

Lisa G. Cowan  
lgcowan@cs.ucsd.edu

Kevin A. Li  
kevinli@research.att.com

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

### Motivating ShadowPuppets

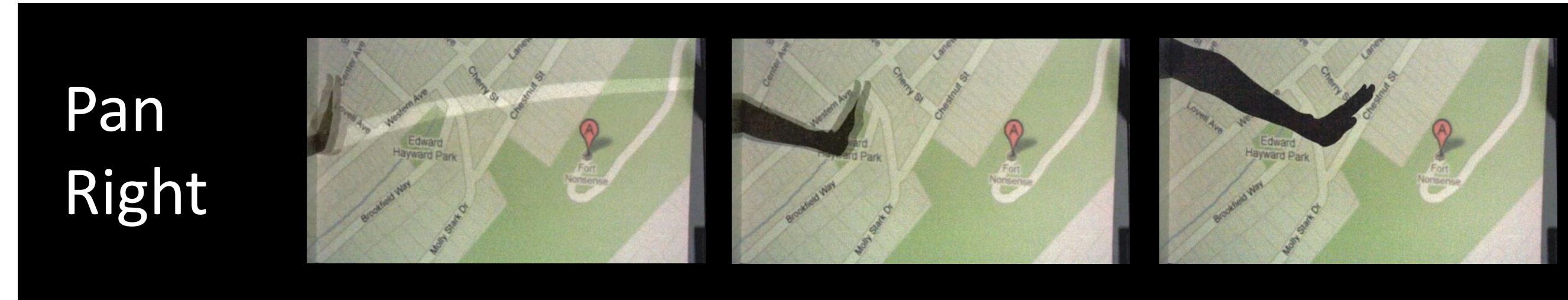
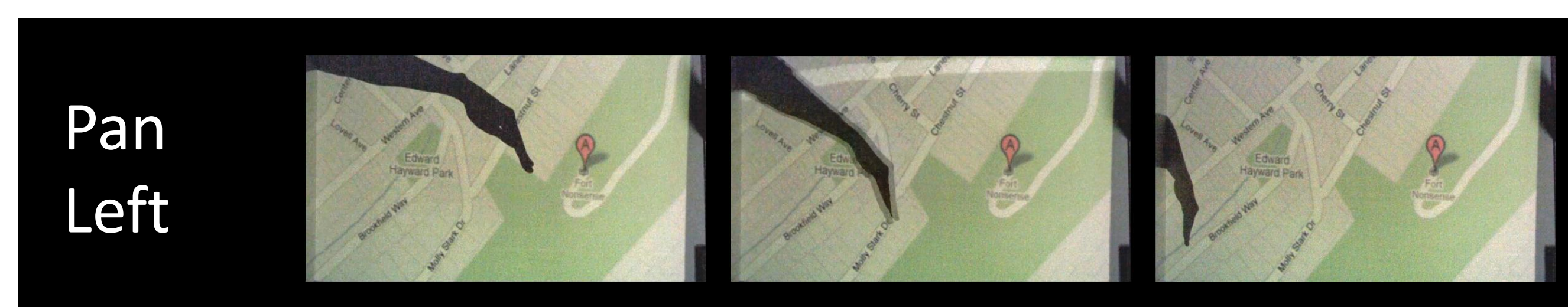
#### Problem: Lack of support for collocated interaction

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



#### Supporting multiple perspectives

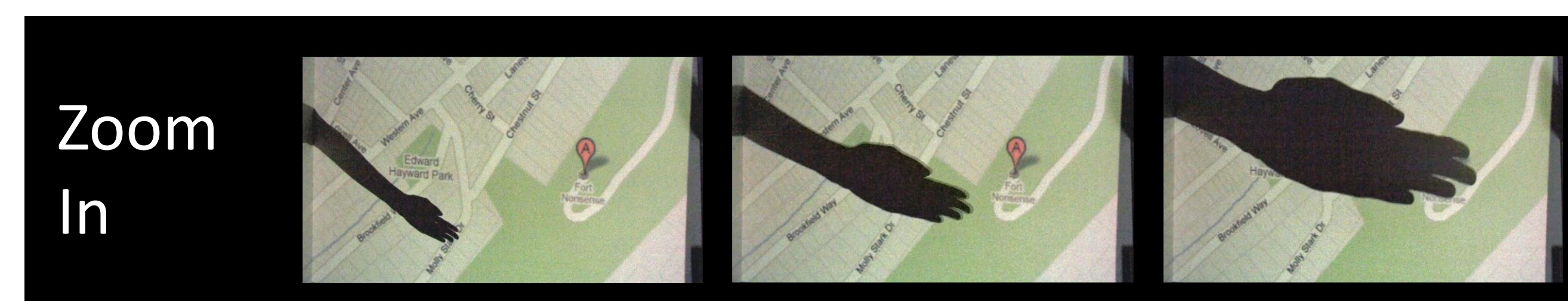
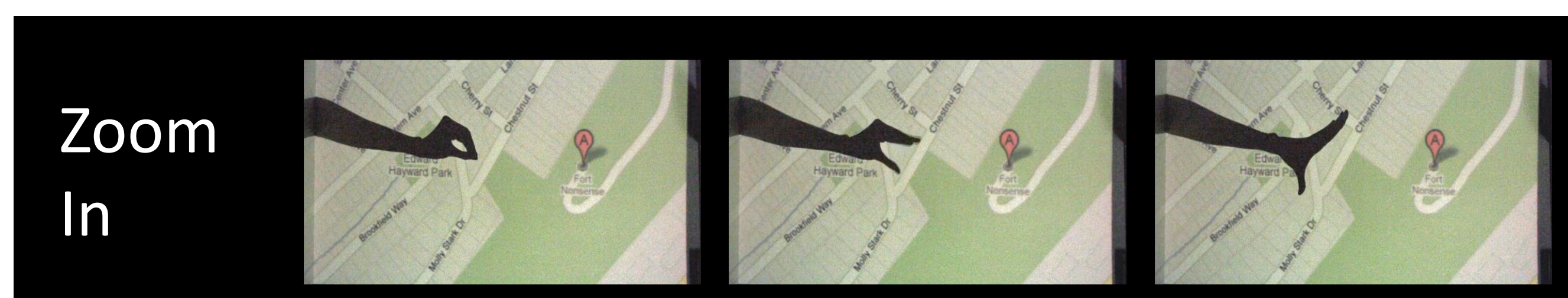
##### Goals for performers and observers may conflict

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).

#### The most popular gestures may not be the best



#### A familiar 2D metaphor: Expand / contract

"Like using a touch screen"

Most users suggested direct translations of familiar 2D gestures. New ways of interacting may not occur to users.

#### 3D: Pull toward / push away from the projector

"Like bringing the map closer to you or pushing it away"

A few users suggested novel 3D gestures, such as pull / push zooming, which most users later found to be intuitive.

### 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.