Portable Mixed-Reality: A Programmable Pipeline for Mixed-Reality Development on Tablet PCs

Overview

A key task in software development is prototyping: creating a simplified solution to a known problem in preparation for continued progress. For mixed-reality graphical applications, we make this process quick and intuitive through the use of a programmable pipeline and demonstrate it via several applications using Tablet PCs. By providing a natural transition from design to implementation, we aim to improve ease and efficiency of future mixed-reality software.

Procedure

Application development proceeds as follows:
1.) Developer creates instances of existing modules and optionally creates more modules.
2.) Modules are interconnected and configured via a high-level programming interface.
3.) Specialized modules allow for easy image capture, image processing, and simultaneous real and virtual image rendering.

Components

- High-level programmable pipeline
- Implementation of common tasks for mixed reality development (camera manipulation, flow control, image processing, 3D scene rendering)
- Runtime data-checking

Applications

Figure 1: Rapid Mixed-Reality Application Development

Figure 2: By creating new or using existing modules, developer assembles an execution pipeline.

Figure 3: CheckMate! computer opponent prototype. Chess moves are detected by changes to the board configuration, with computer moves generated in response.

Figure 4: Home Improvement Assistant design screens. Real-world images are used to create simple 3D room models, which are then populated with virtual furniture.

Figure 5: Super Imposer scene creation prototype. Two volunteers spar in a virtual boxing ring by superimposing live footage onto a 3D-rendered scene.

Mixed Reality Project Team
Student: Paul Ardis
PIs: Daniel Aliaga, Dongyan Xu
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