ARISupport - Interaction Support for Augmented Reality Systems

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Abstract. The communication between user and software is a basic stage in any Interaction System project. In interactive systems, this communication is established by the means of a graphical interface, whose objective is to supply a visual representation of the main entities and functions present in the Virtual Environment. New ways of interacting in computational systems have been minimizing the gap in the relationship between man and computer, and therefore enhancing its usability. The objective of this paper, therefore, is to present a proposal for a non-conventional user interface library called ARISupport, which supplies ARToolKit applications developers with an opportunity to create simple GUI interfaces, and provides some of the functionality used in Augmented Reality systems.

1 Introduction

Nowadays, the high degree of complexity imposed by tasks in different scientific areas is demanding more from man than their natural senses can provide. The interface with the user is constituted by the presentation of information, and it is this interface that asks for and receives data input, controls and commands. Finally it controls the dialog between the presentations and input. An interface defines both the strategies for carrying out the task as well as leads, guides, receptions, warns, assists and answers to the user during interactions [1]. Augmented Reality systems have the objective to make interactions in 3D environments possible, and to stimulate as many human senses as possible in order to connect the user in a way that is as close to reality as possible. However, to provide this connection, it is necessary that the user may be able to visualize, understand and carry out the necessary tasks in the Virtual Environment. In this article, we describe an interaction support for applications for Augmented Reality that provide components for the creation of geometrical forms, interaction tools and the development of the virtual environment. This support permits to developers to create sensitive interfaces by using markers from ARToolKit library [2], besides OpenG1 and GLUT [3] functions.
2 Overview

In section 3 below, we describe the interactions in Augmented Reality, some interaction tasks and some interaction tools. In section 4 the ARToolKit library is presented, and as well as reporting on the use of this library in existing studies. In section 5 we find the support architecture as well as the functionalities provided. In section 6 the application tests using this support are illustrated. The limitations and future work are presented in section 7.

3 Interactions in Augmented Reality

The main requirement for the project of a computational graphical interface is the enhancing of the visualization task, i.e., the means that permits the user to access the system’s contents. An interface may involve a highly interactive 3D control of computational processes, where the user enters the virtual space of applications, visualizes, manipulates and explores the application data in real time, using their senses, particularly the body’s natural movements. To carry out this type of interaction, the user may use non-conventional devices such as visualization by HMD, gloves and others [4].

3.1 Interactions Tasks and Tools

According to Poupyrev [5], interaction tasks parameters are all the factors that influence the user’s performance while he is carrying out an activity. They may classified according to their dependence on:

• **User**: experience, cognitive capability, perception and motor abilities, physical differences and others.
• **Input and output devices**: devices attributes such as freedom, resolution vision field and others.
• **Interaction techniques**: technique metaphors, their suggestions and implementation.
• **Application**: virtual environment configuration, size, form, use of objects, colors, lighting and others.
• **Context**: required precision, the tasks initial and final conditions, reaction to the tasks and others.

The interaction with virtual objects requires ways for the selection of objects, i.e., ways to indicate the interaction aim desired: Logical interfaces specify how the parameters for the environment and their objects may be altered, and physical interfaces, that consists of one or more visual, auditory or tactile equipment. The interaction controls may be [6]:

• **Direct User**: Hand tracking, gesture recognition.
• **Physical**: Joystick, trackball, mouse, gloves.
• **Virtual**: Virtual objects used to control movement.

Physical devices, however, do not always offer a natural mapping that facilitate the interaction task in the virtual world. By visually representing a physical device, any-