

Foundation for Research and Technology – Hellas (FORTH)
Institute of Computer Science

Human - Computer Interaction Laboratory 

Virtual Prints (ViPs): A Novel Interaction Concept for Virtual Environments



ViPs



Virtual and Interactive Environments for Workplaces of the Future
IST-2000-26089 Project



EC- INFORMATION SOCIETY TECHNOLOGIES PROGRAMME





The Virtual Prints Concept

In the real world, every living organism constantly leaves traces of its 'interaction' with(in) the physical environment and evidence of its existence. Deer leave their paw marks on the soft forest soil, dolphins carve foam traces on the surface of the sea, flies leave annoying black spots on windows and young children imprint their handprints on the freshly painted house walls.



In contrast to real environments, Virtual Environments (VEs) do not allow their 'inhabitants' to leave any trace behind and suffer from an 'extreme cleanness syndrome'. Walk into your house after leaving your children alone for the weekend and you may instantly realise that a wild party took place while you were away. Walk into a virtual chat room seconds after a meeting of two hundred people has finished and it will appear exactly as if no-one had ever been there before.

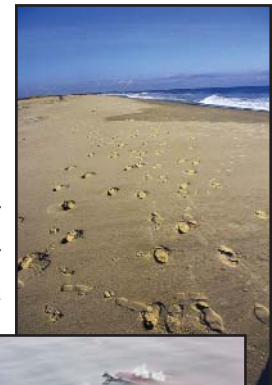


In this context, we introduced the concept of Virtual Prints (ViPs) as the interactive digital counterparts of real-life tracks that people leave behind.



Three different manifestations of ViPs have been suggested:

- Virtual Footprints (FootViPs)
- Virtual Handprints (HandViPs)
- Virtual Fossils (FossilViPs)



Uses of Virtual Prints

ViPs can have a variety of uses in a VE, ranging from supporting navigation, orientation and wayfinding, to training and creation of tutorial sessions, conducting user-based evaluations, etc. Furthermore, as FootViPs and HandViPs are actually a means for recording and visualizing navigation and interaction history respectively, they have the potential to provide several functions and concepts in VEs that are popular, if not standard, in conventional 2D user interfaces, such as shortcuts, bookmarks, undo / redo functions, versioning and collaborative review, as well as marking / identifying (non) visited content. Correspondingly, FossilViPs can be used for content annotation and highlighting, or for offering context-sensitive help.



ViPs can also be effectively used in Augmented Environments. For example, a person using an augmented reality system in a museum can follow ViPs that are related to a specific topic of interest, or those of a virtual guide.

A considerable advantage of ViPs is that they can be used in any VE, in combination with any other existing navigation and wayfinding support approach, since they do not require any alterations of the virtual space and they are not attached to a specific input interface metaphor or device. Furthermore, the fact that ViPs have real-life counterparts with which humans are very familiar renders them an intuitive and easy to use metaphor.



The ViPs Mechanism



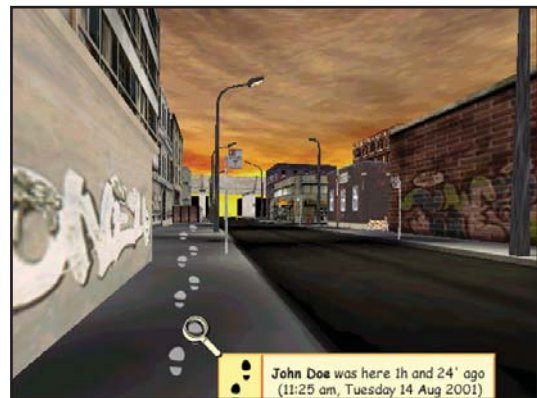
In a VE, the ViPs concept is instantiated and supported through a software mechanism (the ViPs mechanism) that, on the one hand implements all the required functionality for generating, tracking, configuring and handling ViPs, and, on the other hand, provides a user interface for interacting with them. This mechanism allows the user (e.g., through a 3D, or a voice menu) to release ViPs, activate or deactivate the automatic recording of ViPs, search for specific ViPs, and modify the ViPs generation and display configuration.

Each ViP is associated with miscellaneous data, such as its type, owner, creation time and date. This information can be presented to the user in multiple ways, depending on the application and user requirements. For example, it can be visualized through an information sheet triggered by a 'virtual pointing device', e.g. the mouse cursor, or a virtual hand.

While a user is moving in a VE, Virtual Footprints (FootViPs) are left behind. Every time a user interacts with a virtual object, HandViPs are 'imprinted' on it. At the same time, a FootViP, to which the HandViP is attached, is automatically released to record the position and orientation of the user at the moment the interaction took place. FossilViPs can be left on user demand anywhere within the virtual world or be attached to a specific virtual object.

In correspondence to real world marks, ViPs can be personalized, thus helping the participants of a multi-user VE to acquire awareness of the presence of other users in the environment as well as of their activities. ViPs can be represented in various ways, depending on the characteristics of the application and on the user's requirements and preferences.

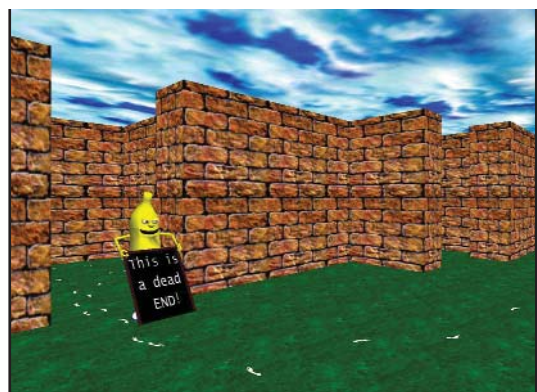
ViPs can be time-sensitive (for example they can fade or change shape as time goes by), thus avoiding visual pollution and helping users distinguish older from new(er) ones, but also keep track of time. ViPs that are related can (upon user request) be connected through connecting lines.



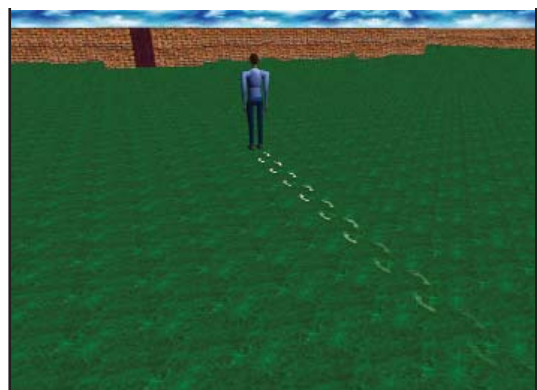
Example of FootViPs



Example of HandViPs



Example of FossilViPs



Example of time-sensitive FootViPs





Pilot tests and Results

In the past few years, ViPs have been presented to several audiences of diverse ages and cultural and educational backgrounds, in occasions ranging from scientific conferences to in-house demos. Interestingly, there are two major observations that occurred each and every time. First, the utility of ViPs was never questioned, and, secondly, almost everybody seemed to have a personal suggestion for a new potential use of ViPs. The latter observation could just be interpreted as a fact illustrating that ViPs can have a rather positive effect on people's imagination, but it might also be an indication that they are a far more powerful concept than what was initially considered.

In addition to the aforementioned informal observations, in the context of the "VIEW of the Future" (IST-2000-26089) project, several formal evaluation sessions employing various methods (expert-based review, co-operative evaluation, user-based studies) have been conducted, on the one hand, to further study the concept in terms of intuitiveness and usefulness and, on the other hand, to assess the software's usability.

In general, the findings of the conducted studies reinforced our hypothesis that ViPs are a powerful concept, while the related software instantiation has proved to be a handy and easy to learn and use tool for navigation, way-finding and annotation. Additionally, these studies support strong evidence that a fully functional ViPs mechanism can significantly increase the usability of VEs. A by-product of our experiments was the formation of a corpus of ViPs-related guidelines covering implementation, visualization and interaction issues.



Co-operative evaluation



User - based evaluation



observation room

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