WEB VR BASED COLLABORATIVE MODELLING AND DISCUSSION TOOLS FOR MASTER PLANNING – THE VEPS PROJECT

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Abstract: It is becoming increasingly important to European democratic governments to increase public participation. We argue that more effective tools are required to clearly display local planning proposals and their consequences in web based interactive 3D, free at the point of access. Initial workshops have shown that such tools are only likely to be used if those so doing can influence the outcome. Tools are needed to share concerns, examine alternatives, and propose solutions through collaborative citizen based examination and discussion. The paper describes a prototype for interactive 3D modelling on the web, which is currently being tested. One of the issues raised in the early workshops was that greater trust needs to be engendered between planners, developers, architects and the public, and that agreement that the data and the resulting representations is sufficiently accurate is likely to provide a stronger base for consensus.

Introduction
Information visualisation remains at the heart of the planning system. It is becoming increasingly important to European democratic governments to increase public participation and the use of the WWW for planning purposes is seen as a recent and expanding area of research.

Thus, Government bodies at various levels (national, regional, and city) are now turning their attention to web based approaches to easing access and empowering public involvement and debate on the issues. A focus on planning procedures at different stages helps to recognise the difficulties inherent in planning, particularly the outcome of changes to the built environment and the importance of people’s involvement in the process.

Individual citizens are unlikely to gain influence in the environmental planning process unless they adequately address the issues, and present positive alternative proposals. It is argued, in this paper, that replication of existing plan and cartographic-based approaches to planning on the web will tend to perpetuate the requirement for trained interpretation, thereby contributing to the exclusion of the general public from participation.

This paper discusses the recent work from which these tools have been developed, in the VEPs Interreg funded project, focused on planning in North West Europe (NWE)\(^1\). VEPs, the ‘Virtual Environmental Planning System’, is an Interreg IIIB NWE funded European project. The project

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\(^1\) VEPS - Virtual Environmental Planning System funded Dec 2004 to 2007 by INTERREG IIIB NWE-ENO (a Community Initiative Programme funded by the European Regional Development Fund www.nweurope.org)
began in late 2005 and runs until December 2007. It has eight academic and industry partners across the North West Europe region. VEPs is led by the Environment Agency for England and Wales (UK), with: The University of the West of England, Bristol (UK); Scientific & Technical Building Centre (CSTB, France); University of Salford (UK); Manchester Digital Development Agency (UK); Clementine Media (UK); Stuttgart University of Applied Sciences (Germany); University of Freiburg (Germany). VEPs has received additional support from the UK government as a potential contribution to its e-Planning programme. The goal of the project is that groups of citizens can engage with each other, and possibly with 'experts', and appraise planning proposals in a VR context virtually on the web. By viewing 3D scenes in common they will be able to engage in dialogue and draw attention to or focus on issues by 'marking up' points of concern or consensus. Beyond this the project partners are developing tools to allow these groups to collaboratively develop alternatives, and to upload their own models or the modified models of others into the same context for exploration. While the full project results are not expected until 2008 the first iteration of tools and tests with collaborative discussion and comment on line by user groups is beginning now. These results will then be used to guide the refinement and further development of the system.

New approaches to high resolution remote sensing allow the possibility of automatically created detailed contextual modelling in which planning proposals for change can be evaluated. One of the issues raised in the early workshops was that greater trust needs to be engendered between planners, developers, architects and the public, and that agreement that the data and the resulting representations is sufficiently accurate is likely to provide a stronger base for consensus. The project partners have therefore been examining how to optimise digital 3D modelling, of urban and rural environments, where the increasing availability of highly accurate Light Detection And Ranging LiDAR laser based scanning offers appropriate remote sensed data. The LiDAR data itself is currently not captured often or extensively enough or at a sufficient level of detail that it can yet be relied on to keep VR analogues of real places up to date through an automated process alone, without additional modelling. Significant costs in modelling and updating urban settings to convey presence thus remain, be it through a combination of photogrammetry, CAD drawings and manual editing. It is argued that, without more effective participative modelling tools, these costs are likely to limit large area 3D modelling to either broad brush overviews (as provided by Google Earth) or to credible street level models in those few locations where the high cost is justifiable, but in which, once the primary purpose of the model has been served, acceptance of the continuing cost of maintenance to reflect change is unlikely.

The paper will put forward the view that currently, where updating of high presence street models does happen, due to resourcing, it is likely to be piecemeal and take place over a long period of time. One possible use of the prototype web based planning tools being developed within the project is to support the participative creation and maintenance of credible street level models, in order to reduce resourcing costs. However the appropriate levels of detail for these participative models needs to be identified, so Issues of verisimilitude in supporting effective judgements in planning appraisal are discussed. For example, whether it is important that VR optimised for the web tends to offer a less photo-realistic appearance than CAD generated VR; when and how to express uncertainty as part of a narrative; and to what extent detail should be depicted. These suggest approaches to navigating from one issue of concern to another, as part of a narrative explanation of a point of view, during a web based collaborative discussion. Within this discussion it is suggested that the form of representation in itself constitutes an important element of the dialogue. Equally important for effective judgement in planning appraisal is informed understanding of the constraints that apply to a particular site or development area. These may be regulatory, or contextual, such as risk of flooding, or risk of subsidence. Regulatory constraints sometimes conflict, see discussion below on the UK, and different constraints apply in apparently similar circumstances. There is a need to display these
constraints in the 3D scene. Aspects of the approach to be taken to address this are discussed below.

**Variance in the planning process in North West Europe**

In the UK guidance on planning policy and process can be found in various places in the Central Government Planning Policy Statements (PPS) to planning authorities. However, these are at times conflicting thereby permitting latitude to developers and professionals, to the greater confusion of the public. PPS 1 on 'Delivering Sustainable Development' (para 7) emphasises the importance of proper presentation of planning applications and PPS12 on Local Development Frameworks draws attention to the importance of local participation and the need for local authorities to prepare detailed plans and drawings which show the proposed development in its setting. Yet according to a statistical analysis, coverage of these issues was until recently still generally sporadic; and presentation of applications, environmental impact analysis and site analysis were only referred to in a fifth of the plans in the UK (Punter Carmona 1997)². The UK Central Government has now started actively to seek ways to improve both the planning process in general and public participation in that process, through its recent e-Planning Blueprint, published in August 2004³. UK initiatives since launched include the national PARSOL (Planning and Regulatory Services Online) project, a range of ‘Pathfinder’ projects and the Implementing e-Government (iEg) initiative. The main focus of these initiatives is to develop a set of toolkits, standards and ‘demonstrator’ projects with the aim of assisting planning authorities to implement e-Planning in forms that citizens will both comprehend and use in their dealings with the councils. New online planning portals are aimed at introducing partnership working, bringing together planning, building control and licensing services.

In comparison to the flexible and discretionary planning system in the UK, German Städte und Gemeinden (cities and municipalities) have a constitutional right of self-government. Local land use planning in Germany is largely about zoning and a municipal responsibility, documented in preparatory and subsequently binding land use plans. The cornerstone of local land-use planning is the power to designate land for specific uses (for example residential and commercial use, public purposes), or to impose restrictions (for example maximum dimensions of development including number of storeys and roof structure). All municipalities are required to have a Flächennutzungsplan, a zoning plan that lays out in general terms the types of land use prevailing or envisaged for the whole of the municipal territory. Preparatory land-use plans are in most cases drawn to a scale of 1:10,000, or occasionally 1:20,000, and have to take into consideration the planning objectives and principles at higher level as set out in the respective Landesentwicklungsplan and Regional plans (Dühr, 2004)⁴. Thus, although local authorities are solely responsible for the preparation of their local land use plans, the legal framework provides mechanisms that ensure conformity between different levels of plans (‘duty of compliance’). The second type of plan at local level is the Bebauungsplan (B-Plan), a plan which contains legally binding designations, drawn up to a scale of 1:5,000 or 1:1,000, regarding the proposed development and structure. A cartographic representation of the territory of the municipality and the proposed land uses forms the central part of both types of local land use plans in Germany. Public participation requirements on plans at local level and development proposals (which have to comply with the regulations set out in the Bebauungsplan) are clearly set out in the Baugesetzbuch. For development proposals, these usually only extend to third parties that would be directly affected by the development. The most recent revision of the Baugesetzbuch

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(2004) has made provision for public participation requirements to be met through the use of new media, such as online plans and proposals. This is a major innovation for the German planning system, which until recently has had strict requirements for two-dimensional print versions of local level plans, and will allow local authorities to make better use of other online tools as well, such as three-dimensional models (Dühr, 2005)5.

Computer visualisation and urban planning

At present there is a wide range of three-dimensional digital urban models and visualisation methods used to support the planning decision-making process. The importance of visualisation is being recognised as crucial for almost all environmental and planning professionals who need to represent, communicate and evaluate design ideas and planning proposals (McKechnie, 1997)6. According to Sawczuk “the design and planning process revolves around client’s needs and therefore the client should be part of the team…” (Sawczuk, 1992)7. The findings of some current research have revealed that while skilled participants appreciate traditional media, such as drawings, unskilled participants prefer photorealistic presentations. Similarly, it was reported that when lay-people were exposed to architects’ drawings “plans had little meaning as the people could not understand what was represented” (Harrlichack 1993)8.

The use of the web for planning purposes is one area that is receiving a great deal of attention lately, in particular, the visualisation of urban forms and landscapes. As the Internet has become accessible and faster, an increasing number of applications are being tested and developed in encouraging public participation in planning process. Research shows that these new tools have improved the communication process (Al-Kodmany, 2001)9 and that 3D forms of representation “made the plan understandable” (Appleton, Lovett 2003)10. Daniel and Meitner cite several experimental studies that have demonstrated the power of visualisations “to affect attention, to alter interpretations of complex concepts and differentially to arouse positive and/or negative emotions” (Daniel, Meitner, 2000)11. Although researchers’ views vary on the appropriate use and place of visualisation in the planning process, all agree that communicating design can be more effective and improved if computer generated visualisation is used as the means. Pietch states that with “increasing participation of non-design professionals such as elected council members and members of the public, the demand is there for a better communication medium than conventional 2D drawings” (Pietch 2000)12.

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Some research suggests that three-dimensional and interactive computer visualisation (based on using 3D VRML in research into community based ‘planning for real’) is one of the “most important developments in visual communication for urban planning and urban design since the development plan”13 (Shiode 2001)14. This is an area that needs more research to establish when it is appropriate to simplify, by how much to simplify while retaining verisimilitude, and how reliable are the consequent judgements. Kaplan and Kaplan argue that “a simplified model is more likely to parallel people’s cognitive structure. Hence the very simplicity of the model may encourage its use. A simplified model also encourages generality; details make things particular, thus narrowing their range of appropriateness. Finally, simplification reduces the total load to one’s processing” (Kaplan 1983)15. Other researchers as Santella state that “the basic goal of realistic rendering is to create images perceptually indistinguishable from real scenes. Since the human observer judges the fidelity and quality of the resulting images, the perceivable differences between the appearance of a computer graphics image and its real world counterpart should be minimised. Thus, visual perception issues are clearly involved.” (Santella, 2005)16

We would, in contrast, endorse the view that “reality is complicated and messy. Rather than realism, what is more often desired is verisimilitude. We want the appearance of reality which has been organized and structured to make its meaning clearer, if necessarily more limited than the infinite complexity of reality.” (Boyd Davis 1996)17 Santella and DeCarlo18 also justify the use of abstraction in non-photo-realistic representations based on experiments with eye tracking data. They found that viewers tend to spend more time looking at regions that have been abstracted less in artistic renderings, which suggests that abstraction can be used as one means of ordering and structuring, for example to guide attention to more ‘important’ regions of an image.( Kolliopoulos, 2005)19

Boyd Davis et al state that “the construction of Virtual Realities should be seen as an intentional activity, based on thoughtful well-informed and inventive decision-making. It is a design process in the best and broadest sense of the term….the decisions in that design process should ultimately be based on effectiveness. All the decisions made can be evaluated by asking: will this project, in this form, achieve the desired result?” (Boyd Davis 1996) Most of the research in this area of VR is focused on metrics for comparing ‘realism’ against reality, by contrast we are

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more concerned with the consistency of the planning appraisal judgement from the time of experiencing the VR representation to the moment of confrontation with the built outcome. If the ‘unskilled’ users are shocked when they finally see the built result of the planned proposal that they earlier evaluated, then the earlier VR representation clearly lacked verisimilitude.

**Top down planning use versus bottom up citizen engagement**

The VEPs project is focused on what can be described as a ‘person-centric’ approach to evaluation of planning issues, based on a credible sense of presence in the scene to support effective judgement. This is perhaps a bottom up approach, contrasted with the usual top down approach to planning. Workshops have indicated that users are most likely to become engaged in the participative planning process when they are conscious of a particular impact on their own lives. One of the areas that gives rise to significant public dissatisfaction and feelings of disempowerment is that of local planning. “Not in my backyard” or ‘NIMBYism’ is now often quoted in the UK as the almost automatically cynical response to local planning proposals. It is then necessary to find mechanisms that create consensus beyond the person centred view, and to allow the cumulative impact of individual decisions to be appraised. The workshops held in the partner countries within the VEPs project have identified that the issues most likely to engage citizens in this way are for example changes to the neighbourhood of their home, or changes they wish to make to their home in the context of their neighbourhood.

Although in the discussion above there would appear to be major differences in practice and process between for example the UK and Germany or France, the person-centric approach may identify significant commonality that supports the development of a system flexible enough to be used in the varying planning systems in the North West Europe member states. For example, in the UK permitted development allows a maximum increase in the massing of the building of 10% of its original volume, and building line controls create a buffer zone beyond which buildings are not allowed to be extended towards the street. In some regions of France similar building line controls apply, however the massing of the building can be significantly increased to the rear, unless the development is within 4 metres of the plot boundary, when a similar restriction to the size of the footprint is applied. Thus, in either the UK or France, from the point of view of the Householder wishing to substantially increase the volume of his house, an extension close to the building line or plot boundary will not be permitted without special permission or a change in the approved plan. At this point one of the critical planning judgements will be whether granting such permission will lead to a flood of similar applications which will thereby cumulatively change the character of the neighbourhood.

A solution to this form of display of cumulative impact was developed by Bourdakis and colleagues within the PICT project. They developed a tool that gave the ‘ability to visualise the city as if the regulations allowance for building heights was fully exhausted. This is done in a semi-translucent grey block model, generated automatically based on the regulations permissions for each urban block, superimposed on the existing city model. Employing a birds eye view this tool clearly designates structures not in line with the current legislation (protruding from the translucent grey blocks) as well as areas where building activity is potentially expected (empty grey block areas).’ (Bourdakis, 2004) One might describe this as the ‘permitted development envelope’ or PDE. However due to the latitude of interpretation leading to a range of acceptable alternative proposals within the limits of the constraints the display of these PDEs may need to be shown in a fuzzy or dynamic manner.

The prototype tools described hereafter are aimed at the bottom up use by Citizens, able to model their own explorations as well as viewing street level impacts in their immediate

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neighbourhoods, other investigation during the VEPs project is examining how to facilitate the planning process and planners. In Stuttgart the Stuttgart University of Applied Sciences is working with the City Planners on a case study of the Rosensteinviertel area proposed for major air-rights extension to the city centre over undergrounded railway tracks and for urban regeneration. For regional appraisal “there are several planning support systems (PPS) available on the market today to ESRI users. PSS use indicators and alternative development scenarios … can measure and compare performances of different … indicators for land use, transportation, natural resources and employment…”21 There are a range of what are now termed Planning Support Systems under development such as Metroquest22, and it is not intended to replicate these, but rather to identify what data needs to be passed from local and neighbourhood impact proposals in order for such systems to be pump-primed so that matching sites can be identified and the cumulative effects of similar development modelled forward over decades. Equally further constraints may be formulated using such simulations that will better inform decision making at the local level, so a two-way exchange needs to be established.

**The VEPS project: Analysis**

The VEPS project preliminary analysis suggested that there are three viable approaches to public consultation and engagement in the planning process. Firstly, the complex information in a planning consultation may be “dumbed down” to a level that can be understood by the average member of the public without a qualification in planning. Secondly, full information can be presented but the citizen might need to receive training in order to understand it, particularly because plans and maps require training to read and interpret correctly because for an 'untrained' user they often contain ambiguities. Thirdly, (the proposed VEPS project approach) an interactive three-dimensional (3D) virtual reality (VR) visualisation would allow the viewer to experience the highly complex information without the need for training, because they can see and experience what the visual impacts of the planned development will be in the associated model. This approach is also supported by the existing literature which claims that the use of 3D visualisation is particularly powerful in visualising urban and built environments as it gives the option to deliver the relevant information in an intuitively comprehensive form [9]. In this respect newly available highly accurate three dimensional LIDAR data is becoming more widely available. LIDAR stands for Light Detection and Ranging and is a (usually) airborne mapping technique which uses a laser to measure the distance between the aircraft and the ground. LIDAR is a range imaging data acquiring method, which is used, in conjunction with the Global Positioning System (GPS), to deliver high resolution digital elevation models. A flash movie on the Environment Agency Website23 demonstrates these principles. This data can be sufficiently

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21 In ESRI commercial sales literature on “GIS supports planning and the public participation process with Planning Support Systems” it refers to 3 PPS systems: “What if ™”; “INDEX”; and CommunityViz


accurate for the precise judgments demanded in planning to be made, and, as image 1 shows, provides a digital context in which new proposals can be viewed. The issue that is then posed is how best to represent proposed changes in this environment, so that they are credible and the judgments that may be made by non-technical people are reliable - without making the proposals so photo-realistic that they are 'read' as certain.

The VEPS project focuses on the master planning stage where visualisation can assist in avoiding delays in the planning process - here, the judgments required can be made before a specific proposal has been formulated and / or before an application for planning approval. The project also proposes to develop means of enabling the public to 'what-if', to modify proposals and to examine the impact of their modifications, or to upload alternative proposals. An underpinning Spatial database will assist analysis of the potential impact. Such spatial databases are in effect a form of GIS when associated with spatial analytical tools. The benefits of GIS in this context is borne out by current research in this field which states that "the potential for extensive and alternative use will be directly reflected where GIS will prove to be powerful" (Shiode, 2001)24. In the resulting VEP system an underpinning spatial database will be crucial throughout, from data acquisition to modelling process, to enable on-demand responses and for maintenance of the system.

In VEPS, the purpose of visualisation is to assist users to make decisions together about proposals for change, using a digital environment that represents the proposals. It is regarded as critical that they then endorse those early decisions when they are confronted by the final built outcome. Hence to start with, for this research, visualisations have been created and published using existing commercial and / or open standard file formats, such as VRML; to swiftly create a prototype web based virtual reality that users can freely explore. This is intended to lead to user engagement in the research process and to user driven optimisation of the final system. The final system would be expected to fall into the category of those systems with 'full analytical features' [24]. It is hoped that this will indicate improvements in the way in which users participate in the planning process and decision-making.

Web based 3D e-Planner prototype toolset
A prototype has been developed for interactive 3D modelling on the web, which is currently being tested, intended for use by citizens to create their own ‘what-if’ planning proposals, share them with others, who may in turn modify them, and thus try to reach consensus. Therefore the prototype also contains tools designed to support collaborative dialogue in the course of that modelling, and to draw attention to or to focus on specific planning appraisal issues in the same 3D web based interactive environment. The focus of the tools is on early design stage master

planning. However, the tools may also serve to reduce the costs of creating and updating large area urban models by empowering heterogeneous groups of people to share the tasks of digitising and updating buildings that convey a credible sense of presence. Credibility and presence are related to the degree of verisimilitude that the model affords for judgements that prevail when the built outcomes are encountered.

The VEPS project is focused on easing the task of creating and comparing 3D modelling of what does not exist, within an existing context. Because of this distinction tools are needed that allow modelling to be created in the context of the varying height of the DTM. While it is useful to be able to trace round existing aerial imagery and even to elevate modelling with bitmaps, this is not enough to meet the need. It is important to be able to freely if simply model in context using as referents the shape of the terrain and the form of adjacent buildings structure and landscape to be retained.

These modelling tools should ideally be open source and deploy VRML, X3D and similar emerging open standards. These standards require plug-ins or extensions to current web browsers to operate at present. In examining the available plug-ins those for VRML have been available the longest and are the most developed. Digitisation of new modelling in context requires a particular scripting behaviour of VRML, the touch sensor. This is now described in X3D as the "PointingDeviceSensor" component, of which the touch sensor is a particular ‘node’. "Pointing-device sensors detect user pointing events such as the user clicking on a piece of geometry (i.e., TouchSensor)…. As the user moves the bearing over the TouchSensor node's geometry, the point of intersection (if any) between the bearing and the geometry is determined…. hitPoint_changed events contain the 3D point on the surface of the underlying geometry, given in the TouchSensor node's coordinate system." 25 Although a number of current and emerging browser plug-ins provide either the VRML or X3D functionality all of those tested with the exception of the Cortona VRML plug-in lacked sufficient precision to calculate the accurate location of the cursor in relation to the existing contextual geometry. Thus currently only the Cortona plug-in has been found to adequately enable accurate digitisation for interactive modelling (at VRML 97 single-bit precision). 26 The functionality for the ‘what-if’ modelling toolset is currently written therefore using the Cortona Software Development Kit. Parameters of the user interventions in the pre-created LiDAR and aerial photo context, whether CAD derived models, or digitised in scene, are stored in a PHP database with locational data, thus a simple spatial database. The parameters are read and converted into VRML (or other file formats potentially) when a user invokes the work of another, or retrieves their own previous work. There is thus the potential for spatial analysis and for parameter driven modelling of the type discussed earlier in displaying constraints, although more work is needed to develop the prototype this far.

6.1 3D Modelling, Imagery and Users

This current 3D e-Planner prototype toolset is undergoing user evaluation following the EAR [27] methodology. At present it consists of a DTM with draped

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26 "Precision - VRML97 provides only single-precision floating point values. This is insufficient to represent data on a planetary scale down to around 10 m resolution or beyond. GeoVRML provides solutions to extend this precision and enable sub-millimeter positional accuracies." http://www.geovrml.org/download/1.0/geovrml1_0.pdf
aerial imagery and vector mapping. It has the capacity to provide two zones, an inner neighbourhood where users can interact and model, and an outer contextual zone that is interactively navigable but ‘locked’. Modelling created by one user can be shared with another across the web and viewed in context. The recipient can save the modelling of another and modify and then upload it. Within the interactive modelling zone (which can be an entire neighbourhood or scene) users can both digitise around the aerial imagery or digitise new buildings in context (see Image 2). Tools have been created to enable users to elect to share their modelling with others. Users, whether the originator or other members of the public with whom the originator has shared the modelling, can interactively modify the elevational height of a selected building and adjust the slope or form of its roof. They can also save the digitised building as a VRML (CAD) model then re-insert, move, scale, or rotate it (Image 3).

Users can adjust the colour or transparency of a selected building (Image 4), change them to wireline, or add rectified images (perhaps taken by digital camera or camera-phone) to a single selected elevation or all elevations. There is a presumption therefore that photos of existing and nearby buildings will provide the template elevations for the proposed. It is suggested here that often what is desired by the public is that new buildings should reflect their neighbours, and that this is a presumption implicitly reinforced in the zoned 3D Masterplanning that takes place, particularly in France and Germany. However, this does not preclude the use of scanned or photographed sketch drawings for elevations, which may in fact prove more effective at conveying the ‘uncertainty’ of the proposal and thus encouraging the exploration of alternatives and a free debate. A library of CAD derived VRML components (including complete buildings with bitmap surfaces and groups of buildings as zip files) is in development that can be positioned in the scene, and these can currently be scaled, moved in any axis, and rotated. Consequently proposed buildings derived from CAD and provided by design consultancies or developers can be uploaded and viewed in the same context. Because the DTM has draped imagery the users can in principle digitise 3D building form from the footprint on the aerial photograph, but the aerial photos are more suited to digitising the context, since they show the existing situation rather than the proposed. Hence better tools are desirable to enable proposed sketches to be superimposed on the existing photo. Some exploration has also taken place of how best to show point cloud data in the context of the model for use in more accurately visually checking or digitising heights, but this feature has yet to be implemented.

Within the limitations of the web browser and plug-in (cast shadows are not readily achievable in VRML for example27) it is possible to create scenes that offer a high sense of presence as defined at the start of this paper. The currently developed tools for web based digitisation are not nearly as flexible as those in CAD, so some building forms are not easy to achieve. There is also a need for a compromise between simplicity and ease of use and the provision of more powerful but more complex features. However open source 3D CAD modelling tools exist [28] and effort will be made during the life of this project to look at how to define an interface for the ready integration of data.

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27 In the development of X3D “we are nearing the Grail of absolutely realistic 3D simulation, although we are not yet able to have things such as a shadow following a character” Richard Trigaux of http://www.shedrupling.org in web3d.org message board discussion June 8th 2004. http://www.web3d.org/message_boards/viewtopic.php?t=24

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Image 6 The comments of others can be retrieved with their modelling, clicking on the comment buttons on the right invokes each view in turn, forming the basis of a narrative explanation of the originators point of view.
from such sources. There are also precedents for more sophisticated modelling using web browsers. These include the Virtual Context doctoral thesis work of M.C Stellingwerff (Stellingwerff, 2005)\textsuperscript{28} and VR Sketchpad by Ellen Yi-Luen Do (Yi-Luen, 2001)\textsuperscript{29}. These will be explored to determine the extent to which unskilled users can readily learn and adopt the techniques that they have developed.

Users can comment as they explore the scene, either on their own developing views, or about the work or interventions of others. These comments are stored with the prevailing viewport parameters (Image 5). A sequence of comments may be created and stored with viewpoints, forming a simple captioned narrative (Image 6). Work is proceeding on storing voice comments as well as text with viewpoints, and on easing the task of ordering the viewpoints into a narrative flow. Planning appraisal issues may also be presented synchronously in the form of whiteboard conferencing, (the current implementation in VEPs relies on the commercial conferencing package Marratech). Playback facilities for previous synchronous discussion may be useful as a record of points of agreement, and in this respect require subsequent additional more expansive description for full understanding by others. Similar tools are required to support asynchronous debate. The authors thus suggest that effective, easy to use, to understand and review records of synchronous exchanges of views or tools for asynchronous discussion may need to create an illustrated narrative, and in this respect adopt the readily understood language of film.

**Conclusions**

The project team have argued that replication on the web of existing plan and cartographic-based approaches to planning tend to perpetuate the requirement for trained interpretation, thereby excluding the general public. Effective tools are held to be required for collaborative citizen based examination and development of alternative proposals. This paper has described the basis on which the VEPs project is seeking to establish a new open standard web VR approach to enable citizens to view, analyse, interact with and respond to proposed changes, to collaborate and comment together and pose and test their own alternative solutions. The visualisation also needs to support easy to use upload of citizens own models, and to provide extensive support for shared comment and debate.

It is suggested that user choice from a variety of forms of representation are needed both for narrative description, for expressing certainty or uncertainty, and for drawing attention to or focusing on issues of concern. Just as it is clear that unskilled users are more comfortable with ‘realistic’ images than with drawings, so it is suggested that they are likely to be most comfortable with the language of film, deployed in a familiar way in the medium of VR. Thus the emerging comment / dialogue markup language being developed in the VEPS project may in due course resemble an instruction set for a ‘robot’ cameraman. Finally it is suggested that much more research is required into the area of verisimilitude for which it is suggested that the ‘Occam’s razor’ judgement is whether or not the viewer holds to the same view when they experience the final built result that they formed from the VR based visual representations. It is increasingly important to determine how the model can be effectively simplified to draw attention to, or express a bandwidth of uncertainty, a ‘fuzzy’ template within which alternative outcomes can be displayed, without sacrificing verisimilitude, and so inducing what are later found to have been flawed judgements. Although a prototype has been developed to explore specific aspects of some of the issues and challenges, much more work remains to be done.


This paper has described one approach to reducing the cost of large area urban modelling by empowering heterogeneous groups of people to share the tasks of digitising and updating buildings that convey a credible sense of presence. It recognises the increasing availability of detailed 3D bare earth terrain models, aerial photography and the increasing availability of simple building block data sets. It seeks to find remedies through a public participative process in creating and updating local detailed building data sets, since these often do not exist where they are needed for public participative debate on planning proposals. The generation of 3D urban models containing such detailed building street scenes currently involves high production costs, which limit their use and availability for change updates. The VEPs project aims to provide tools that allow citizens to become more involved in the planning process. It is suggested that one way of achieving this increased participation is by empowering citizens to take responsibility for the editing and updating of their own neighbourhoods in 3D form and proposing their own “what if” scenarios for their future development.

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