Olhar 3D

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Figure 1: *Visitor of the exhibit View in Spaces of Dimension 3 uses the Olhar3D App to interact with multimedia content.*

Abstract

Olhar 3D is part of the mathematical exhibit *"Um Olhar nos Espacos de Dimensao 3"* (A View in Spaces of Dimension 3) shown at MAST - Museu de Astronomia e Ciencias Afins, in Rio de Janeiro. It enhances the visitor's experience with interactive multimedia content and information. The App was developed using the Expo framework that exploits microlocation beacon technology in the context of museum applications.

CR Categories: H.5.4 [Information Interfaces And Presentation]: Hypertext/Hypermedia —Architectures

Keywords: exhibits, mobile, micro-location

1 Introduction

In recent years, developments in networking, computing and related technologies, as well as, advances in software started a deep revolution in our society. More specifically, the emergence of mobile platforms are enabling a plethora of new media with great impact in many applications. In this context, the combination of location and multimedia can be used to create mobile apps for museums, extending traditional exhibits beyond the physical collection. These Apps have the potential to operate radical changes in social education and cultural heritage because they allow personalised interaction with information and media content, while maintaining the sense of presence through a direct relation with the physical space. Here, we describe Olhar3D, an App for the exhibit "Um Olhar nos Espacos de Dimensao 3". (See Figure 1).

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2 The Olhar 3D App

Olhar 3D is the app of the exhibit "A View in Spaces of Dimension 3", shown at the Museum of Astronomy and Related Sciences (MAST) in Rio de Janeiro [Velho et al. 2015].

The nature of three-dimensional spaces is the theme of this exhibit created as part of a project by scientists and artists from Brazil and France. The main goal of the project is to reveal to a general public recent advances in Mathematics, concerning the Poincare' theorem. In 2002, the Russian mathematician Grigori Perelman proved Thurston's Geometrization theorem on the classification of 3-dimensional spaces. As a result, he solved the famous Poincare' Conjecture, one of the Millennium Problems open since 1904.

The exhibition reveals intuitively the above mathematical notions through images, animations and interactive installations, so that the public can glimpse the beauty of the ideas involved. As such, it is divided into distinct parts, including an introduction to the concepts of Geometry and Topology; two interactive installations on 2- and 3-manifolds; the main related theorems; and biographies of mathematicians pioneers in this field.

The App *Olhar 3D* expands the content of the exhibition and makes the user experience more interactive by combining real and virtual content through the mobile device. For this purpose, it exploits three main features: micro-location; wireless communication; and interactive multimedia. Bluetooth Low Energy (BLE) Beacon technology situates the visitor within the exhibit's space. WiFi networking gives access to content streamed from museum servers. Multitouch input coupled with audio-visual output enables natural interaction with the collection.

The design of individual interactions with particular items of the collection relies on Beacon micro-location: as the visitor approaches different areas of the exhibt, actions associated with that content are enabled. Figure 2 shows a schematic flow of the operation.

We designed an implemented the app using the Expo Framework which facilitated enormously the whole process. The framework is described in Section 3.

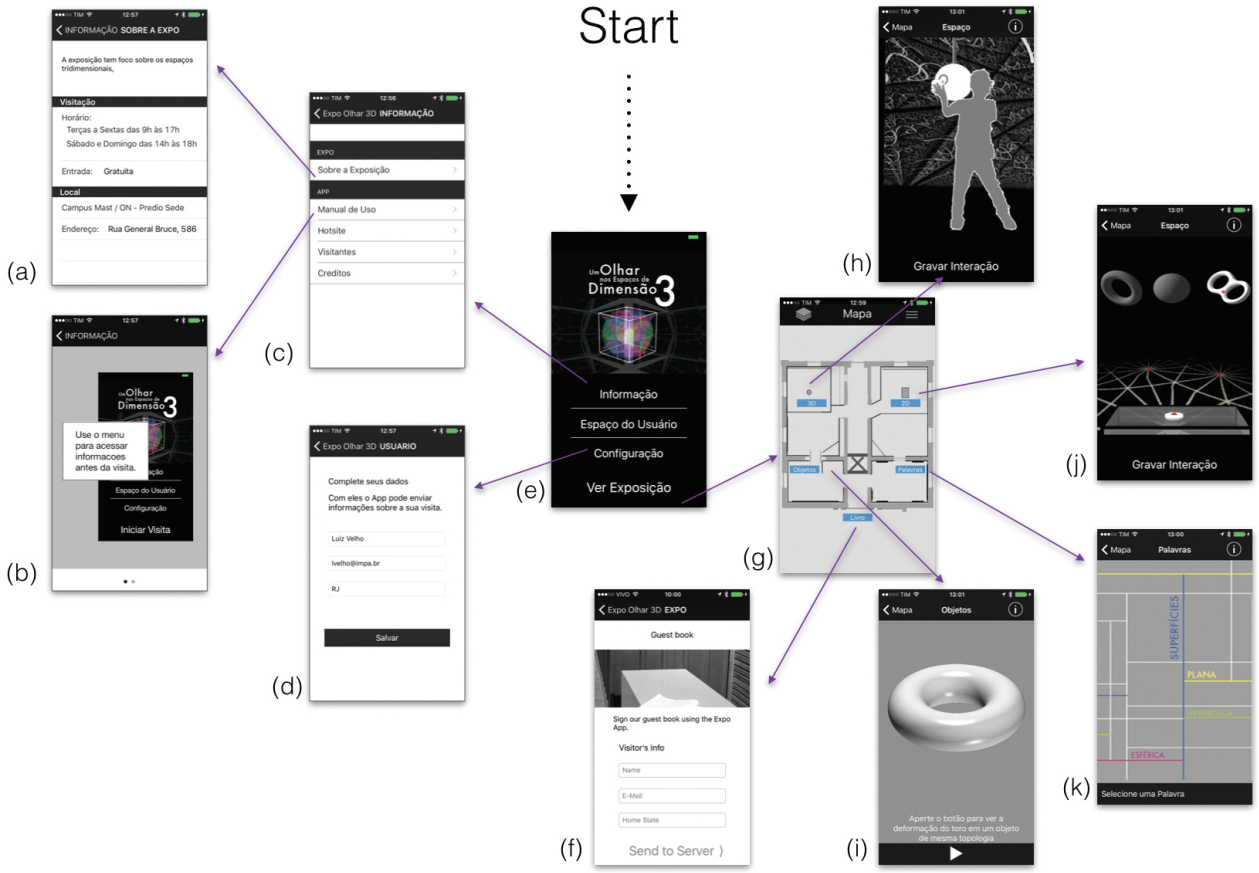

Figure 2: *Main flow of the Olhar 3D App: (a) About the Exhibit; (b) User Manual; (c) Info Menu; (d) User Data; (e) Initial Screen; (f) Guest Book; (g) Exhibit Map; (h) 3D Installation; (i) Objects Display; (j) 2D Installation; (k) Words Pannel;*

3 The Expo Framework

The Expo Framework makes the development of museum's applications more effective by providing an authoring environment taylored to the exhibit's content so that curators and designers could focus on their creative needs. This goal is acheived by providing a flexible structure that uses as a language the visitor's experience, and at the same time, hides unnecessary technological details [Velho 2015] .

The Expo authoring architecture is based on a Finite State Machine (FSM) such that Beacon Events and User Actions trigger changes of state and set the context to specific interactions.

The Framework employs a hierarchical FSM in which the first level corresponds to the main logical flow of a visitor through the exhibit, while the higher levels correspond to interactions with individual areas of the exhibt.

In that respect, the main flow comprises the following states: *outside*; *check-in*; *idle*; *in-spot* and *check-out*. Transitions from outside to check-in and inside to check-out are signaled by Beacon Monitoring events. Transitions from idle to in-spot and vice-versa are controlled by Beacon Ranging. Other transitions are generally derived from user actions. Figure 3 shows the first level of the Expo state machine.

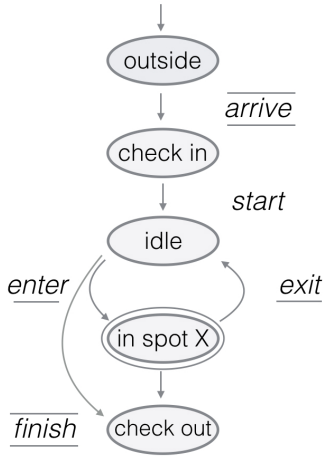

Figure 3: *Expo framework level 1 state machine for exhibit.*

References

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