Imaginary Devices

gesture-based interaction mimicking traditional input devices

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You flew for 5 seconds!
Walking is best with keyboard and mouse
Driving with steering wheel
Flying with joystick
Imaginary Devices
gesture-based interaction mimicking traditional input devices
With Imaginary Devices, the user can choose the input device, simply by forming the posture...
and the input mode instantly switches.
Prototype Implementation
Figure 24: Illustration of the optical tracking setup. The setup consists of ten, red OptiTrack V100:R2 infrared cameras. The white rectangle denotes the area with the most accurate tracking. The white x marks the position for the participant.

The cameras are positioned to observe a central tracking volume of 8 m $^3$ where the user operates the interface. All cameras are connected to a PC and the frame capture of every camera is synced. The cameras are positioned so that each marker is seen by multiple cameras. The markers consist of an infrared reflective material, which reflects the light from the infrared LEDs into the camera lenses. The infrared reflection allows the setup to detect the markers in the tracking volume. Multiple markers are assembled to form a unique pattern of a rigid body. Due to the unique, unsymmetrical nature of the rigid bodies, the setup

7 devices
Related Work
MS Kinect steering wheel games
(1) Turn on a TV

"Push" a power button. 

Bend an index finger.

(2) Turn up the volume

"Turn" right a volume knob.

Turn right a wrist.

(3) Change to next channel

Change to "Next" channel.

Point to right direction.

Ubi-Finger [Tsukada and Yasumura APCHI 02]
Imaginary Phone [Gustafson et al. UIST 11]
(1) Turn on a TV
- "Push" a power button.
- Bend an index finger.

(2) Turn up the volume
- "Turn" right a volume knob.
- Turn right a wrist.

(3) Change to next channel
- Change to "Next" channel.
- Point to right direction.
Several “Imaginary” input devices already exist...
The real benefit of Imaginary Devices comes from switching quickly between them.
User Studies
Study 1
Switching between devices

Study 2
Interaction performance
Study 1: Switching Between Devices
Table 2: Confusion matrix for walk-up condition. The rows represent the actual device. The columns represent the resulting label of the classification. The device names are abbreviated and Uncl. stands for unclassified. Differences to 100% are caused by rounding errors.
Walk-up accuracy per device

- Joystick: 0%
- Gun: 0%
- Touchpad: 0%
- Gamepad: 100%
- Keyboard: 100%
- Wheel: 100%
- Mouse: 100%

Guessability rate

Walk-up accuracy per device
Participants had different ideas of what a joystick was.
Accuracy after demonstration

classification rate

100%

joystick

0%

gun

touchpad

gamepad

keyboard

steering wheel

mouse

Accuracy after demonstration
Study 2: Interaction Performance
2 representative devices (mouse=2D; wheel=1D)
Results

Table 2: Confusion matrix for walk-up condition. The rows represent the actual device. The columns represent the resulting label of the classification. The device names are abbreviated and Uncl. stands for unclassified. Differences to 100% are caused by rounding errors.
Throughput per device

Throughput (bits/sec)

- Imaginary
  - Wheel: 2
  - Mouse: 2

- Physical
  - Wheel: 3
  - Mouse: 4
Conclusion
Gestures easy to form and remember ✓

Sufficient performance ✓

Accurate mobile gesture tracking ?
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