Platform-Driven Design for serious games, Collaboration and Multilayer methodology

Abdelali Slimani[1,*], Mateu Sbert[2], Fatiha Elouaai[3] and Mohammed Bouhorma[4]

[1,3,4]Computer science, systems and telecommunication Laboratory (LIST)

Faculty of sciences and technologies, University Abdelmalek Essaadi, Tangier, Morocco {slimani.abdelali, elouaaif, bouhorma} @gmail.com

[2]Institut d'Informàtica i Aplicacions, Universitat de Girona, Spain,

[2]School of Computer Science and Technology, Tianjin University, mateusbert@mac.com

Abstract. The multilayer methodology involves several concepts for serious game design; it can increase the collaboration between several actors of design, obtaining a more efficient serious game. Although it requires a specific environment to provide an effective assistance and visibility during the development of serious games, it improves on the combination of learning and entertainment fields. In this paper, we present the multilayer methodology and how can actors collaborate to provide an effective design, then, we study the implementation of the methodology on an online platform. This methodology can make the design process more structured and improve the collaboration purpose. Finally, we propose a new environment of serious game design.

Keywords: serious game, design, multilayer methodology, collaboration, online platform.

1 Introduction

Serious games provide an effective tool to engage participants on active learning process, they increase the learner attention and make learning more efficient compared to traditional methods [1]. Nowadays, serious game industry becomes more popular and improves their application in several fields such as health, military, economy, and management. In these issues, recently a big effort has been undertaken to find a coherent model that combines experts of these fields and game designers for the design of serious games enhanced learning solutions[2].

Multilayer methodology highlighted a new approach to support the collaborative design on serious games, and engage the domain experts, designers and players to design and evaluate game prototypes [3]. However, their application requires a practical environment to facilitate the communication between actors and storing the design

data of the several prototypes achieved. In this perspective, the current study proposes an online platform dedicated to multilayer methodology to provide a more efficient serious game. In this paper, we present the multilayer methodology and how can actors collaborate to provide an effective design, then, we study the implementation of the methodology on an online platform, this methodology can make the design process more structured and improve the collaboration purpose. Finally, we propose the new environment of serious game design.

2 Multilayer methodology

Multi-layer methodology (see-Fig.1) provides an evaluation support to design serious games, it focus on a collaborative framework to engage concerned experts, designers and players to promote reflection and efficiency analysis of serious games design [3]. They follow the reflection on design, play, and experience concepts [4] to analyze a serious game; the actor comes up with the goals for the resulting experience to guide the design, defining the context that arises when the player uses the game, and specifying mechanics to measure the effectiveness of the design once implemented. The assessment and debriefing layers provides an effective visibility and assistance for the expert actor during the achievement of the serious game. He can proceed in a more formative and summary way to make serious game genuinely beneficial.

Fig. 1. Multilayer Framework

The multilayer methodology proposes a practical guideline (see Fig.5) adapted to each reflection state (design, play, and experience) and design layer (learning, story, gameplay, experimentation, debriefing and assessment). It involves the approach of a design on layers to bring together the separated stages and steps of design and analysis with the purpose to simplify the evaluation issue. It starts by defining the objectives

and pedagogical content of learning, follows by analyzing the integration of pedagogy through an entertainment story, by describing player interactions and scoring rules on the gameplay, and by inspecting the engagement of game object in the experimentation. Then the debriefing layer collects the player results and feedback. Finally, the assessment layer evaluates each layer result and provides the required evolutions, it focus on several criteria such as learning content, play rules, motivation, feedback, and game integration.

The purpose of the evaluation is to reveal the quality, efficacy, efficiency, adaptability and utility of the serious game design. To accomplish this purpose, the evaluation has to be executed carefully and rigorously.
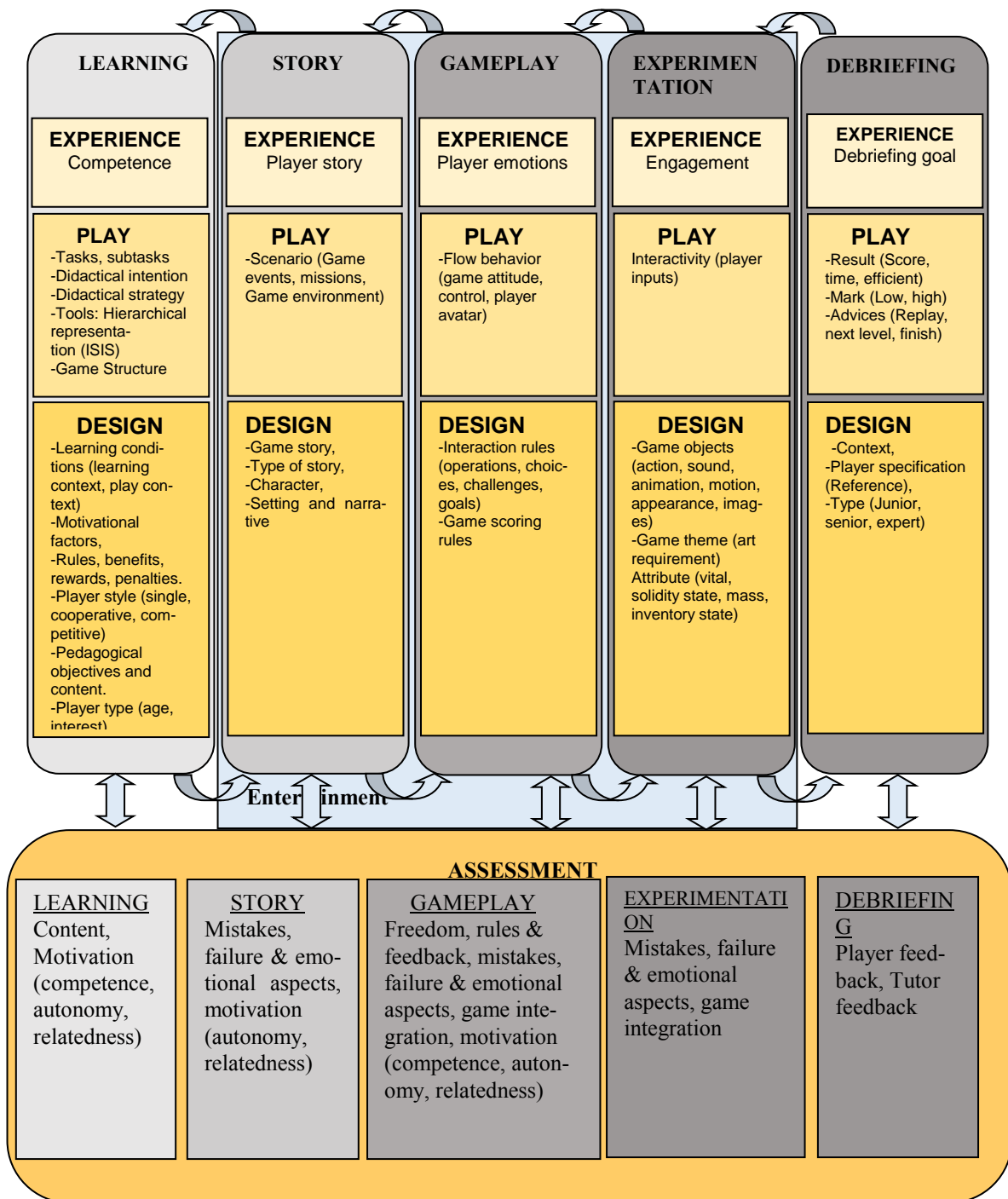
LEARNING	STORY	GAMEPLAY	EXPERIMEN TATION	DEBRIEFING
EXPERIENCE Competence	**EXPERIENCE** Player story	**EXPERIENCE** Player emotions	**EXPERIENCE** Engagement	**EXPERIENCE** Debriefing goal
PLAY -Tasks, subtasks -Didactical intention -Didactical strategy -Tools: Hierarchical representa- tion (ISIS) -Game Structure	**PLAY** -Scenario (Game events, missions, Game environment)	**PLAY** -Flow behavior (game attitude, control, player avatar)	**PLAY** Interactivity (player inputs)	**PLAY** -Result (Score, time, efficient) -Mark (Low, high) -Advices (Replay, next level, finish)
DESIGN -Learning condi- tions (learning context, play con- text) -Motivational factors, -Rules, benefits, rewards, penalties. -Player style (single, cooperative, com- petitive) -Pedagogical objectives and content. -Player type (age, interest)	**DESIGN** -Game story, -Type of story, -Character, -Setting and narra- tive	**DESIGN** -Interaction rules (operations, choic- es, challenges, goals) -Game scoring rules	**DESIGN** -Game objects (action, sound, animation, motion, appearance, imag- es) -Game theme (art requirement) Attribute (vital, solidity state, mass, inventory state)	**DESIGN** -Context, -Player specification (Reference), -Type (Junior, senior, expert)

Enter inment

ASSESSMENT

| LEARNING Content, Motivation (competence, autonomy, relatedness) | STORY Mistakes, failure & emo- tional aspects, motivation (autonomy, relatedness) | GAMEPLAY Freedom, rules & feedback, mistakes, failure & emotional aspects, game inte- gration, motivation (competence, auton- omy, relatedness) | EXPERIMENTATI ON Mistakes, failure & emotional aspects, game integration | DEBRIEFIN G Player feed- back, Tutor feedback |

Fig. 2. Multilayer methodology

3 Multilayer platform

The multilayer platform provides a specific tool to serious game design; it focuses on multilayer methodology to support the collaboration between designers, domain experts, and players. In this perspective, our platform proposes an environment of assistance structured on layers. Fig. 3 provides the database schema implemented to achieve the multilayer platform.
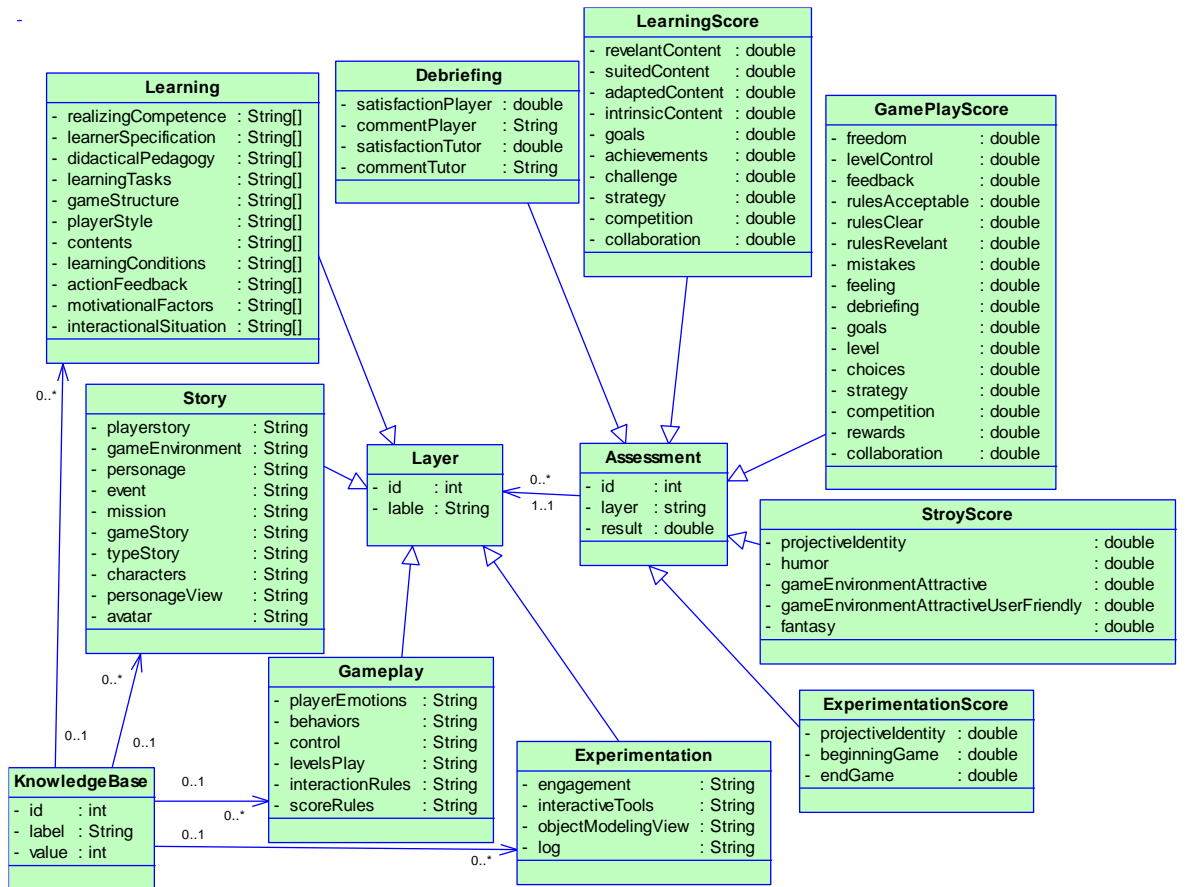

Fig. 3. Multilayer database schema

Learning overview provides the domain-specific knowledge and learning outcomes achieved through the serious game. Following the multilayer platform, the expert selects on the experience box the learner targets and the learning outcomes, and then he focuses on play box to specify pedagogical concepts and tasks involved to achieve the final goals, finally the design box highlights the learner preferences and the learning conditions to support the learning process on serious game.

Story interface helps the designer to define the correlation between the pedagogy and game play, the serious game scenario combines pedagogy and entertainment that attracts the learner attention to play more, and learn while he plays. The designer defines on the platform the player story experience, then he presents on the play box the global scenario view specifying the flow chart, which relates events, missions, and story environment, finally the design box provides the specification of designer story that produces the game scenario.

The gameplay form provides the game and scoring roles that support the flow experience of the player. In this layer, the designer stresses in "experience" the final player emotions experienced, then he defines on "play" box the game behavior, control components, and the play levels. Finally, the "design" highlights the interaction and scoring rules, choices and challenges.

The experimentation provides technical specifications of user interface represented on the game. In this layer, the designer interacts on the multi-layer platform to define player engagement on the "experience" box, and then, he specifies the interactive tools on the "play" box, finally the "design" box provides the game objects, modeling view, and the player log.

The debriefing on multilayer platform refers to the real evaluation of the game product on learning room, the players interacting with the serious game and the teacher collecting the scores and player feedback. Our platform provides a debriefing form to fill the real feedback of player and tutor.

Our platform involves an evaluation form related to the multilayer framework and helps the expert to provide feedback on the serious game. It provides an adapted evaluation for each layer of design: (1) learning, (2) story, (3) gameplay and (4) experimentation. The purpose of this proposal is to assess the mechanism quality, efficacy, efficiency, adaptability and utility.

4 User interface

The user interface provides an online tool to interact with the multilayer methodology and make a collaboration design for serious game. Fig. 4 and Fig .5 highlight an overview of the multilayer platform.

Fig. 4. Learning layer

Fig. 5. Learning assessment.

5 Conclusion

The multilayer platform provides a powerful tool to support collaborative design through serious games; it focuses on multilayer methodology to engage several actors of design on the platform. In the future, we expect to highlight an expert system to assist designers and experts to provide a good analysis and evaluation for their serious game design

References

[1] A. H. Maslow and R. Frager, *Motivation and personality*. Harper and Row, 1987.

[2] B. Schmitz, A. Czauderna, R. Klemke, and M. Specht, "Game Based Learning for Computer Science Education," in *Proceedings of Computer Science Education Research Conference*, Heerlen, The Netherlands, 2011, pp. 81–88.

[3] A. Slimani, O. Bakkali, F. Elouaai, and M. Bouhorma, "Toward a design approach for serious games," presented at the International Workshop on E-Learning & Innovative Pedagogies, 2015.

[4] I. Marfisi-Schottman, A. Sghaier, S. George, F. Tarpin-Bernard, and P. Prévôt, "Towards industrialized conception and production of serious games," *ArXiv Prepr. ArXiv09114262*, 2009.