

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.

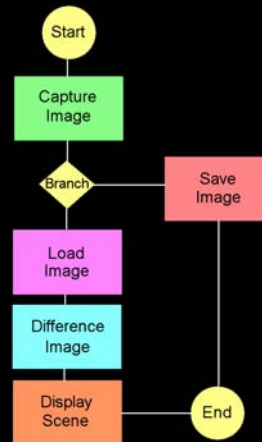


Figure 1: Rapid Mixed-Reality Application Development

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.



```

Pipeline p;
CameraModule camMod;
BranchModule branchMod;
SaveModule saveMod;
LoadModule loadMod;
DifferenceModule diffMod;
SceneModule sceneMod;
:
:
p += camMod;
camMod.branchOnFirst();
camMod.next = &branchMod;
branchMod.branchTrue = &saveMod;
branchMod.branchFalse = &loadMod;
loadMod.next = &diffMod;
diffMod.next = &sceneMod;
:
:
p.run();
    
```

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

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 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
August 2005
Student: Paul Ardis
PIs: Daniel Aliaga, Dongyan Xu
Supported in part by Microsoft Research