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efit of the multi-touch technology is the possibility to collaboratively work on a single exhibition. Around a multi-touch table, as shown in Figure 1, authors can jointly discuss ideas and simultaneously position and adjust exhibition artifacts. The project cooperation between JOANNEUM RESEARCH and Fraunhofer Austria got off to a good start with two major enhancements of eXhibition:editor3D, namely the possibility to design virtual exhibitions with a modern gesture input interface and instant visual feedback of the resulting 3D scene. The combination of these two features provides exhibition editors a fast and flexible workflow for efficiently designing virtual exhibitions appropriate for a wide range of cultural heritage themes.

Links:
http://www.exhibition3d.at
http://www.fraunhofer.at/vc
http://www.joanneum.at

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VISITO Tuscany: Landmark Recognition for Cultural Heritage

by Giuseppe Amato, Fabrizio Falchi and Paolo Bolettieri

VISITO Tuscany (VIsual Support to Interactive TOurism in Tuscany) is a research project which investigates techniques for producing an interactive guide, accessible via smartphone, for tourists visiting cities of art. The system applies image analysis and content recognition techniques to recognize photographed monuments. The user just has to take a picture of a tourist landmark to obtain pertinent information on his or her smartphone.

In the last few years, the problem of recognizing landmarks has received growing attention from the research community. As an example, Google presented its approach to building a web-scale landmark recognition engine that was also used to implement the Google Goggles service [3]. VISITO Tuscany [1] also addresses this issue, investigating and developing technologies in order to produce an interactive and customized advanced tour guide service to visit Tuscan cities of art. More specifically, it focuses on offering services to be used:

- During the tour – through the use of new generation mobile devices in order to improve the quality of the experience. The mobile device enables users to get detailed information about the artistic objects they are looking at or about their location. While taking pictures of monuments, places and other close-up objects, the users indicate what appears to them to be most interesting. When a picture is taken it is processed by the system to infer the user's interests and to provide relevant and customized information. For example, if a user takes a picture of the bell tower of Giotto, they can get detailed information (historical, artistic, structural techniques, etc) on this monument.
- Before the tour – to plan the visit in a better way. Information from other users of the system and their experiences , together with information already included in the database system and, more generally, on the web, can be employed by users to better plan their own visit. Interaction will take place through 3D graphic-based techniques.
- After the tour – to keep the memory alive and share it with others. The user can access the pictures taken and the itinerary followed through an interaction based on 3D graphics. Information and experiences can be shared with other users by creating social networks.

Figure 1: Tourist information on a smartphone.

One of the main novelties of VISITO Tuscany, is the possibility of obtaining information about monuments by taking a picture of the tourist landmark with a smartphone. The acquired image is analyzed and the landmark recognized so that the user can obtain relevant information related to the monument.

The landmark recognition system is composed of three main components: a client application that runs on a mobile phone, an image classifier that recognizes landmarks contained in pictures, and a digital library containing descriptions of various monuments. At the moment of writing, we have created recognizers for hundreds of monuments in three cities in Tuscany: Florence, Pisa, and San Gimignano. The mobile application is already available for the Android platform [2] and will be soon available also for iPhone. When the user takes a picture of a monument, the picture is first sent to the classifier that checks if one of the available monuments is recognized. When a monument is recognized, the description is retrieved from the digital library and sent back to the mobile device.

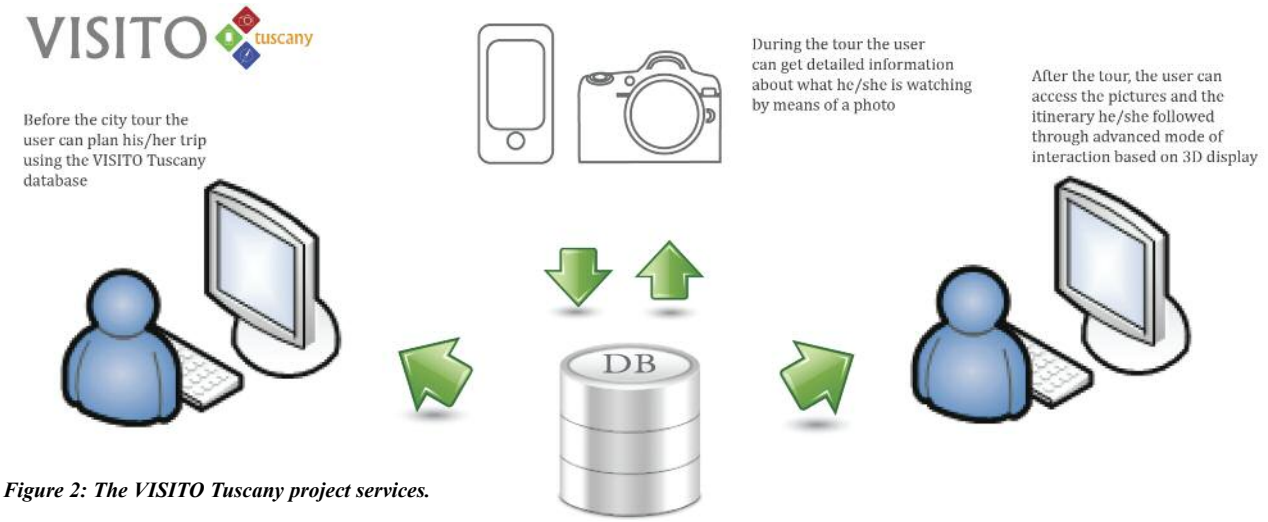

Figure 2: The VISITO Tuscany project services.

Landmark recognition is performed using local features and kNN based classification algorithms. We defined a new approach that relies on a revision of the single label kNN classification algorithm. More specifically, we propose an algorithm that first assigns a label to each local feature of an image query. The label of the image is then assigned on the basis of the labels and confidences assigned to its local features. In other words, our kNN approach is based on the similarity among the local features of the query image and the ones in the training set rather than similarity among whole images.

The VISITO Tuscany project is funded by the Tuscan Region and is coordinated by ISTI-CNR. The consortium includes three ISTI-CNR laboratories (Networked Multimedia Information Systems, Visual Computing and High Performance Computing), the security laboratory of IIT-CNR, and three private companies: Alinari24Ore, Hyperborea, and 3Logic MK. We thank the municipalities of Florence, Pisa, and San Gimignano for providing us with all authorizations to build the demonstrator.

Links:
[1] http://www.visitotuscany.it
[2] https://market.android.com/details?id=it.visitotuscany
[3] http://www.google.com/mobile/goggles

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National Gallery in Prague

by Stanislav Mikeš, Michal Haindl and Radek Holub

Scientists at Institute of Information Theory and Automation (UTIA), Academy of Sciences of the Czech Republic have developed a detailed virtual model of the Department of Modern Art of the National Gallery in Prague. This impressive seven-storey building holds the gallery's collection of contemporary images, drawings and statues as well as several temporary exhibitions. This virtual model serves as a comprehensive 3D information system with navigation support for visitors and as an interactive tool for exhibition designers and curators. Within the comfort of their own home, visitors can experience an animated online thematic visit to their selected works of art and also print a map with a proposed personalized route.

While navigation in real world, ie travelling to a specific target location, often poses a challenging and only partially-understood problem, especially in unknown environment, navigation in a virtual reality (VR) environment is even more difficult due to many missing real world cues. A major problem for users of virtual environments is maintaining knowledge of their location and orientation while they move through the space because perceptual judgements are biased within a virtual environment.

The proposed solution for navigation in this huge gallery building, which has seven exhibition floors and two large exhibition halls in the ground floor, is based on the graph structure. One's actual position in a complex virtual scene is depicted as a highlighted point in an overlaid transparent map of the building floor plan. This basic navigation graph structure is constructed semi-automatically and it is subsequently locally changed by the exhibition editor which places new exhibition panels into the building interior and thus locally changes the navigation route structure. The optimal navigation route is automatically generated using graph algorithms and user defined constraints. For example, we assume that a visitor will never walk closer than half a metre to the walls, will pass through each exit in its centre and larger spaces are covered with walking loops with a minimum diameter of one metre, etc. Each floor plan is than supplemented with a preset route graph structure based on the basic