Natural User Interfaces in Mixed Reality Applications and on Mobile Phones

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Traditional Mobile Phone Interface

- The traditional UIs are often cumbersome and very slow to use
- The keypad is too small for many users
- Especially the ‘Navi/Joystick’ -button often misinterprets the direction of the press

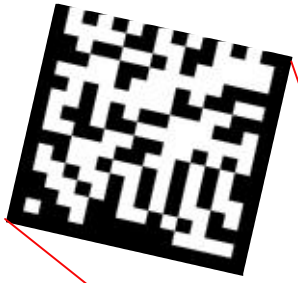
However, mobile phones are widely used devices and thus ideal for many services and applications.

→ There is clear need for better user interfaces.

Pointing User Interface

Children use pointing inherently in all cultures.
Pointing is the most natural way of making selection.

Demo!

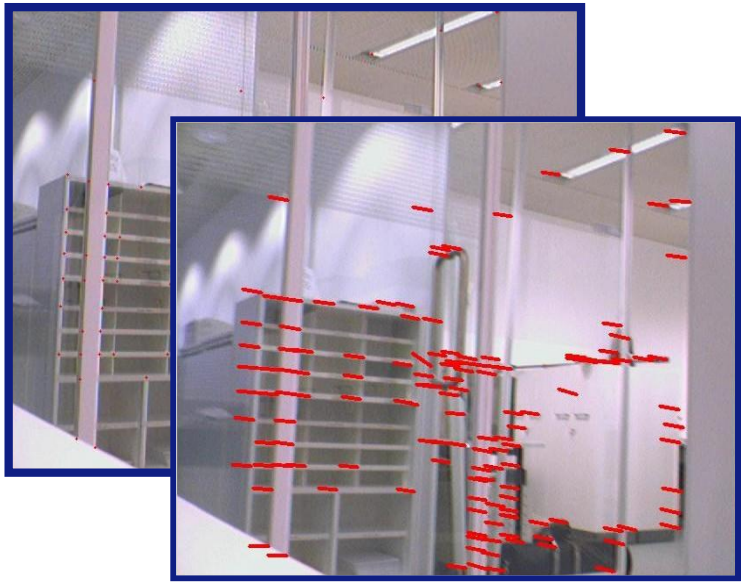


VisualTag

- Detection accuracy: 3-4 pixels/data cell
- 8 fps (= 125ms/frame)
- Rotation free
- Number of data cells: 6x6 – 30x30
- Storage capacity: 8 – 600 bits (= ID -150 digits)
- 255 information types + extension

Video!

Motion detection and Feature Tracking



- Motion detection in 2D
- Light-weight feature/motion detection algorithm for camera phones
- Feature based markerless tracking for general applications
- Motion based UI using phone's camera

PhoneMouse

Demo!

- Use camera phone as PC mouse
- Move the cursor by moving phone in the air
- Phone keys simulating the mouse buttons
- Features: draw mode, scroll, backspace, ...
- Applications: e.g. PowerPoint presentations

Mobile Entertainment - SymBall / Pingis

Virtual table tennis game for camera phones

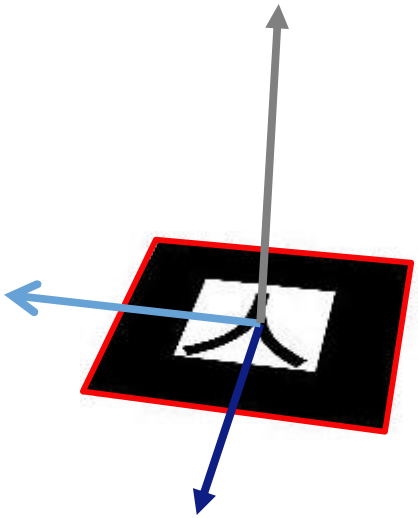
- Use camera phone as racket (no joystick) !
- Camera driven game control by motion detection
- Data connection between players via Bluetooth or GPRS
- First networked camera phone game in the world
- Implementation on Symbian OS/Series 60
- Performance 15-18 fps on Nokia 6600
- Features: sounds, ball speed, racket shape, etc.
- International distribution by Mobile Solutions,

  Italy (www.mobilesolutions.it)

Video!

Demo!

Marker Detection in Augmented Reality Applications



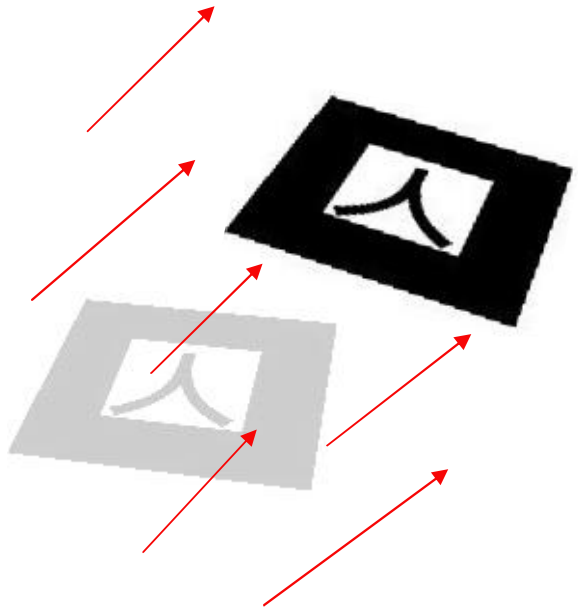
- Camera Pose and Position
- Perspective Matrix
- Transformation Matrix
- etc.
- Intrinsic Camera Parameters

Demo!

ARInterior

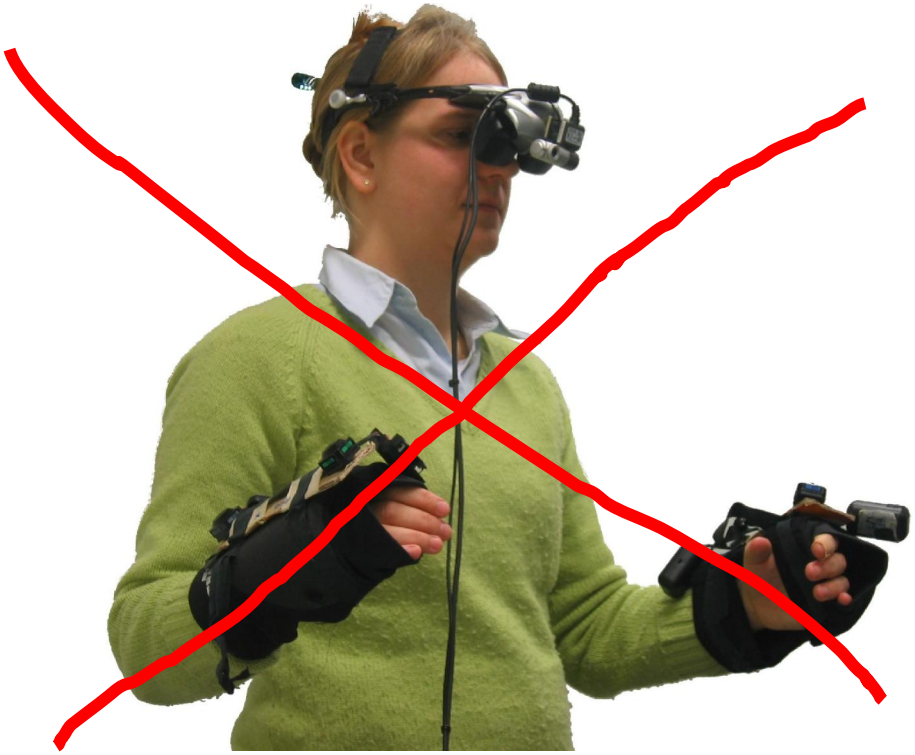
Video!

Hybrid-tracking



- The marker is used for calculating 3D orientation of camera and world
- Then markerless tracking is used for further tracking
- AR-applications are not limited to the view where the marker is visible
- Avoid the typical flickering due to imprecise orientation calculations

Augmented Reality in Consumer Applications



Data glasses, data gloves, etc. are:
- not commonly available
- unfamiliar to the ordinary consumer
- good for immersive applications

Mobile phones, digital cameras, PCs:
- commonly available
- ordinary consumers are familiar with them

Augmented Interior Design - Consumer Solutions

ARInterior

Demo!

Video!

- Single marker placed on floor
- Digital camera images are uploaded to the computer
- Virtual furniture is selected and placed in the desired position
- Features: lighting, shadows, hiding of marker
- Potential also for Internet portal solution

Demo!

ARPhone

- Placing virtual furniture on phone's camera image
- Based on feature tracking - no markers required
- Also, architecture, historical sites, entertainment, ...

Videos:

- **ARInterior**
- **SymBall**
- **ARScaleModel**
- **VisualTag**

Demos:

- **ARInterior**
- **SymBall**
- **VisualTag**
- **ARPhone**
- **PhoneMouse**

Videos and Demos available at:

http://www.vtt.fi/multimedia

Thank You!

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