

“herbARium”

An interactive augmented book of trees

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Abstract

We present an interactive application of augmented reality. Our “herbARium” is an electronically augmented book of plants. It was inspired by medieval herb books that showed pressed plants and sketches to impart and illustrate knowledge. From this idea we go further using today’s state-of-the-art computational techniques. Instead of flat herbs we show threedimensional trees, growing lively from the book pages. Our application was developed with a university background and is now part of an exhibition of virtual environments in Darmstadt.

Description of “herbARium”

Our “herbARium” is an electronically augmented plant book. With the help of augmented reality techniques trees grow from its pages. Imagine a book that does not differ from those books humans have been used to for hundreds and thousands of years. It contains illustrative sketches and some explaining texts. You can touch it, turn it, turn over its pages. On some pages there are printed special marker patterns. And here is where the “magic” begins. Through a simple webcam a computer — a current consumer workstation or notebook — detects these patterns and projects a simulated growing tree at the position of the pattern in the book. This tree is included in the moving camera images in real time and shown on the computer’s display. Inclining and turning the book you can gather different perspectives of the growing tree.

We have additionally included more interaction that will enrich the explorative character of our application. Another lantern-like marker pattern can be used to indicate the direction of our sun. The tree changes direction and grows toward this virtual light source. Different book pages have different marker patterns and, thus, cause different tree types to grow. Every new page explains another part of our growth algorithm and how the beauty of plants can be described by simple rules in the computer.

Target audience and experience with users

The target audience of our application can be any person of any age — without any computer knowledge. Actually you never touch



a mouse or keyboard. Interaction is done with an ordinary book and lantern. Our “magic” begins with the camera and within the computer and, therefore, need not be noticed by the user at all.

Like this, interaction is really easy, but, of course, there is one drawback. When the printed marker patterns cannot be fully seen within the camera frame, the computer cannot detect them and no tree will be rendered. Users need to be explained that fact.

We first presented our application during the Cybernarium days as part of an exhibition of virtual environments at the Cybernarium in Darmstadt where it is still shown to the visitors. We experienced that especially young children, experts and older visitors were intrigued by these virtual trees. Our goal to evoke fascination both for trees as such and for the underlying technology was successfully achieved.

Developmental background

The idea of interactive augmented plant growth was first created at an arts course held by Markus Lohoff, MA, at the University of Koblenz. Three students of Computational Visualistics, a study that connects computer science and courses from other academic disciplines, developed a first version of “herbARium”. Later when Torsten Fröhlich from Cybernarium in Darmstadt let know they were interested to exhibit this work it was pushed farther in the students’ spare time, always under the guidance of the two mentors.

Some technical bits

The developing process was subdivided into three independent parts that were put together later and refined to fit together. The application mainly consists of finding and locating marker patterns, simulating tree structure and then rendering the growing tree onto the moving camera images. Finding and locating marker patterns is achieved integrating our program with an augmented reality toolkit published by Washington University. The algorithms to simulate tree structure and growth draw upon research in so-called L-Systems and procedural plant models and were adapted to fit the real time and animation needs. The simulated tree model is finally rendered and textured using OpenGL. Textures were created from photographs or were simply drawn by hand which yields some beautiful effects.

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