An Accessible Toolkit for the Creation
of Socio-Emotional Agents

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ABSTRACT

FAtiMA Toolkit is a collection of open-source tools that is designed to facilitate the creation and use of cognitive agents with socio-emotional skills. The toolkit was developed with a focus on accessibility so it could be used by both researchers and game developers. It provides a computational model of emotions that is based on the OCC appraisal theory as well as an explicit dialogue structure that is familiar to game developers while maintaining the flexibility of an approach based on autonomous agents. Among various use cases, the toolkit has been successfully applied by an external game studio in their development of two serious games.

KEYWORDS

Embodied Agents; Affective Computing; Cognitive Architecture

1 INTRODUCTION

FAtiMA Toolkit[1] is a collection of tools designed to be used in tandem for the creation of cognitive agents with socio-emotional skills. The toolkit was developed in the context of the RAGE[2] project with the goal of improving the FAtiMA Modular agent architecture [3]. FAtiMA was initially developed in 2005 for the purpose of driving the behavior of autonomous 3D characters in a serious game about bullying [4]. At the time, its distinguishing feature was a computational model of an emotion theory named OCC [2] that affected the character's planning and behavioral reactions. Since then, many other computational models of social and psychological constructs were added to the architecture. Some examples include empathy [9], psychological drives [6] and culture [7]. The addition of all these constructs had a significant impact on the complexity of using the architecture. To facilitate this problem, a modular version was developed [3] that allowed users to turn off the cognitive modules they were not interested in using for their scenarios. The

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[1]http://fatima-toolkit.eu
[2]http://rageproject.eu/

toolkit presented here is the result of several improvements that were made to the FAtiMA Modular architecture.

2 FATIMA TOOLKIT

Despite the empirical evidence of the benefits of using embodied agents [5] the lack of accessible and reliable tools for creating such agents inhibits a more widespread adoption. With this concern in mind, we developed FAtiMA Toolkit, a collection of agent based tools that can be easily integrated into Unity[3], a highly popular game engine. The toolkit allows developers to add different levels of intelligence to their characters such as decision making capabilities, emotional responses, emotional appraisal of events, autobiographical memory and dialogue capabilities.
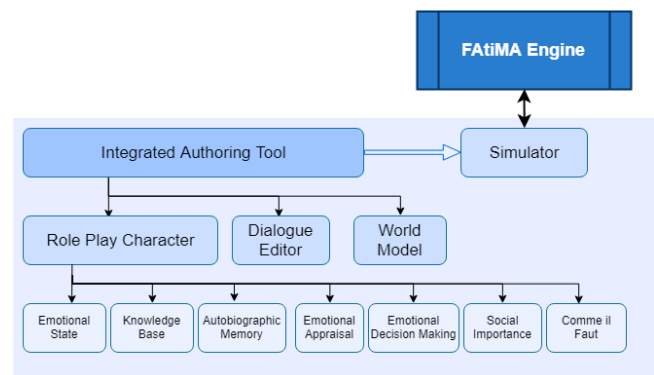

Figure 1: Components of FAtiMA Toolkit

As show in Figure 1, the toolkit is composed by a set of runtime C# libraries, the FAtiMA Engine, and an integrated authoring tool. These libraries can be directly imported into the game engine without imposing additional technological constraints. The integrated authoring tool is an application that provides a GUI for developers to design and create their scenarios and the characters within them (see Figure 2). The scenarios created can be tested directly from the authoring tool with the use of a dedicated simulator.

One of the main application domains that the toolkit was designed for is interactive storytelling [1]. For this domain, the toolkit offers a character-centric approach, which means that the story emerges from how the player and the agents interact with each other. An agent, in FAtiMA, is called a Role Play Character (RPC),and it is composed by various behavioral assets, that, while each can work independently, they work best together.
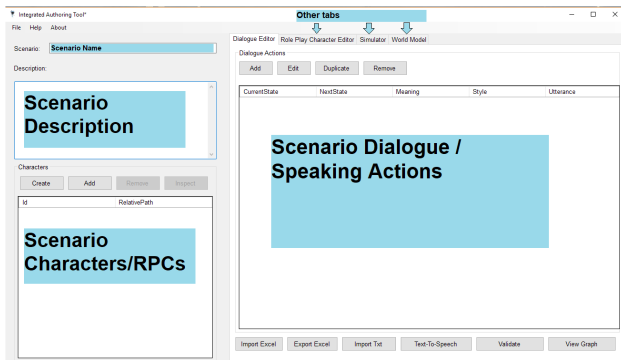
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[3]www.unity3D.com

Figure 2: User Interface of the Authoring Tool

2.1 Role Player Character

In FAtiMA Toolkit, developers are able to create or change existing Role Player Characters and their respective profiles. Each sub-component can be added or removed at will. For instance, if the developer wants a character to be able to emotionally perceive events around her then it can use the Emotional Appraisal editor within the toolkit to specify which type of response that the character should have to a particular (or generic) event. If the author wants to guide the decision-making process of the agent then it can author the Emotional Decision Making asset of that character. Both these components use a rule-based approach where a unification algorithm tries to unify a set of logical conditions against the beliefs stored in the agent's knowledge base. To increase the flexibility of this approach, it is possible to define logical predicates whose value is computed dynamically by different dedicated algorithms. In turn, this allows for multiple reasoning and affective processes to be interwoven together under a general rule-based system.

2.2 Dialogue Editor

The purpose of the Dialogue Editor is to define all the dialogue actions that will be available for the agents and the players to select from. Additionally, the Dialogue Editor also provides a validation mechanism that verifies if all dialogue paths that were specified can be reached or not. This type of information is used to quickly detect any possible errors within the dialogue.

2.3 World Model

To help the authoring process, the user is capable of defining what are the consequences of an agent performing a specific action in the *World Editor*. For instance, the author can specify that after each "Give(Money)" action the property "Money(Quantity)" will increase. It is important to note that the effects of actions might also be programmed directly in the application itself and communicated to the agents via events. The main benefit of using the World Model is that the effects defined here are done so in a declarative manner and thus they can be changed more easily. Also, the action effects defined in the World Editor will be visible to the Simulator. This last component allows the developer to quickly run and test the defined scenario. As such, it becomes easier for the author to be

able to do iterative testing and to reuse previous configurations from other scenarios and adapt them accordingly.

3 USE CASES

During its development FAtiMA Toolkit has been successfully used in a wide array of applications. Experienced and non-experienced users were able to create complex and yet interesting scenarios.

Space Modules Inc and Sports Team Manager. Using FAtiMA Toolkit, Playgen a game company from the UK developed two serious videogames. "Space Modules Inc", where the player takes on the role of a customer service representative for a spaceship part manufacturer. And 'Sports Team Manager" [4] where player be able to assemble together the most optimally performing sailing team by resolving conflicts and managing the team's interactions. Each customer/sailor can have a different emotional profiles, thus providing a different challenges to the player [8].

VR Police Interrogation. In collaboration with the Portuguese police, a playable Virtual Reality experience was created based around a police interrogation. Users play the role of a police interrogator and interact with a virtual suspect. The virtual character's decision making, emotional appraisal, dialogue and voice are all managed through FAtiMA Toolkit.

Artificial Intelligence For Games Course. In the Technical University of Lisbon, students who took the AI for Games course were encouraged, as a group project, to create interaction scenarios using the FAtiMA Toolkit. In two years, students have created over 40 different interactive experiences in various creative contexts.

FAtiMA's Game Jam. To promote the use of FAtiMA Toolkit an online "hackathon" was created where participants were encouraged to "create video games with engaging characters powered by the FAtiMA Toolkit The winner was a game called "The Princess and the Shapeshifter" [5] that was created for the competition with original art and design. Throughout the game, players must interact with 6 different characters/agents, with different personalities and abilities and must persuade them into letting players take somethings from them so that they can "shape-shift" into them.

4 CONCLUSION

In this paper, we described an accessible toolkit for the creation of intelligent, emotional and social agents. The goal is to promote a wider adoption of agent-based technology. So far, the results are encouraging as the tool has been used by both external researchers and developers with no previous experience in the agents field. From professional serious games developers to amateurs to computer science students, creators were able to learn and design agents that fitted their applications using the FAtiMA Toolkit.

ACKNOWLEDGMENTS

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[4]http://playgen.com/play/sport-team-manager/
[5]https://petzi.itch.io/the-princess-and-the-shapeshifter

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