Multi-Touch Interaction for 3D Urban Development

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Abstract

Betaville is an ongoing project at University of Applied Sciences Bremen, that aims at providing an online collaboration platform in the field of urban development. Its main purpose is to engage the residents of a city in a collaborative, creative environment, where everyone can express their ideas towards enhancing underdeveloped city areas. By providing a development and communication environment, Betaville aims at narrowing the gap between residents of a city, the administration and potential investors as well as taking advantage of the creative potential of the people. Betaville is focused on reaching its audience through three different, yet integrated platforms: web client, mobile phones and multi-touch table (MTT). The demo presented will feature the MTT.

1 Introduction

Every city is „in beta", i.e. every city is incomplete and under on-going development. For the development of a livable city, the citizens' demands, potential interests of authorities and technical restrictions should be taken into consideration. This requires the active participation of different parties such as city's residents, experts and potential investors in the urban development and decision making process. Starting out from this premise, the *Betaville* project at University of Applied Sciences Bremen aims at providing an online collaboration platform in the field of urban development (Eirund & Teschke 2011). Using state-of-the-art technologies, every member of the community has the chance to participate in a city's on-going development projects online, e.g. by proposing new ideas in the shape of 3D Models, by refining and extending already published proposals or by commenting them. Also the voting process in form of two-proposals-comparison makes it possible to include the users' opinions in the selection process of the most popular proposal, which represents the voice of the community.

The *Betaville* platform consists of three clients: mobile client, multi-touch table and web client. These three client technologies are connected to a server that serves the data storage

and exchange of project and proposal data. More information about each client can be found on the project's website[1]. This paper features *Betaville's* multi-touch table, whose main purpose is to offer its users an environment for collaborative and creative urban development at public places such as the town hall.

2   Multi-Touch Interaction for Urban Development

MTTs offer a large screen where users come together and interact with the system at the same time in an intuitive way. This technology offers therefore the possibility to enhance the face-to-face collaboration of small user groups (cf. Dietz & Leigh 2001, Clifton et al. 2011). The MTT application in *Betaville* is designed to benefit from the collaborative possibilities of interactive tabletops in the field of 3D urban development. In the following, some aspects of the application are described in more detail (for further impressions cf. demo video[2]*).*

2.1   Map View

The multi-touch application displays *Betaville's* active projects on a map by using a shape of the project area, the name, and further selected project data. Every project on this map owns a context menu in which each menu item is visually connected to the respective project. There are two types of menu items: Scalable content items and normal event items. Both types are draggable on the screen. Normal event items guide the users to a new view once they tapped on it. Scalable menu items can in addition be scaled and rotated by the users. The content of such a scalable item is only visible when it is opened.

2.2   Multi-User Management

User activities in *Betaville* like voting and new proposal creation are user-dependent processes. A theoretically unlimited number of users are able to login to the multi-touch application at the same time. This supports the collaborative aspect of this application since it enables multiple users to discuss, modify or vote simultaneously on a proposal. To start a user session, a user token has to be dragged out from a blue area at the bottom right corner of the screen. A logged in user token can be used to vote and to create a new proposal version from an existing one.

2.3   Hierarchical Proposal Browsing

A project in *Betaville* can contain an infinite number of urban proposals, which are saved in a hierarchical tree-like structure. Every child proposal is derived from its parent. The proposal

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[1]   http://betaville.hs-bremen.de/

[2]   http://vimeo.com/41870103

browser of the multi-touch application is designed to visualize the relation between different proposal levels in this tree-like structure. All proposals on the same hierarchical level are displayed in a circle in which each proposal is represented by its 3D models. The currently active level in the hierarchy is displayed in a large circle in the middle of the screen. The child proposals of every circle item are displayed in small sub-circles under their respective parent. The parent proposal is displayed in a medium sized circle above the current main circle.

The visual organization of this interface provides the users at every time with a comprehensible parent-child relation between adjacent hierarchical levels. The users are able to browse through this proposal structure by conducting quite intuitive multi-touch gestures. Animations indicate transitions between the levels of this hierarchy, thus supporting the users' orientation within the proposal hierarchy.

2.4   3D Object Manipulation

In the creation view, the users are able to create a new version of an existing 3D proposal. In addition, photos of the project area that have been uploaded by users using the mobile client of *Betaville* are placed in this 3D environment with respect to the GPS coordinates and orientation of the photographer. This augmented reality feature (Carmigniani, Furht et al. 2011) provides the users with impressions of the proposal's embedding into its real environment without the need to leave the table.

Whenever a user taps on a 3D model its manipulation mode is activated, which decorates the model with a ring and an arrow which enable the user to translate, scale, delete, and rotate the respective 3D model. When a user drags the up-arrow, the model's altitude is changed. When he drags the ring that is placed around the model, the model is rotated (cf. fig. 1).
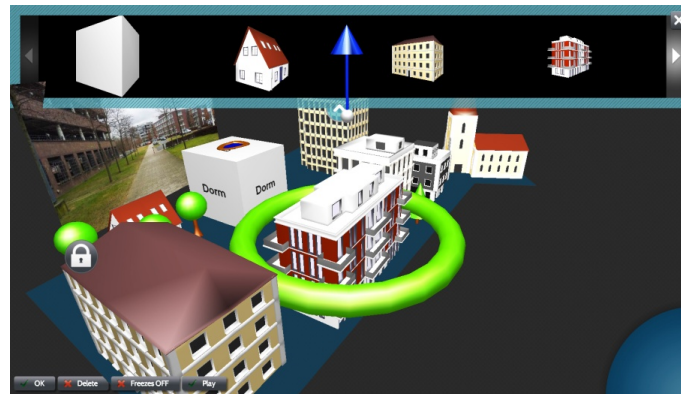

Figure 1: Proposal creation and manipulation

A library of 3D models, which is customizable in *Betaville's* web-client, is displayed on the top of the screen. The users are able to add such 3D models to their new proposal. Once a 3D

model is added from the library, it can be manipulated like all other items in this proposal. The library of every project in *Betaville* contains a "request box" which can be labeled with its' intended functionality and scaled unproportionally. A request box acts as a placeholder for not-yet existing 3D models and can be replaced later using any 3D modeling tool.

Once a user saves a new proposal, the GPS coordinates of these buildings are calculated by the application and saved on the server. Therefore it is possible to watch the proposals that are created on the multi-touch application in the augmented reality (Carmigniani, Furht et al. 2011) view of the mobile client.

3   Conclusion

Betaville offers its participants an intuitive system for enhancing underdeveloped city areas by using state-of-the-art technologies like multi-touch tables, mobile and web technologies. An implemented voting mechanism makes it easy to find the most popular proposal for a certain area in a democratic way.

Betaville's multi-touch client offers the users an intuitive and understandable 3D environment for browsing, creating, and manipulating proposals for any project in *Betaville*. We are convinced that users without any knowledge in 3D modeling will be quickly acquainted with the use of the multi-touch application to express their ideas and hence to integrate their creative potential into the planning phase of city development. The system enhances the collaboration of people and suggests improvements to democratic and transparent urban development.

References

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