+SPACES: Serious Games for Role-Playing Government Policies

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Abstract
The paper explores how role–play simulations can be used to support policy discussion and refinement in virtual worlds. Although the work described is set primarily within the context of policy formulation for government, the lessons learnt are applicable to online learning and collaboration within virtual environments. The paper describes how the +Spaces project is using both 2D and 3D virtual spaces to engage with citizens to explore issues relevant to new government policies. It also focuses on the most challenging part of the project, which is to provide environments that can simulate some of the complexities of real life. Some examples of different approaches to simulation in virtual spaces are provided and the issues associated with them are further examined.

We conclude that the use of role-play simulations seem to offer the most benefits in terms of providing a generalizable framework for citizens to engage with real issues arising from future policy decisions. Role-plays have also been shown to be a useful tool for engaging learners in the complexities of real-world issues, often generating insights which would not be possible using more conventional techniques.

1. Introduction

The EU +Spaces project (Positive Spaces—Policy Simulation in Virtual Spaces) explores how virtual world technologies can enable government agencies to measure public opinion on a large scale and maximize the value from prospective policy measures by leveraging the power of virtual world communities (Tserpes et al, 2010). The project aims to build applications that range from simple polling and debating to more advanced role-play simulations of government policies. Many of the challenges for the +Spaces project are shared with immersive education and there are close similarities with the use of virtual worlds for educational 'Serious Games' that are designed for the purpose of solving a problem. The project will be using some of the ideas from serious games to provide a framework for engaging with citizens in role–playing activities, allowing them to explore the implications of proposed government policies.

In the context of +Spaces, the scope of 'Virtual Worlds' is broad. 3D immersive virtual environments typically allow users to collaborate with one another in an online virtual space. However, the project also considers simpler environments that allow users to meet and share information within a social network to also constitute a type of virtual world. Users of social network environments, bloggers and microbloggers all communicate with each other within their respective systems, creating rich patterns of interaction. Examining these systems will enable us to tap into an extensive and diverse user base, overcome some of the entry barriers to the 3D environments, and study a wider variety of technologies to receive more representative insights into the problem domain.

The project exploits the viral dissemination properties of social networking services to build up engagement with large groups of citizens online. Also, one of the additional significant challenges of the project is to provide generalised middleware which can deploy and manage +Spaces applications (polls, debates and role-play simulations) across these different virtual spaces simultaneously (Kardara et al, 2011).

This paper begins by examining both 3D immersive collaborative spaces and 2D social networking services. These are the main categories within which the +Spaces applications will be implemented. For each category we make a clear definition of each area, in terms of how they will be used by the +Spaces project. We then examine some of the issues related to the creation of role-play simulations to support policy−making scenarios—ultimately the most challenging part of the +Spaces project. A number of different simulation scenarios are identified, and the issues and challenges for the project are clearly highlighted.

2. 3D Virtual Worlds

The term 'Virtual World' is often poorly defined. For example, Wikipedia describes it as "an online community that often takes the form of a computer-based simulated environment, through which users can interact with one another and use and create objects" ("Virtual World," 2011). More specifically in this section we are considering three-dimensional (3D) virtual worlds, as a specific sub-group within this wider virtual world definition. These are interactive 3D virtual environments, where a user takes the form of an avatar visible to others graphically, usually depicted as two-dimensional or three-dimensional graphical representation. Other key characteristics of a virtual world are that it is a multi-user environment that supports synchronous communications between its users, and the state of the world persists beyond a user's session.

3D virtual worlds have been used for a very wide range of applications, which can often make it difficult to generalise about their characteristics and the benefits that accrue from the use of the technology. Figure 1 illustrates one possible framework to describe the use of virtual worlds, derived from the observation of virtual worlds for teaching and learning. Here one dimension is the formality of usage, i.e. if the world is a controlled environment for formalised operation (such as online lectures) or is an informal space for users to enter when needed (such as a museum environment). The other dimension indicates if the world is primarily built to allow its users to interact with the three-dimensional content (such as a science experiment), or if it provides a set of tools to allow its users to collaborate more effectively with one another (such as a collaborative working environment). The intended use of the

virtual world will also determine how its effectiveness may be evaluated. For example, the evaluation of a world designed to support e-learning would need to consider the pedagogical issues whereas a world designed for business collaboration would have more pragmatic success criteria (such as ease of use for setting up meetings). However, whatever the requirement, the decision to employ a virtual world will usually be based on two fundamental objectives, that of cost (it is cheaper to achieve in a virtual world than in real life) and safety (it would be too dangerous or impossible in real life).

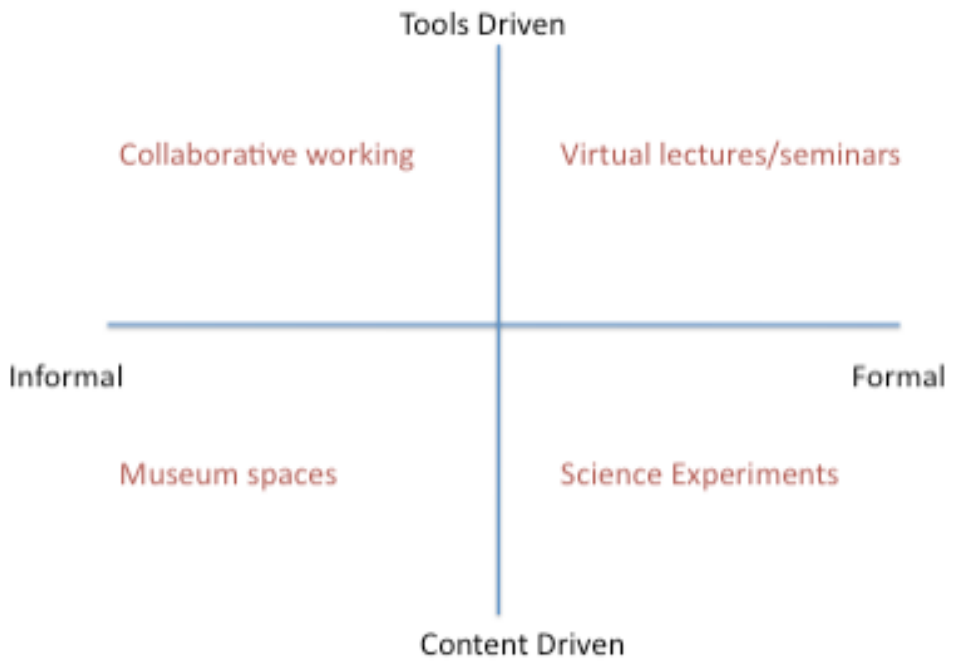

Figure 1: 3D Virtual Worlds Usage Framework

There are also several key technical and service characteristics which can help to differentiate between different types of 3D virtual world platforms. These are:

- Business model: proprietary/commercial or open source
- Hosting: public subscription model, private hosted or deploy on own server
- 3D content creation: proprietary or open art path, in-world or external tools
- Robustness: suitability for mission-critical deployment
- Client: downloadable install, Java applet, browser-based
- Extensibility: scripting, APIs, extensible module architecture, development environment
- Graphics engine: OpenGL, DirectX, Flash, jMonkeyEngine
- Notable features: voice communication, shared applications, streamed media, etc.

- Scalability and performance: number of concurrent users, extensible architecture, behaviour on server or client
- Graphics quality/fidelity
- Client hardware requirements
- Collaboration tools e.g. shared applications, voice communications, chat, etc.
- Online social dimensions, e.g. whether the world has an economic model
- Types of users supported
- Privacy/security, authentication

Given the current state of development of 3D virtual world technologies, the key technical differentiator of robustness seems to be dependant on the business model adopted by the technology provider. Commercial suppliers such as Linden Labs and Unity Technologies have invested many millions of dollars in the development of their respective platforms for specific niche markets, and are generally regarded as being fairly resilient well-supported platforms. Alternatively, there are several free open-source offerings such as OpenSim, OpenWonderland and Open Cobalt™, all at relatively early stages of development, and with variable levels of training and support. Consequently these latter platforms have so far been more widely used in research rather than for mission-critical applications.

3. 2D Social Networking Services

A 'social networking service' has been described as "online service, platform, or site that focuses on building and reflecting of social networks or social relations among people, who, for example, share interests and/or activities" ("Social networking service," 2011). Thus, the key components of social network services are the data encompassing the connections between people who are members of the service. However, all the social networking services contain additional components, which, combined with the social network structure, enable users to communicate with their networks.

Social networking sites tend to share some conventional features. Most frequently, individual users are encouraged to create profiles containing various information about themselves. Users can often upload pictures of themselves to their profiles, post blog entries for others to read, search for other users with similar interests, and compile and share lists of contacts. In addition, user profiles often have a section dedicated to comments from friends and other users. To protect user privacy, social networks usually have controls that allow users to choose who can view their profile, contact them, add them to their list of contacts, and so on. In recent years, it has also become common for a wide variety of organizations to create profiles to advertise products and services.

Social network environments are uniquely positioned for viral dissemination of information. When a user posts a status message, comment or link, their friends/contacts are immediately informed. If they find the information interesting, they can easily propagate the information to the circle of their friends, and so on. Information received via a friend is given preferential treatment by its receivers, thus enhancing its effect even further.

Social networking services have a huge market share. Nielsen Reports finds that even in 2009 "social networks and blogs are now the fourth most popular online activity ahead of personal email. Member communities are visited by 67% of the

global online population, time spent is growing at three times the overall Internet rate, accounting for almost 10% of all Internet time" ("Social Networks," 2009). Tapping into this immense user base seems worth exploring in the context of the +Spaces project.

Many different social network services are available, however they are often categorized into three broad types: social networks environments, blogging environments, and microblogging environments. These groups share many features, and overlap to a certain extent, but are sufficiently different that we would like to explore the use of a representative member of each type. In this section we give a general description of each type.

3.1 Social Networks Environments

Social networks environments such as Facebook, LinkedIn, Orkut® and many others, focus on "friending" networks. Users explicitly create connections with other users within the service, and thereafter interact closely with their friends. Users can update their friends on their activities, interests and recommendations, and this information in turn can become the basis of comments and feedback.

While the basic structure is that of a graph, many social networks environments also provide the concept of groups, created by users to assemble people who share common interests. Members of a group can view content specific to the group, and communicate with each other within a common space.

Social network environments already offer abilities relevant to the +Spaces agenda. User-posted content often sparks hot debate among the user's friends, which is then propagated to friends of friends. Polling mechanisms are implemented in various ways in many environments, either through third-party applications or as an integral part of the system. Different design decisions on the part of system implementers have resulted in the creation of several privacy models. Users can control the access of others to information they create, and groups restrict certain actions to members of the groups. Some information is open to the general public. This offers interesting issues to explore: to what extent do people radicalize or tone down their rhetoric as a function of how widely they expect it to be disseminated? Can polls be propagated notwithstanding privacy controls? Do peer pressure effects apply in virtual social groups? To what extent do language barriers inhibit the propagation of information within social networks? These questions and others are key to the study of social network environments in our context.

3.2 Blogs

Blogs (or web logs) are "usually maintained by an individual with regular entries of commentary, descriptions of events, or other material such as graphics or video" ("Blog," 2011). Blog posts tend to be "heavy" in content, with descriptions of new information discovered, compendia of references to useful materials, opinions and analysis. Users can encounter blog posts while searching the Internet for relevant keywords, or can subscribe to read content in a specific blog. Some blogs have restricted access, but most are open to the public.

A key feature is the ability of other users to comment on blog entries, potentially creating conversations centred on topics of interest to the community. Blogs and blog posts are often tagged with metadata terms, thus creating a rudimentary

searchable categorisation of topics, useful to users who are looking for blogs relevant to their interests.

Blogs are uniquely suited to act as focal points for debates. While social networking environments focus on short, informational content, blog posts often contain extensive, well-researched and -referenced opinion pieces, which spark off debate among commentators. Furthermore, an influential blog post will often prompt other bloggers to respond in their own blogs, thereafter propagating the discussion.

3.3 Microblogging

Microblogging environments are similar to blogging environments in that they enable users to post individual content. However, as their name implies, the content is severely restricted in size, thereby creating a very different set of interactions between users. Whereas blog posts are often long, well thought out opinion pieces, microblog posts are short, often fragmentary messages. As such, they lend themselves easily to other modes of interaction.

Users of microblogging environments subscribe to follow posts by others in whom they are interested, and environments usually offer some level of access control to restrict followers. Microblogging environments are often used for the broadcasting of pointers to content on different sites, for the benefit of the users who are following another user's stream of posts. Some sites also provide metadata tagging possibilities, to help users categorize and search for interesting people or topics to follow. Microblogging is thus a key component in the viral dissemination of information.

Microblogging environments are ideally suited for use as polling platforms. Poll questions can be floated into the environment as posts, and answers or responses are posted by other users thus spreading information about poll participation and prompting more users to contribute their views.

4. Simulation in Virtual Spaces

The +Spaces project is based on the underlying concept of a Virtual Space as a micro-society: it has the many of the same dynamics as the real world, based on the virtual interaction between real people. Furthermore, existing Virtual Spaces incorporate the dynamics of social networks that are already widely established, making them an ideal testbed for experimentation of a simulation of policy.

It is envisaged that the reactions governments would see in a Virtual Space would be participants' real responses to simulated situations, rather than simulated responses in hypothetical situations. It is believed that these measured reactions could be extrapolated to derive conclusions for the society at large.

+Spaces does not propose to create a simulation of society, something that is extremely difficult (if not impossible). Instead it intends to use environments that are already simulations of reality, miniatures of society, which are richer in characteristics of reality. The intention is for +Spaces to provide the tools to translate the behaviour in these spaces to predicted behaviour in real spaces. Virtual Spaces are seen as ideal environments because the +Spaces applications of polling, debating and simulation could be applied seamlessly across several Virtual Spaces.

This vision of using Virtual Spaces for simulating government policy presents several challenges. This section of the paper provides some more concrete examples of the use of Virtual Spaces for simulation and some proposed implementation scenarios. It begins by highlighting some of the issues involved.

4.1 Virtual Space Simulation Issues

Policy simulations present several challenges when it comes to modelling the real world. For example how easily can we change a person's regular habits? How can we interpret a habit based on the simulation of a policy?

We also need to be clear about what policy simulations can achieve that polls and debates cannot. The policy maker uses a poll to ask a specific question whereas the topic of a debate is usually more open but rooted in a core issue. However, when considering the simulation of a policy, the policy maker may not know the question to ask. Users give direct answers to polls and in debates they give more open answers. When participating in a policy simulation user may be unaware that they are answering any question at all.

Simulations may also exhibit a Hawthorne effect—if we force users to behave in a certain way, they will typically start to adapt their behaviour—that means that people that participate in simulations are likely to change their opinions about the topic being studied.

A key issue for +Spaces is the lack of reusable simulation models. Most existing simulations, such as the BBC Climate Change Simulation[1] combine an underlying simulation model (the rules and conditions which affect climate change) with a virtual environment or user interface, which enables users to explore and engage with the simulation. Furthermore, many existing simulations are highly complex game-playing environments, which contain rich graphics, story narratives and game-playing metaphors.

There is also the issue of how to encourage citizens to engage in policy simulations. People generally want to engage with a simulation because they are interested in the topic (such as climate change), or they are enticed by the game-playing or entertainment provided by the simulation (such as Farmville). A policy simulation, then, has to attract users to participate—this challenges policy makers to design a simulation that entices a wide variety of users.

A simulation model is generally measured by four factors (Edmonds and Hales, 2003):

- Generality of scope (i.e. broad scope)
- Precision (i.e. not vague)
- Realism (i.e. reflects knowledge and processes)
- Lack of error (i.e. accuracy of results)

A simulation model should aim to combine all of these factors, as illustrated in Figure 2. However in reality it is very difficult to combine all four factors in a single simulation, and policy simulation rarely goes beyond two factors. Generally 'lack of error' and 'generality of scope' is seen as the key dimension for policy simulation.

[1] http://www.bbc.co.uk/sn/hottopics/climatechange/climate_challenge/

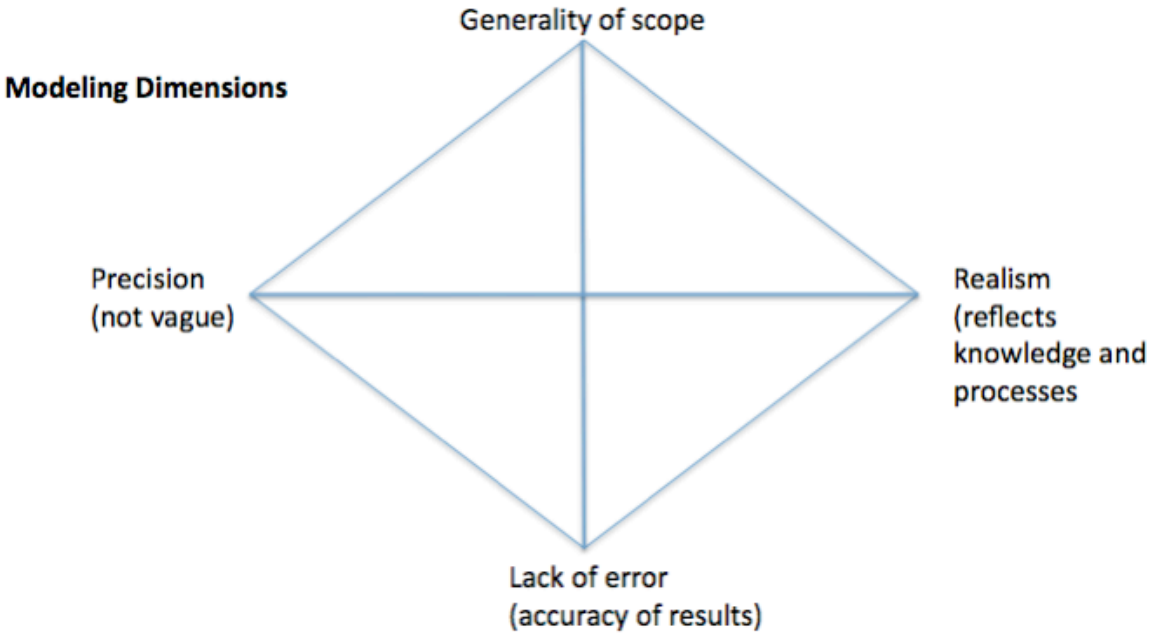

Figure 2: Simulation Models

4.2 Virtual Space Simulation Scenarios

The following scenarios for +Spaces virtual space simulations were identified as possible areas for future exploration at a project workshop:

- Recycling: engaging users in a game that would examine their willingness to recycle. This could involve users exploring the following issues: what is rubbish? Where does it come from? Where does it go? A simulation could involve users having their own virtual homes and activities that produce rubbish of different types, such as organic, plastic, paper, glass, metal.

- Transportation simulations: modelling the transportation infrastructure for a particular area such as a town or city. This could be combined with some form of traffic modelling to dynamically vary the characteristics of the simulation (such as congestion, speed of traffic), and allow users to explore some of the implications of transport policy implementation (for example, closing some streets in central Athens for pedestrians only).

- Marketplace simulations: some Virtual Worlds (such as Second Life and Farmville) implement their own internal monetary systems and currencies that can be used to buy virtual goods and services. Users can purchase internal credits with their real currency, and it has been proved by past research [25] that there is a close correlation between real and virtual buying behaviour. Virtual Worlds could therefore provide an ideal simulation for economical policies based on a defined marketplace for virtual goods and services.

- Learning simulations: the SIMiLLE project investigated the technical feasibility and pedagogical value of using virtual worlds to provide a realistic socio-cultural setting and content for second/foreign language learning. The role of the virtual world was to provide a rich environment for learners to practice their language skills in a variety of realistic settings (Gardner et al, 2011).

The above simulation scenarios all require the implementation of some form of specialised game-like environment that mimics a real-world setting. This can be difficult to achieve, as it demands the accurate representation of a real-world setting within an artificial environment. Such an environment can be both challenging to model graphically and also complex to model in terms of the behaviours, such as transportation congestion, marketplace currencies. It may also be problematic to attract users to participate in these new environments.

4.3 Role-Playing in Virtual Worlds

A common problem with computer-based simulations is the 'black-box' nature of their underlying internal models, whereby they are hidden from the end-user. This may be of benefit in terms of improving the overall usability of the interface, but is a major weakness for a policy-making application, where the rules of the internal model will make up the framework for the implementation of any new policy. From a policy-making perspective the transparency of the internal model is critical to understanding the factors that will affect the successful or unsuccessful outcome of any new policy. Also, by the nature of their implementation computer-based simulations are often very specific to a particular problem domain and do not generalise well, if at all. Consequently, it becomes difficult for the +Spaces project to develop a general framework for policy simulation in which each policy does not require its own particular implementation. This observation makes computer simulations an infeasible option for the project, as it does not support the dissemination and use of the outputs from the project by other parties.

Other experts support this observation. For example, Prof. Richard Duke is a pioneer of computer based urban simulation games and is President of the International Simulation and Gaming Association. His work has moved away from using simulations because of their black-box nature. Instead, he has adopted a more general approach based on role-playing simulation exercises that allow different players to engage with each other. Duke believes that this approach provides a far less deterministic outcome, which is more generalisable, and introduces the benefit of an unpredictable element of human choice into the process (Duke & Geurts, 2004).

Thus, our preferred simulation scenario is to provide Virtual Spaces in which participants themselves can act out a particular government policy issue through an online role-play activity. This scenario could be a mediated task, facilitated by an online moderator, whereby participants are assigned roles (such as central government policy maker, civil servant, local government agent, citizen) and then asked to act out a particular simulation role-play (such as the implementation of a new waste removal service by private contractors). The role-play could take place in virtual worlds that visually recreate the location of the intended policy, such as town hall, local street, or city centre.

This type of virtual world simulation is often referred to as a 'serious game'. Serious games are often used where it would be too dangerous or too costly to attempt the learning exercise in a real-world setting. Examples include safety training on oil rigs and war-gaming exercises. In both these examples, the keys factors are:

- A realistic virtual world environment (reflecting the real world)

- Multi-player scenarios and collaboration, often with users role-playing different characters (such as paramedic, doctor, patient)
- A rich underlying model reflecting the real-world behaviours available (such as fire fighting capabilities on an oil rig)

The creation of a serious game learning exercise presents similar issues to those identified for simulations such as the problems of generalising across multiple domains and multiple deployment platforms. However, research in the field of serious games has resulted in potential solutions to these problems. One such solution is PIVOTE: an open source virtual learning authoring system for virtual worlds (Burden & Jinman, 2011). PIVOTE provides authors of serious game learning exercises with a form-based user interface to create a decision tree of game steps. The learning exercises generated by PIVOTE can be seen as isomorphic with the role-playing exercises necessary for +Spaces policy simulation. PIVOTE could be used as the means to enable policy makers to specify the role play of a simulation. The additional benefit that we can exploit from PIVOTE is its ability to simultaneously deploy exercises onto several platforms (including Second Life, OpenSim and web), and that it uses an open architecture based on web services.

Within the context of +Spaces, users could be exposed to a simulation activity of this kind, which is then followed by an online poll and debate (using the other +Spaces applications) that can help to capture further quantitative and qualitative information about the user's perception of the main issues arising from the simulation. Such a sequence is illustrated in Figure 3.

Figure 3: Role-Playing Simulation Scenario

It is important to remember that the key end user role of the +Spaces applications is that of policy maker: a person from a government agency who typically has no expertise either in the creation of virtual spaces or serious games. Thus, it is critical that we provide this user with guidance on how to create role play simulations. With this in mind, the project has been exploring the use of role-play templates to help policy makers devise an appropriate role-play simulation to support a given policy issue. The following are examples of existing role-play templates[2]:

- Galactic wormhole: participants imagine themselves to be five years in the future and reflect on positive and negative outcomes of a particular strategy
- Depolarizer: structured game based on the philosophy that many issues that we treat as problems to be solved are actually polarities to be managed
- Environmental decision-making: participants learn about a particular environmental issue from multiple perspectives by interacting both online and face-to-face with their peers about a topic in assigned "stakeholder" roles

Figures 4 and 5 illustrate the stages of the Galactic Wormhole and Depolarizer role-plays, respectively. We have successfully used these templates within the project as part of a "real world" workshop and plan to implement them in a forthcoming stage of the project.

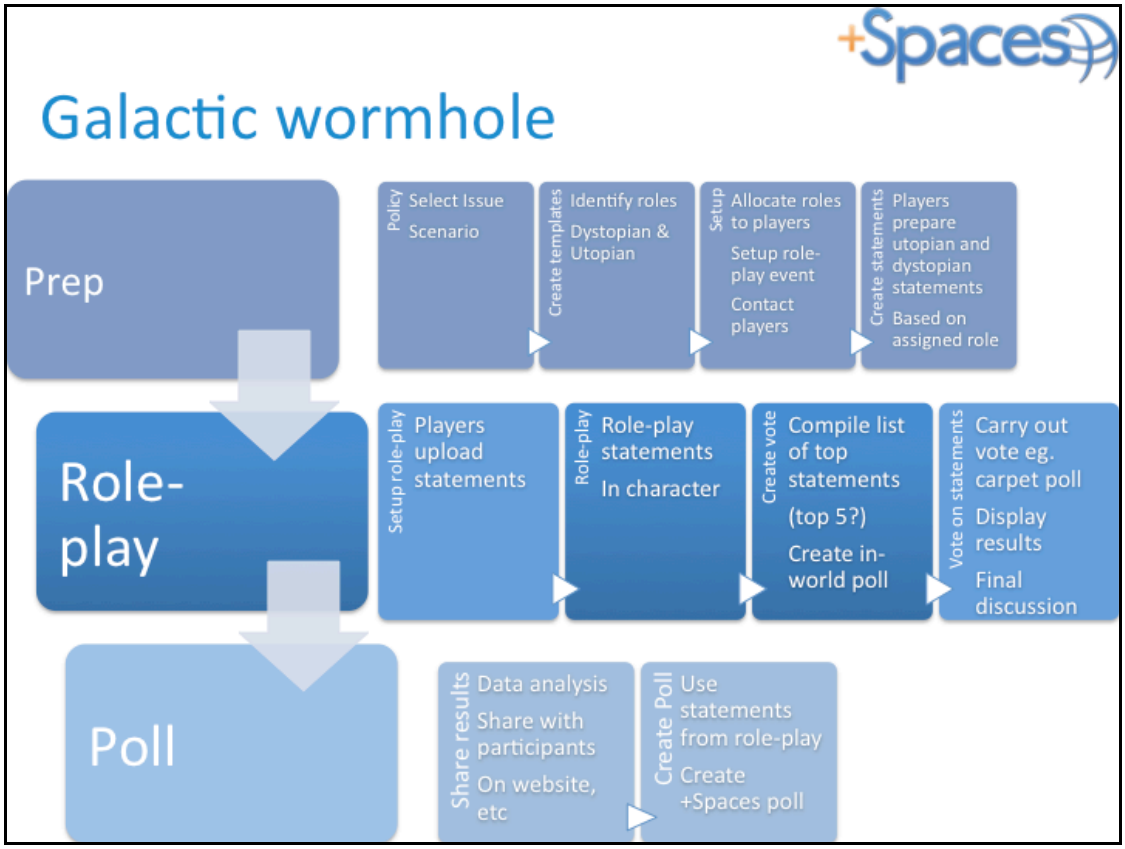

Figure 4: Galactic Wormhole Role-Play

[2] http://www.learningdesigns.uow.edu.au/guides/info/g1/index.htm

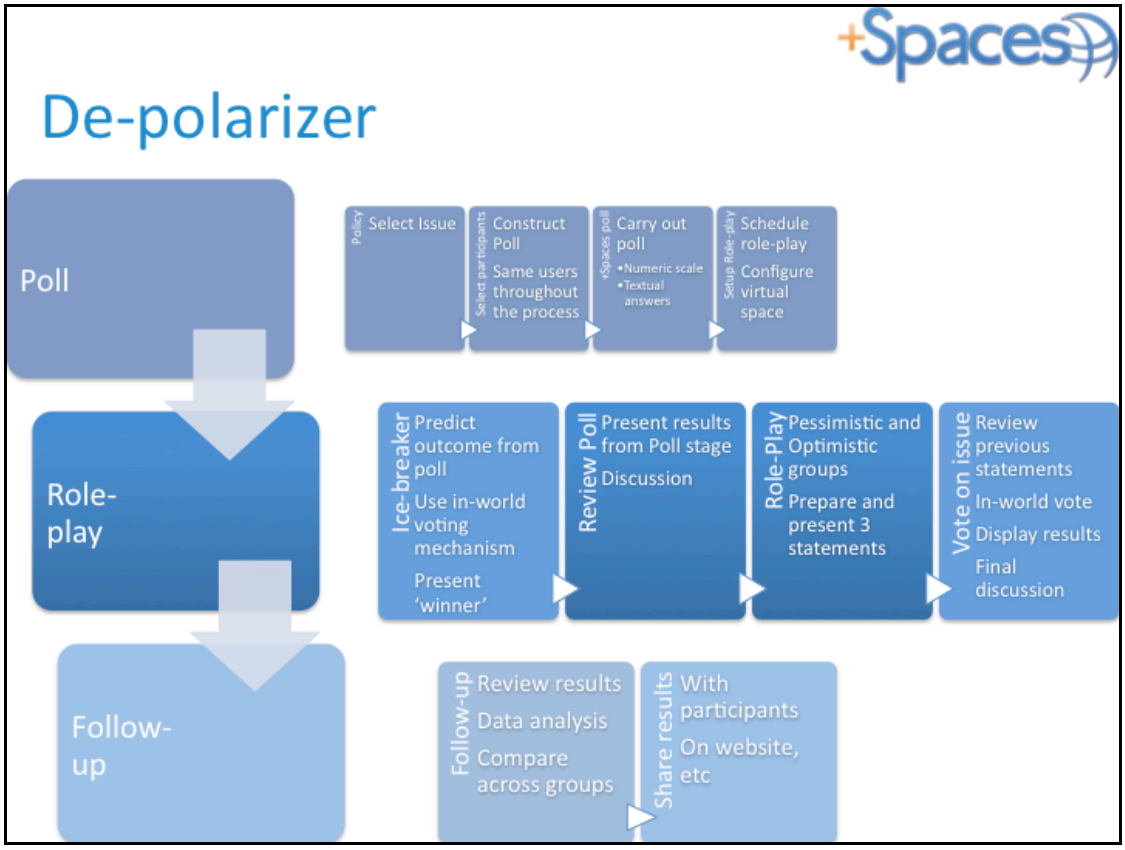

Figure 5: Depolarizer Role-Play

Figure 6 illustrates a screenshot from an early prototype based on Open Wonderland of the second stage of the Galactic wormhole template. The participants have uploaded their statements and other supporting documents to the virtual world, arranged around the periphery of the space. On the floor of the space is a "debating carpet" on which users can register their degree of agreement with questions posed by a moderator.

Role-playing is an approach that has been effectively used for many different purposes such as predicting outcomes, war-gaming, team-building and training. Aspects of role-play have already been used elsewhere in online theatre, gaming, focused discussion forums, and so on. The innovation for the +Spaces project is in the application of role-playing as a simulation tool for policy makers. The consequent challenges for the project include:

- How to support online citizen participants across different virtual space platforms
- How to provide policy makers with a user interface in which they are able to define a role-play and then select users and schedule (and setup) a role-playing simulation event
- Managing the structured role-play in a virtual space according to the steps defined in a template
- Capturing the results from the role-play simulation
- Analysing the results to support policy making

Figure 6: Role-playing the Galactic wormhole template

From a project perspective the benefits of using a role-play simulation approach are that it emphasises the need for inter-operability across 2D and 3D platforms, across +Spaces applications (polls, debates, simulation), and with other core +Spaces services (recommender/reputation system selecting participants, data analysis service). It will also provide rich data sets for the analysis services in terms of the role-play dialogue and events, and it should provide a more generalisable policy simulation framework.

5. Conclusion

The underlying concept of the +Spaces project is that the virtual world provides a micro-society. The work of Castronova on synthetic worlds and their economies has already demonstrated that user behaviour in virtual worlds mirror those in the real world (Castronova, 2005; Castronova, 2008). The objective of the +Spaces project is to engage with users in these virtual spaces and discover their real responses to simulated situations. Creating computer-based simulations can be very complex, and existing game-based simulations are typically closed environments that cannot easily be re-purposed. It is also difficult to reuse the underlying models to construct a new simulation. For these reasons role-playing provides a more tenable and reusable framework for 'simulating' government policy. In a role-play the virtual space provides an environment in which the participants themselves can act out a particular government policy issue, mediated by an online facilitator. The role-play could take place in a virtual space that visually recreates the location of the intended policy. The +Spaces project is building on previous work on using serious game role-

play environments to construct a unifying framework that ties all of these elements together.

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