MARVIN

a Mobile Automatic Real-time Visual and INertial tracking system for VR

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IVY
The Immersive Virtual environment at York

- 6 sided immersive display (8’x8’x8’)
- Requires accurate knowledge of the users’ head position and orientation (pose) to generate proper views of 3D world
- Requires wireless tracking system
- Commercially available tracking systems require the user to be tethered to base station … this is unacceptable for a fully immersive display!

The Inertial System

- 6 Accelerometers in specific geometric relationship
- Double Integration allows for relative motion estimate
- FAST! >= 1000 Hz
- Problem: error accumulates and estimate drifts away from reality
- Solution: use another absolute pose estimation system to update at slower rate

The Vision System

- Mount Lasers on users’ head so they are not visible by the user
- Camera mounted outside IVY recover laser points on the walls
- Four laser spots permit the recovery of users’ position and orientation
- Simple Projective Geometry relationship allows us to solve for the position and orientation
- Transmit data over 802.11b wireless connection to integrate into pose estimate
- Update at 30 Hz
- Provides absolute pose data
- Error < 4cm per point
- Can refine using Non-linear methods

System Integration

- Use EKF to combine Inertial and Vision pose estimates of user

Current System

- Wearable computer assembled and power source created
- Cameras in place
- Software Infrastructure in place
- Pose Simulation completed
- Inertial device built
- Laser device built
- Tracking Laser Points in image robust and accurate
- Image to Screen linear calibration finished

What’s Next?

- System Integration
- Non-linear calibration
- Inertial calibration