. We define a data model that validates these XML files. SeGAE architecture integrates proxies and mediators that handled respectively data model and GUI of the game objects. We have applied our approach on the Blossom Flowers, a serious game developed by the company Ktm-Advance. We edit and adapt different aspects of the game like the characters, the scenario and the user language.

**ACKNOWLEDGMENT**

We are grateful to our colleagues in the MOCAH-LIP6 team for their helpful discussion. We also thank the region Iles de France which finances this project (SE-SG-FEDER).

**REFERENCES**


---

³ http://flash.medialab.fr/