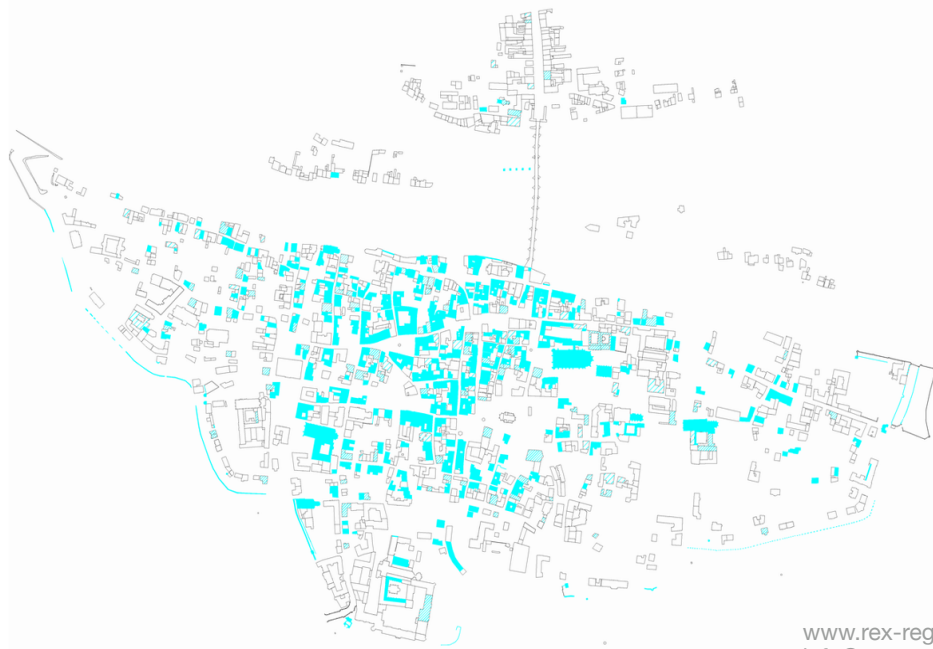


# TIMEWINDOW

**rex**  
Regensburg Experience

dig through time



[www.rex-regensburg.de](http://www.rex-regensburg.de)  
[info@rex-regensburg.de](mailto:info@rex-regensburg.de)

## Summary

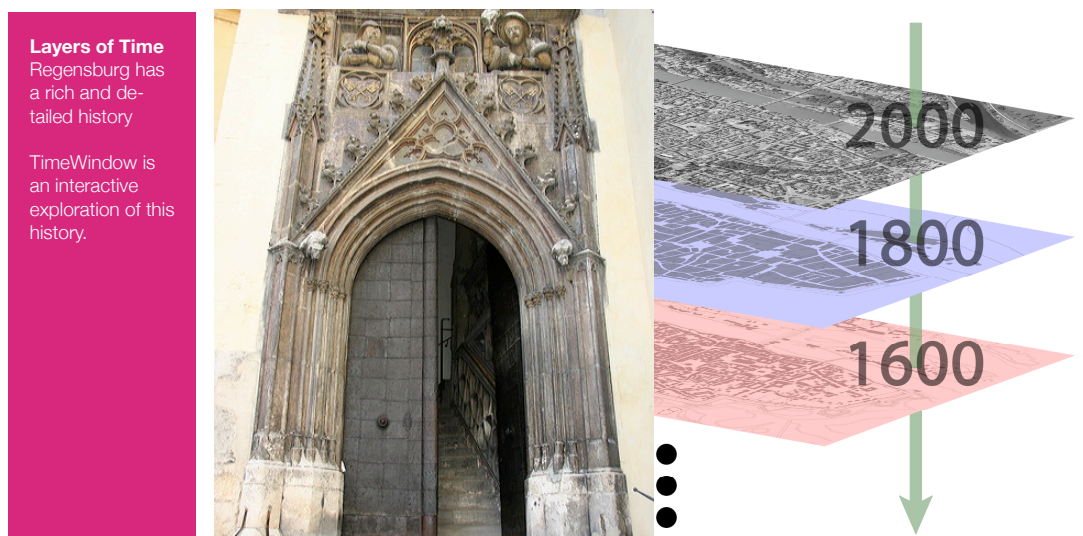
The Regensburg Experience (REX) is a visitor center in Regensburg, Germany. The REX initiative documents the city's rich medieval history. Planned for late 2006, REX will highlight the various aspects of medieval life, from architecture and science to literature and music, in interactive exhibits.

One of these exhibits is TimeWindow, an interactive exploration of Regensburg's urban changes. Participants *dig through time* by manipulating a large touch-sensitive display. Time, as displayed in the bottom corner of this page, is divided into separate layers, like individual frames of a film. As participants touch points on the map, the layers beneath are revealed.

The TimeWindow exhibit debuted in July 2005 as part of the *REX Preview*. The Preview gathered city representatives and citizens of Regensburg. Attendees offered enthusiastic feedback and enjoyed their role as active participants in the discovery of Regensburg's history.

Since then, TimeWindow, has undergone new and exciting changes. Although the underlying concept remains the same, the technology driving the interactions has evolved. Drawing on advancements in the field of Human-Computer Interaction, the exhibit is no longer limited to a single person. TimeWindow, in its current state, consists of a low cost multi-touch tabletop. This exciting technology offers new directions for the TimeWindow exhibit.

In summary, the TimeWindow exhibit is a compelling format to present Regensburg's history. Participants experience a historical narrative in the context of interactive media. This media, supported by emerging technology, is easily shaped around specific themes or festivals. Visitors can explore a new aspect of Regensburg's history each time they return.



## Details

TimeWindow explores the navigation of Regensburg's historical changes within a time-space metaphor. Like individual frames of a film, historical periods are represented as individual layers. The exhibit focuses on the visual exploration of these time layers. The center piece of the exhibit is a large surface that displays the initial map. For the preview, TimeWindow used a touch sensitive SMARTboard, as shown to the right.



### Interaction

The TimeWindow system, displayed here at the REX preview in Regensburg 2005, is a single-person exhibit.

Interaction takes place on a touch sensitive Smart Technology display. Participants gather around the display and take turns exploring the history of Regensburg.

A typical interaction begins with a recent image of Regensburg. When the participant touches this layer, the point of contact changes and reveals a glimpse of the layer beneath. As the participant touches the spot again, more of the next time layer is revealed. During the exploration, this process repeats for all layers.

Hidden at different points, within the layers, are items that elaborate on a particular aspect of Regensburg's history. For exam-

ple, when the participant digs to the 1800 time layer, a small diamond is revealed in the Regensburg market square. When touched, the diamond triggers the introduction of a video clip. Zooming into the center of the screen, the clip offers an explanation of historical fact about significance of the market. When the clip finishes, it zooms out and the participant returns to their exploration through the time layers.

This scenario describes the typical experience of a REX preview participant. After exploring the exhibit, the participants offered useful comments and feedback. In particular, they wanted to explore a unified theme of Regensburg. In the preview, the video clips displayed were an assortment of loosely related historical facts. The participants desired a stronger narrative. Instead of the factual information found in a history book, participants

wanted to hear a story. Given the appropriate theme, this feedback can easily be incorporated into the current TimeWindow exhibit.

In addition, the most frequent request was that of multi-person interaction. This request is to be expected. Whether it's a tabletop or whiteboard, large surfaces are a familiar place for people to work together. The single-touch limitation of the SMARTboard prevented this. The current prototype of TimeWindow has removed this limitation. Participants can gather around the exhibit and explore the history of Regensburg *all at once*. In the following section, we will look at the process and materials that are required to make this happen.



### The REX Preview

Jan discusses TimeWindow with the lord mayor of Regensburg, Hans Schaidinger

**Sensing**

A low cost multi-touch surface can be built using a camera, an acrylic surface, Infrared LEDs, and image processing.

Using the principal of Total Frustrated Internal Reflection, fingertips show up as bright points of light.

For detailed info: [mrl.nyu.edu/~jhan/ftirtouch/](http://mrl.nyu.edu/~jhan/ftirtouch/)



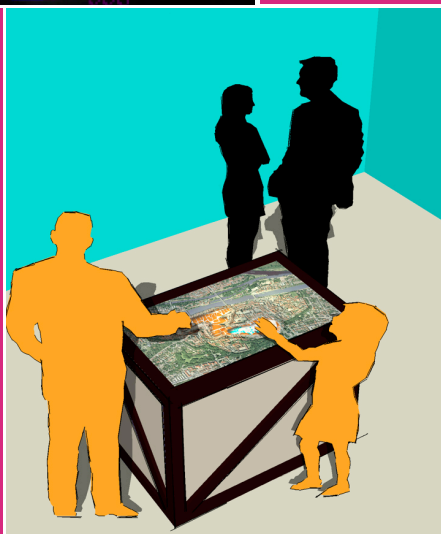
**Processing**

In this image, a hand touches the surface. The thumb is placed on the right hand side of the image. The four fingers are on the left.

The identification number of the finger is white. Blue represents the center and perimeter. Purple represents the total surface area of the touch.

**Rendering**

A sketch of the envisioned TimeWindow exhibit.



**Process**

The central input device of the current TimeWindow exhibit is the multi-touch surface (see bottom image). A camera, fitted with a wide angle lens, is placed below the surface and *senses* each participants fingertips. Each point of contact, captured in the camera frame, shows up as a bright spot. The surface, made of acrylic, is fitted with LEDs along its edges. Typically, this light travels from edge to edge. However, when a finger tip touches the surface, light is scattered around it, causing the bright spots.

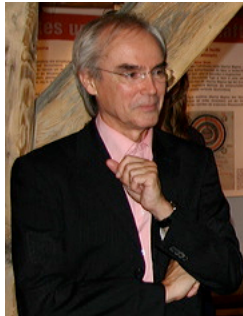
This camera frames, containing the bright spots, are sent to an image processing application, running on a MacBook Pro. The bright spots are extracted from the image and given an identification number. Like the left image shows, each finger has a center point, size, and rotation. This information is then passed to the TimeWindow application.

The TimeWindow application receives the finger information and uses it to visualize the participants dig through the time layers. The output is rendered with a projector, position below the surface. Two mirrors are used to lengthen the projector's path of light and increase the dimensions of the table. Currently, the exhibit comfortably supports up to 3 participants at the same time.

**Materials & Cost**

- Acrylic Surface (€60)
- Camera (€120)
- Wide Angle Lens (€30)
- LEDS (€50)
- Power Supply (€30)
- High Resolution Projector(€950)
- Current Total: €1240

## People



Dr. Julien K. Biere  
jb@rex-regensburg.de

Julien Biere is a communication expert, active in media design, production, training, consulting for over three decades. Julien is the initiator of the REX concept and team-leader for the not-for-profit Regensburg Experience GmbH.



Prof. Dr. Jan Borchers  
borchers@cs.rwth-aachen.de

Jan Borchers is a full professor of computer science and head of the Media Computing Group at RWTH Aachen University. With his research group, he explores the field of human-computer interaction, with a particular interest in new post-desktop interfaces for smart environments, ubiquitous computing, and time-based media such as audio and video. Before joining RWTH, he worked as an assistant professor of computer science at Stanford University for two years, and briefly at ETH Zurich. He received his PhD in computer science from Darmstadt University of Technology in 2002, and is a member of ACM, SIGCHI, BayCHI, and GI.



David Holman, M.Sc.  
holman@cs.rwth-aachen.de

David Holman is PhD candidate in the Media Computing Group, under the supervision of Prof. Jan Borchers. His research interests include ubiquitous computing and merging the boundaries between physical and digital interfaces. In addition to building the multi-touch surface and writing the image processing software, David is supervising the visual design and implementation of the TimeWindow exhibit.



Sarah Mennicken  
sarah-mennicken@rwth-aachen.de

Sarah Mennicken studies computer science at RWTH Aachen university, with a specialization in media informatics. Her major task in the TimeWindow project is the implementation of the TimeWindow exhibit. Taking advantage of her background in architecture, she is also responsible for parts of the conceptual and graphics design of the exhibit.

TimeWindow dig through time

## Comments? Questions?

Thanks for taking the time to explore the TimeWindow project.

We look forward to your thoughts, ideas, and feedback.

For general information about the REX project, you can reach us at [info@rex-regensburg.de](mailto:info@rex-regensburg.de)

For enquires concerning the TimeWindow project, please contact [holman@cs.rwth-aachen.de](mailto:holman@cs.rwth-aachen.de)



**TimeWindow**  
An interactive  
exploration of  
Regensburg's  
history.