2013 International Conference on Electronic Engineering and Computer Science

Digital Graffiti – a Smart Information and Collaboration System

Wolfgang Narzt, Gustav Pomberger*

Department of Business Informatics – Software Engineering, Johannes Kepler University of Linz
Altenberger Street 69, A-4040 Linz, Austria.

Abstract

This paper illustrates the development process and the results of a research business informatics project. Inspired by an innovative idea and the objectives for new communications technology, we present the design process with the logical and technical architecture of a software framework "Digital Graffiti" as the technological basis for the development of soft-ware-intensive, mobile, location-based systems. As a result, we describe a prototype implementation of a mobile, smart, information- and collaboration system essential from the perspective of business informatics.

Keywords: Digital Graffiti; Location-Based Service; Information and Collaboration System

1. Classification

   In the course of an earlier research and development project named "INSTAR – Information and Naviga-tion Systems through Augmented Reality", an innovative augmented reality car navigation system has been designed and implemented as a prototype (see Narzt et al. 2003, 2004 [1][2][3][4]) and accredited for patent (EU patent EP1415128B1 and US patent US7039521B2). The published visualization and implementation paradigms that evolved from this project have been picked up in nearly identical form by navigation system producers for implementation of their current and future product versions (see, e.g., [5][6][7]).

* Wolfgang Narzt. Tel.: +43-732-2468-4254; fax: +43-732-2468-4245.
E-mail address: wolfgang.narzt@jku.at

Fig. 1. (a) INSTAR car navigation system; (b and c) Digital Graffiti metaphor

In the course of this research project, the problem arose that in the live image of a camera, objects had to be identified, highlighted and provided with additional information (e.g., a filling station and its current fuel prices when the fuel level sensor drops below a given threshold; see Fig. 1a). It soon became clear that this problem could not be solved with known methods and thus required a new solution. Exploring a solution to this problem led to the idea of virtual sensors to be implemented with an innovative technology that first had to be developed – we call it Digital Graffiti technology, elucidated in the following sections.

The name Digital Graffiti results from an initial thought where users were supposed to perceive hands-free drawn virtual information through an augmented reality display. Although it would have been technically manageable to implement this idea as illustrated in Fig. 1b and 1c utilizing tilt sensors and compasses, we reduced a Digital Graffito to information without expansion but restricted to a geographical point carrying a visibility radius for perception.

2. Idea and Goals

Inspired by the problems identified in the INSTAR project, the idea arose to define a technological platform that enables linking any position in three-dimensional space with one or more information elements of any kind (e.g., text, image, sound, video, hyperlink), providing this pair (geo-position and information element) with a visibility space and a set of recipients, and, when one of the recipients moves into the visibility space, transferring to it in suitable form the information elements associated with the geo-position at the center of the visibility space (for related developments see e.g., Liu et al., 2011 [8] and Ait-Cheik-Bihi et al., 2011 [9], Indulska and Sutton, 2003 [9]). Thus the filling station and the car in the example given above serve both abstractly and in reality as (virtual) sensors that, depending on their relative positions and their states, trigger a (sequence of) action(s). Such a technology platform seemed to be viable for various applications.

So, the major goal was to design a technology platform (in the form of a framework), modeled and implemented as a prototype in order to open previously unavailable and innovative information, navigation and collaboration options that can be used in industry, business and administration to improve business processes, as well as in private domains. In particular, the technology platform and the underlying architecture are to enable depositing information in the form of Digital Graffiti on mobile devices (notebooks, PDAs, mobile phones) at any location in public and private space and consuming such (i.e., linked to the geo-position of the device). Furthermore, the platform is to enable automatic control of electronic actions (e.g., opening a gate, starting or stopping a machine, triggering a measurement or transaction), i.e., without any additional (manual) action, when a given device is in the vicinity of a specially equipped digital graffito (a virtual sensor). A digital graffito is to be provided with access (more precisely, visibility) authorization that relates to a person, a device, a software system, etc. or that results indirectly through the settings of a certain interest profile.