Governmental Virtual Institutions

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ABSTRACT

Virtual Worlds are very popular media for social interaction and we believe that the adoption of this media is suitable for Electronic Government applications. It can increase the capillarity of public services, facilitate the access to (and execution of) government services and provide citizens with a natural and immersive experience. In the present paper we introduce a Government Virtual Institution Model that satisfies relevant issues such as: user friendliness to citizens with diverse education levels; facilitated connection between heterogeneous government systems; satisfaction of government services requirements related to security, privacy, reliability, scalability and interoperability. The government services and the information flow across the Government Virtual Institution are formally described using the Lightweight Coordination Calculus (LCC) language, and the model is specified based on the use of the JamSession decentralized architecture for virtual worlds.

Keywords

Electronic Government, Virtual Worlds, Intelligent User Interfaces, Interoperability, Information Representation

1. INTRODUCTION

Virtual worlds constitute a highly popular media for general purpose social interaction, as well as for purpose oriented task execution. The tasks that can be effected through virtual worlds can be related to activities such as entertainment, electronic commerce, education, culture, and the provision of services e.g. related to electronic government.

Using a rather technical terminology, this can improve the *affordance* of the virtual worlds [4], i.e. the extent to which the experience of being in the virtual worlds is natural and intuitive, together with the extent to which the actions of users in these virtual worlds are guided to belong to a controlled set of actions, in such way that the users do not feel constrained in their attitudes.

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We propose to employ virtual worlds as a natural and immersive interface for the electronic government. This paper presents a Government Virtual Institution Model (GVI) for the provision of public services, that satisfies relevant issues such as: adaptability to different citizens education level; adaptability to heterogeneous government systems; alignment with government services requirements related to security, privacy, reliability and scalability; and government interoperability requirements.

The GVI Model shall be implemented using the JamSession Architecture for distributed virtual worlds [2]. The correctness of transactions can be verified based on descriptions of formal interactions presented using the Lighweight Coordination Calculus - LCC [5].

We believe that the GVI model can contribute to increase the capillarity of public services, providing users with an immersive experience in a rather familiar environment, avoiding the need to require from them to physically travel to a governmental office, and also avoiding costs from the government by reducing the necessity to maintain too many governmental offices and branches.

2. THE GOVERNMENT VIRTUAL INSTITUTION MODEL

The Internet has proven to be an important tool to increase the capillarity of public services [6]. An important issue to be taken into account, however, is that such services are directed to citizens whose levels of education can vary significantly. Hence, some recipients of these services may not be acquainted with digital technologies and with the software interfaces that are most commonly employed to access these services.

We propose to employ virtual worlds as a natural and immersive interface for the electronic government, simulating situations for users that they would live through if they were physically present at an office and attended by a human clerk. A user can navigate across a virtual world, interact with a synthetic character that simulates a human clerk and/or with avatars of governmental officers, get his/her tasks accomplished and reach his/her goals, experiencing situations that are familiar to him/her and yet avoiding the need to physically travel to a governmental office – and, in many cases, the need to count on an officer for personal assistance at the other end of the line.

Many services offered through electronic government systems involve the exchange of sensitive information (e.g. bank transfer records, document numbers, personal address, etc.).

To deal with that, we define a model of Governmental Vir-

tual Institution (GVI) that presents a formal model of information representation, service modeling and governmental interoperability rules. We use the concept of Virtual Institution as defined in [1]: *Virtual Institutions are 3D Virtual Worlds with normative regulation of interactions.* We use the Lightweight Coordination Calculus (LCC) [5] to formally model, simulate and control the services and interoperability rules relevant that are relevant to electronic government, and the JamSession architecture for decentralized virtual worlds to present services to end users. The LCC is a process calculus for specifying social norms and was designed for expressing P2P interactions within multiagent systems [3]. LCC also permits simple but powerful mechanisms for analysis, simulation and deployment of interactive systems.

LCC can be used to specify, verify and execute interaction protocols. The specification of interaction protocols makes use of the formal syntax of LCC to build interaction models that can be formally verified, in order to ensure the satisfaction of desired properties. In a GVI, LCC is employed to encode government interoperability protocols.

The GVI model defines interactive systems to be built on the JamSession architecture, satisfying all necessary requirements and ensuring security and reliability in transactions. JamSession is an architecture for the exchange, communication and sharing of software applications based on virtual worlds. It is decentralized and based on the notion of islands. An island is hosted by a computational device connected to the Internet. When two or more islands are connected, they accept the mediation of a *router*, which is typically located together with one of the islands and coordinates the synchronization of the connected islands. Each island contains a queue of events that must occur within itself, and synchronization is based on the exchange of a minimal set of messages that ensures consistency among all queues of events. Hence, events do not necessarily occur simultaneously in all islands, but the sequence of events occurring in each of them is equivalent. Once a set of islands is connected and synchronized, the islands can virtually *see* each other through gateways. Physically, this is done by replication of all islands that are connected and synchronized in each computational device that hosts each one of the synchronized islands.

Upon mutual agreement, two islands in JamSession can exchange objects, i.e. the simulation of physical objects, characters or processes that embody services can migrate through a gateway across islands, thus enabling the interaction of objects whose origin is based on different islands, and creating the capabilities to build the purpose oriented cooperations for task execution. Physically, this is done by the dynamic update of the minimal set of messages that is exchanged between synchronized virtual worlds, as well as by the actual migration of mobile objects across the Internet.

JamSession is fully decentralized, and therefore does not require a full fledged network server to host the virtual worlds. Alternatively, computational devices with different capabilities – including desktops, smartphones, mobile and low cost equipment – can host *islands*.

GVI assumes this distributed architecture, consisting on an interconnected network of virtual worlds where each node is a virtual governmental agency representative or an agency's department. Users interact with agencies through their avatars, and agencies exchange information based on interaction protocols implemented using LCC and knowledge representation techniques, such as ontologies and reasoning mechanisms based on formal logics. Different groups of services must be required by interaction protocols with different features and specificities.

To illustrate GVI in action, we show in Figure 1 a simplified scenario related to document issuing in the context of electronic government. In this scenario, the external interface interacts with the database *system*, through messages coined *exists* and *register*, respectively to check whether a *birth* date is a valid entry in the database *system* and to update that database.

When a character assumes the role of *citizen*, it must check its birth date and then present the corresponding request for a document, *DOC*. This must be informed to a second character who must have assumed the role of *govagent*. The character who has assumed the role of *govagent* can, in turn, receive the request for the document. It verifies in the external database *system* whether the corresponding birth date exists. If it does, then it can issue the requested document and register the transaction in the external database.

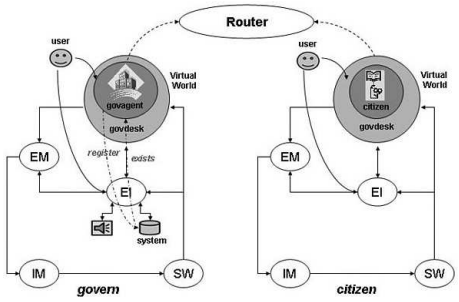

Figure 1: Issuing a Document in GVI

Security and reliability in transactions, whose steps must be carefully recorded in the databases that are connected to JamSession as well as to governmental information systems, is a prominent issue for this sort of applications. In the JamSession architecture, these features are dealt with by the *external interface (EI)*, which must be particularly well engineered in this case. Further technical details about GVI can be found in a Technical Report [2].

3. ACKNOWLEDGMENTS

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