

augmented reality for woodworking

Statement

In woodworking, a tactile industry where craftsmen transform raw materials into artifacts, it is important to produce quality products in an efficient manner without compromising safety.

Through the lens of woodcraft, this thesis examines new design principles for augmented reality (AR) to create intuitive experiences in hands-on industries.

Derek Burkhardtsmeier . MDes 2019
Axel Roesler (chair) , Sang-Gyeun Ahn (member)

HOW CAN PROJECTED LIGHT
GIVE INFORMATION
TO A WOODWORKER?

Background

Augmented reality (AR) is part of the Reality-Virtuality Continuum (Milgram). On one end of the continuum is a real environment and on the other a virtual. AR combines each end of the continuum by displaying relevant virtual information directly in the user's physical environment. AR has been in existence since the 1960s, however, today's advanced technology allows for the seamless combination of the digital and physical world. This technology has many unique applications to enhance a user's visual field. Currently, it is being developed for industries such as medicine, construction, flying, maintenance, and marketing; but it has yet to interact with a creative industry like craft.

Primary research

In an attempt to better understand the various ways in which AR can be applied in a tactile environment; I have been spending my time in a wood shop, building a wine cabinet that I designed. I chose a wine cabinet, because while its form is simple, the amount of parts and joints needed, add complexity.

This research methodology has allowed me to interact with the machinery found in a wood shop. For example, the wine cabinet used a jointer, planer, chop saw, table saw, and router. Each machine serves a different purpose and offers a unique opportunity for the application of augmented reality. Through building, I have spent time problem solving, analyzing, and discovering what parts of the process could be enhanced through AR.

Findings

Novice woodworkers will face additional challenges due to their inexperience with the machinery and joints needed to create objects. Woodworking is about problem solving, as a large amount of the time is spent determining how to produce certain cuts, join pieces, or correct mistakes.

As I myself am a novice woodworker, I was highly inefficient during primary research collection, in that I cut materials and joined parts incorrectly while building the wine cabinet. Although frustrating, it validated the assumption that novice woodworkers face additional challenges when working in the wood shop. By focusing on a hands on primary research technique, it allowed me to discover parts of the woodworking process where AR could assist the novice woodworker.

Design opportunities

There is a unique opportunity to utilize AR as a planing and measurement tool during the fabrication of wood furniture to help a novice woodworker improve their craft. This thesis aims to address two design opportunities:

1. Currently, woodworkers rely on audio and tactile feedback when using a dangerous machine like a table saw. Would a projected augmented system provide a user with an additional visual feedback directly in context with the machine?
2. How could a head-mounted AR system help a woodworker inventory their parts and visualize progress? Is there a physical way to interact with a virtual model?

Resources

Aukstakalnis, Steve. Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR. 1 edition.

"Augmented Reality in Architectural Construction, Inspection, and Renovation."

Caudell, T. P., and D. W. Mizell. "Augmented Reality: An Application of Heads-up Display Technology to Manual Manufacturing Processes."

Gibson, James Jerome. The Perception of the Visual World.

Milgram, Paul, Haruo Takemura, Akira Utsumi, and Fumio Kishino. "Augmented Reality: A Class of Displays on the Reality-Virtuality Continuum."

Tang, Arthur, Charles Owen, Frank Blocca, and Weimin Mou. "Comparative Effectiveness of Augmented Reality in Object Assembly."

Contact

Derekb13@uw.edu
www.derekburk.com

