

# Storytelling based Edutainment Applications

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Immersion represents one of the most important factors with regard to the acceptance of human-computer interfaces. Content, which is presented in an exciting and diversified way, is indispensable to bind users to a system. In order to overcome this obstacle, the Digital Storytelling department uses interdisciplinary approaches settled in the fields of multimedia, media design, TV/movie, or literature and myths, and it develops narrative edutainment applications.

Similar to Hollywood productions, content and dramaturgically designed scripts are generated by authoring tools and transmitted by multi-modal interfaces enhanced by natural conversation forms.

This article shows the wide range of Storytelling driven edutainment applications taking into account both technological and application-oriented aspects. Typical examples are e-Commerce applications such as virtual or

physical information kiosks, multi-modal exhibition booths, cultural heritage, or collaborative learning environments. Here, usage of information technology in the domain of arts and culture always seems to be a contradictory approach. The big question is how to apply novel Storytelling technologies for the presentation of cultural and artistic expression on the one hand, and not conflicting with the cultural and artistic spirit of exhibits on the other hand, without overstraining ordinary users such as museum visitors with technical issues on system handling.

## IZA Information Kiosk

With the »IZA – Info zum Anfassen« (tangible information) project, the ZGDV has developed a novel concept to present information in a compelling way while keeping track of intuitive forms of interaction.

## German Abstract

Dieser Beitrag beschreibt anhand von diversen Projektbeispielen die Methoden und Konzepte zum Aufbau von Storytelling basierten Edutainment Anwendungen. Die Grundidee besteht darin, narrative und dramaturgische Ansätze aus den Bereichen Film, Fernsehen, Theater oder Märchen für den Aufbau von narrativen Umgebungen und User Interfaces zu nutzen. Somit können Anwender in eine Story eintauchen und aktiv den Ablauf einer Geschichte/Anwendung beeinflussen und ihre individuelle Lern- und Erlebniswelt schaffen.

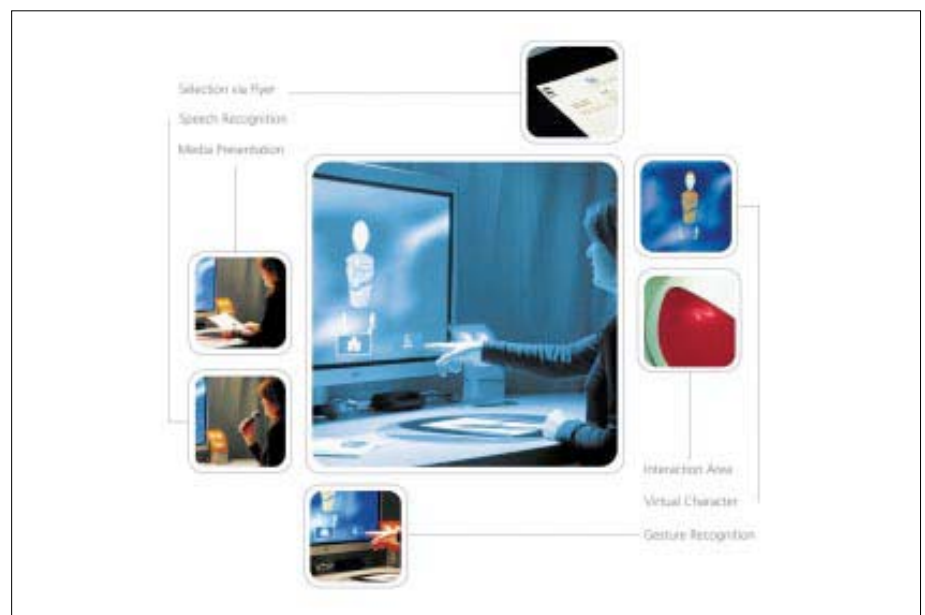


Figure 1: Mixed Reality Platform IZA as ZGDV information kiosk



Figure 2:  
art-E-fact proto-  
type presented on  
the IZA platform

The IZA platform has been used to realize a specialized mixed reality information kiosk system for ZGDV. It serves as an interactive information desk and provides information about the ZGDV and its projects in a proactive manner. Due to its generic architecture, application scenarios range from interactive presentations of artwork in the context of culture and arts to novel forms of point of information and sales systems (POI/POS).

### Art-E-fact Platform

Based on IZA, art-E-fact (EU IST-2001-37924, [www.art-e-fact.org](http://www.art-e-fact.org)) has been set up as a generic platform for the creation of interactive art experience in mixed reality. Similar to IZA, the technologies and concepts of mixed reality and Interactive Storytelling offer completely novel metaphors to interact and navigate in an intuitive way by fusing physical and virtual realities and by integrating multimodal interaction metaphors. Users are emotionally attracted and immersed into the story presented by such environments. The usage of interestingly designed plots and agents that offer conversational skills and an authentic look and feel ensures a convincing experience for the user. In addition, applying story models that adapt sophisticated concepts from movies, literature, games, etc. and using virtual characters with autonomous behavior will also foster this kind of experience.

Art-E-fact addresses especially artists and designers and tries to incorporate their way of creating pieces of art into the platform. Hence, the platform serves as a medium for the presentation of information about art and it offers a new way of creating pieces of art. The artist is enabled to provide information in an exciting way of storytelling and to design the behavior and look of the virtual conversational partners. Moreover, the artist can design and integrate specialized virtual and physical interaction metaphors. Applying mixed reality and interactive storytelling offers new ways to experience, explore and recognize art. As an exemplary application and proof-of-concept, the art-E-fact project implements an artistic exhibit, which demonstrates the system's



Figure 3: Virtual Character Katharina as main character of the GEIST scenario

The basic idea is to involve the user in a natural conversation with the presentation system. This is done in two interlocked ways: one way is to adapt approaches from the scientific domain of interactive, digital storytelling together with intuitive state-of-the-art multimodal interaction schemas; the other way is to correlate the tangible, hence physical, environment with the virtual presentation environment.

The IZA concept has been implemented as a generic platform for mixed reality information kiosk systems. Based on an underlying story model and conversation strategy, users are involved in a story-driven conversation and they interact with the system. Typical examples of story models are company presentations (application domains, projects, contact persons, etc.) or sales talks (products, features, prices, preview, etc.). Other more complex scenarios are game based story models such as a quiz game or rally. From the technical point of view, the user interaction and communication with the system ranges from simple speech acts and dialogues between the users and avatars to pointing gestures or interaction with physical artifacts. In this context, avatars are used both as digital representatives (of a company) and explicit conversational partners, who explain what the system will offer and how to interact with it.

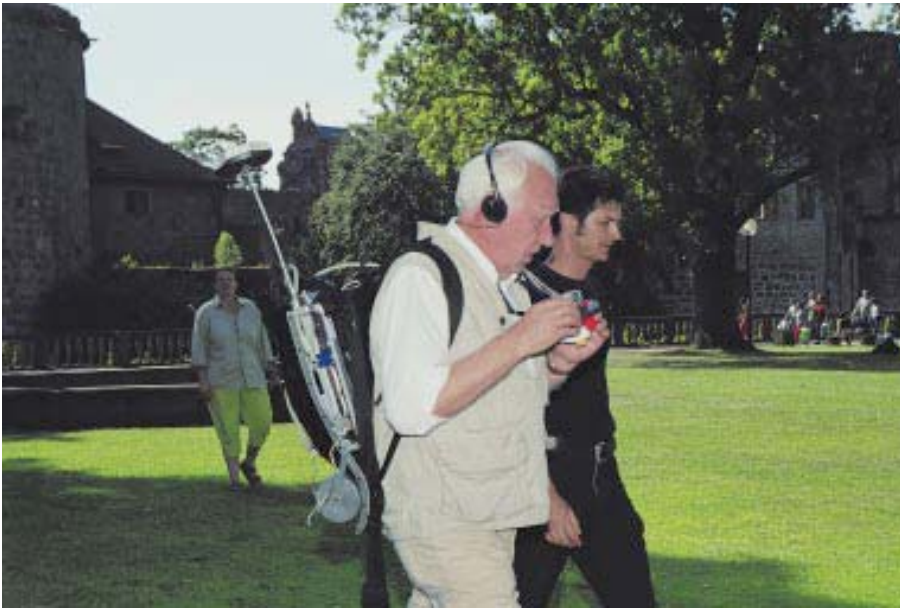


Figure 4: GEIST evaluation with teachers

potential. It features a number of controversially acting virtual characters that present different interpretations of contemporary art and Byzantine icons. Apart from this conversational part, the user is enabled to explore the artworks, which are presented in multifaceted ways, with different kinds of interactions.

### Virtual Human

Concerning the look, appearance and behavior of virtual characters at the end of 2002, the Virtual Human approach (project of the German ministry of science and education, see <http://www.virtual-human.org>) has been set up. The idea of Virtual Human is to bring together specialists settled in the research fields of computer graphics (INI-GraphicsNet with Fraunhofer IGD, ZGDV Darmstadt and TU Darmstadt) and speech technology

(DFKI: German Research Center for Artificial Intelligence) in order to develop methods and concepts for »realistic« anthropomorphic interaction agents. Here, interactive storytelling techniques are primarily used for the Virtual Human run-time environment: A narration engine builds the core of the system and controls the scene and dialogue engine, which are responsible for the creation of interesting conversation among virtual characters or between the user and virtual humans. Apart from the narration engine, ZGDV – based on internal development of a storytelling platform – provides a comprehensive authoring environment for story creation, modeling tool, and rapid prototyping environment. Thus, authors can enter dialogues and configure application scenarios, 3D designers can model virtual humans, or interaction designers can configure the system with regard to appropriate devices and interaction metaphors.

In a first prototype of the Virtual Human platform, an eLearning scenario has been implemented and will be presented to the public at the upcoming Learntec and CeBit exhibitions in February/March 2004. Further application scenarios are currently prepared in the context of interactive TV/quiz shows or augmented sports guides.

### GEIST

Within the GEIST (Engl.: ghost, see <http://www.tourgeist.de>) project, a story engine is conceptualized as control unit for dramaturgy, interactive workflow, and further personalized and application-driven parameters in mobile computer games. From the educational and learning point of view, the main goal of GEIST is to transmit historical information providing mixed reality technology. Users/pupils walk around at historical sites in Heidelberg and they get information presented on head-mounted displays from virtual avatars.

The interactive Digital Storytelling-environment controls the story's cycle while considering user-actions, it keeps the line of suspense, builds up scenes, controls the characters, and sets the possibilities to interact. Several databases providing historical facts



Figure 5: MobiTain Scenario for mobile edutainment applications



Figure 6:  
Mobile Dino Hunter  
application with  
Augmented Reality  
on a Tableaut PC

and fictive story content are therefore tracking-procedures is used to determine the location. The »magic-equipment« enables novel input and output interaction metaphors. It consists of AR-binoculars, Audio-playback-units, and several props. Additionally, the »magic book« provides the possibility to use various GEIST databases directly.

Geist has been evaluated by teachers in June 2003. They were fascinated by the idea of Geist and its possibilities of vivid knowledge transfer by activating numerous senses. Geist may gain the pupils' interest in the historical facts, beginning with the age of 14. The next evaluations with pupils are going to take place in October and November 2003.

### Mobile Edutainment

**MobiTain, EDUTech & DinoHunter**  
Concerning GEIST and its location based services via GPS, MobiTain provides another possibility to enlarge this virtual scenario to Augmented Reality with tracking technology and interaction metaphors. With the help of Augmented Reality, this information regarding, for example, virtual objects as in the Virtual Reality scenario shown before, can be combined with the real surroundings in any kind of (in contrast to GEIST or EDUTech primarily indoor) mobile edutainment applications, for instance in a museum or exhibition fair. Exhibit visitors of

the museum are provided with a mobile end device at the beginning of their visit. They can walk around the artifacts such as sculptures or, in the application context of Dino Hunter, around real skeletons, and they get additional information to this exhibit which is overlaid and displayed on the mobile end device, for example a Tablet PC or a PDA. In the case of Dino Hunter, a real dinosaur skeleton can be overlaid with simple textual information or computer graphics like a virtual skin, organs, or virtual muscles. The surroundings are recorded and augmented with virtual objects via a camera on top of the mobile device. Further on, the dinosaurs' movements are simulated by animated virtual models. To realize this augmented scene, the viewing direction of each user is tracked continuously and in real-time. A storytelling component helps to include a story as a medium to create curiosity and motivation and to convey the teaching material of the museum at the same time.

Realistic types of interaction like the selection, alteration, or recording of a virtual object such as a dinosaur bone could support visitors in a collaborative scene with shared tasks, such as the collective construction of a skeleton, by way of a pen-like instrument or a pointer for 3D interaction. Alternatively, a simple interaction is conceivable like selecting a virtual

object by clicking on its position on the mobile device. All users are tracked in order to adapt information to the user's context. Their position is sent to a central computer and user and situation dependent information is sent back. This aspect is used to submit specific information to a user while standing in front of an exhibit. A localization of a person could be done with different positioning systems like positioning in wireless local area networks (W-LAN), infrared systems, or simply scanning the barcode of an exhibit. Due to the marginal performance of processors utilized in small mobile devices, it is useful to relocate the augmentation to the central computer. The camera image is grabbed by the mobile device and sent to another computer, where the superimposition takes place. The augmented image is subsequently sent back to the mobile end device and there it is visualized.

Further information about the basic concepts and methods of the Dino Hunter approach in general is provided within this topics issue at the report on the m3l workshop and within the experience report of the first fully implemented Dino Hunter project with the Senckenberg Museum and T-Online.

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