ShadowPuppets: Supporting Collocated Interaction with Mobile Projector Phones Using Hand Shadows

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Idea: Users provide input to a projector phone-based system by casting hand shadows

Motivating ShadowPuppets

Problem: Lack of support for collocated interaction
Pico projectors' large displays can ease the sharing of visual information on mobile phones. Yet existing interaction techniques do not enable bystanders to provide input.

Solution: Shadow gestures as input
With ShadowPuppets, collocated users can provide input to a projected interface by casting shadows. Shadow gestures are detected using a camera and computer vision.

Designing Shadow Gestures

- **Pan Left**
- **Pan Right**
- **Zoom In**
- **Zoom Out**

Supporting multiple perspectives
Goals for performers and observers may conflict. For example, asymmetric panning gestures are more comfortable to perform but more difficult to interpret.

The need for gesture aliases
Aliases can support different usage scenarios (e.g. right or left-handed) or preferences (e.g. direction of motion).

Experiences with a Working Prototype

Owner v. Collaborator
The owner (holding the projector) has greater social control, while a collaborator’s gestures are more comfortable to perform, have finer granularity, and are easier to interpret.

Managing attention
Users are able to maintain awareness of each other while focusing on the shared projected display.

Shadows can disambiguate deictic gestures
“When you’re in a group and just pointing, the perspective is different for different people, but shadows make it much clearer since everyone sees the same shadow.”

The need for finer-grained interactions
Users want more precision (e.g. range and speed of panning and zooming).

Conclusion: ShadowPuppets shows promise for supporting collocated collaboration

Multiple users can provide input to a projected interface, without additional equipment.
The system precludes the need for visual attention to the device, avoiding distraction.
Shadow gestures can be intuitive, supporting interpretability of others’ intentions and actions.