# Chapter 26
# I–Gate:
## Interperception – Get all the Environments

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## ABSTRACT

*We present in this chapter the I-GATE architecture, a new approach, which includes a set of rules and software architecture, to connect users from different interfaces and devices in the same virtual environment, transparently, even with low capacity of resources. The system detects the user resources and provides transformations on the data in order for its visualization in 3D, 2D and textual-only (1D) interfaces. This allows users from any interface to get a connection in the system using any device and to access and exchange information with other users (including ones with other interface types) in a straightforward way, without need to changing hardware or software. We formalize the problem, including modeling, implementation, and usage of the system, also introducing some applications that we have created and implemented in order to evaluate our proposal. We have used these applications in cell phones, PDAs, Digital Television, and heterogeneous computers, using the same architecture, with success.*

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## INTRODUCTION

New devices with more and more computational power become commercially available in the market every day. Most of these devices are able to connect with many heterogeneous networks. Most connections allow the devices to run multi-user applications. These applications are very important for nowadays communication. The ways of interaction promoted by this kind of application has changed the course of the human communication. The *chat* applications and multi-user *virtual environments* are some examples of this type of application.

Computer networks are the channels that promote the growth of the multi-user systems. One of the first examples of a multi-user system is the MUD (Multi-User Dungeon) [Wolf, 2008] that is a system developed in 1978 by researchers from Essex University [Bartle, 1999]. The MUD is a kind of game that uses textual description for representing rooms, objects, and game characters. It is a merge of role-playing games [Fine, 2002] and chat rooms.

MUD uses a textual visual (output) interface. In the next two decades after the birth of MUD, the visual (output) interface for multi-user virtual environments becomes 2D and 3D, consecutively. The focuses of these applications are games. But, one of the examples with 3D visual interface was developed to be a browser of the Internet: Active Worlds [Ensor, 2003]. At that time the computer networks all converge to the Internet and it becomes the channel that provides the mature of multi-user systems.

Currently, there are virtual environments still with 3D, 2D and textual interfaces for visualization in the Internet. This can be explained by the fact of the visual interfaces with more complex graphics need more hardware and software resources. Not all the users have such requirements. Therefore, these users seek for environments with more simple graphics capabilities.

Virtual environments (or games) with low level capabilities can be useful to run in a less complex computational device. Besides the PC (Personal Computer) other devices with an embedded system [Ganssle, 2007], such as the mobile phones and IDTV (interactive digital television) set-top boxes [O'Brien, 1999] also allow connection with the internet. Put together all of these devices connected in the same network we can create a much more accessible shared virtual environment, by using an adequate version of the virtual environment in each device

The integration and interaction between several different devices characterizes a ubiquitous/pervasive application [Weiser, 1991]. This is only possible by using a middleware [Vinoski, 2004]. This software layer recognizes and interacts with all devices transparently. The main qualities of a middleware for pervasive applications are interoperability, scalability, reuse, adaptability and portability [Niemelä & Vaskivuo, 2004]. Furthermore, other characteristics are applied to pervasive middleware, like spontaneous interaction, context management, transparent interaction to the user and invisibility [da Costa et al., 2005].

The Interperception [Azevedo et al., 2006] defines an approach in order to solve the problem of allowing the creation of shared virtual environments to run in personal computers. The architecture and communication protocol defined by the interperception paradigm allows any user to connect with a virtual environment by three different visual interfaces: 3D, 2D and textual.

In this chapter, we extend the interperception model, getting it to run a shared virtual environment in different visual interfaces and multiple computational devices. This newly proposed approach allows the integration of users connected to the *Internet* in the same environment even if using different client applications. These client programs can be developed in different platforms (programming language) that promote the interoperability of the system.