

Authoring of a Mixed Reality Furniture Assembly Instructor

Jürgen Zauner, Michael Haller, Alexander Brandl
Upper Austria University of Applied Sciences (MTD)

Werner Hartmann
Institute for Applied Knowledge Processing

1 Introduction

This is a common problem that many people have had before: making sense of complicated handbooks, reference manuals or instructions when assembling furniture. But people simply don't have time to bother with instructions. Besides, they are just another unwanted annoyance. [Antifakos et al. 2002] showed a very innovative idea that involved placing multiple sensors onto different parts of the assembly. As a result, the system as a whole could recognize user actions and thus monitor the whole assembly process. Our approach, likewise, uses Mixed Reality technology to solve assembly problems. By using ARToolKit [Kato et al. 1999], we also attach reference markers to the various furniture parts thus allowing a system to determine the point and order of assembly.

2 The Application

In our application, we distinguish two modes, namely, the application mode and the authoring mode (used to create the application).

Application mode: People who need help assembling furniture can currently use an HMD; however, in the future, a Tablet PC with a mounted camera will be more practical. Figures 1 and 2 present an overview of the application. We use a mixture of traditional 2D and 3D technology in combination with Mixed Reality to guide the user through the assembly process.

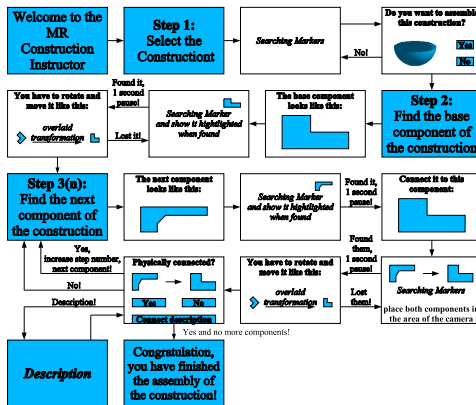


Figure 1: Overview of the Application Mode.

Authoring Mode: The basic logic structure is provided by the application itself. People without any programming skills but experts in their respective field must have an authoring tool that enables them to describe and plan an assembly procedure in Mixed Reality.

The program is based on the AMIRE (Authoring MIXed Reality) [AMIRE 2002] framework which is an EU/IST funded project (IST 2001-34024). Our framework provides a large set of base MR

functionalities and thanks to its component-based and authoring-oriented approach it is very easy to implement MR applications with an authoring mode.

3 Results and future work

Our MR approach guides users step by step through the furniture assembly process in a very intuitive proactive way. A misplaced component of the assembly process, for example is virtually rotated or moved until it fits. The placement of markers on large flat parts is no problem. Furniture, however, also contains parts without a flat surface that is large enough for such markers, for example screws and tubes. Although the occlusion of markers during the assembly process also presents a problem, we have temporarily solved this by using more markers for one component.

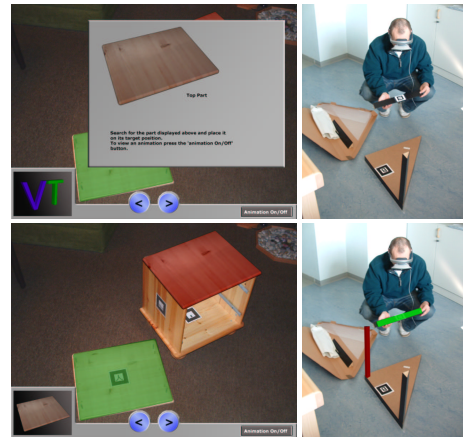


Figure 2: Prototype of the Application Mode.

In future we want to improve the sequential step-by-step instruction process by assembling simple components to more complex components and by using them in a higher level assembly process. Furthermore, we want to show that our MR assembly instructor is also applicable to other application fields like, for instance, assembling large machines.

References

- AMIRE, 2002. <http://www.amire.net>.
- ANTIFAKOS, S., MICHAELLES, F., AND SCHIELE, B. 2002. Proactive Instructions for Furniture Assembly. In *Proceedings of the Fourth International Conference on Ubiquitous Computing (UbiComp 2002)*.
- KATO, H., BILLINGHURST, M., BLANDING, B., AND MAY, R. 1999. ARToolKit. Technical report, Hiroshima City University, December.