A Camera-based Pointing Interface for Mobile Devices
Orazio Gallo, Sonia M. Arteaga, and James E. Davis
Department of Computer Engineering, University of California, Santa Cruz.

Motivation
- The choice of the input strategy is becoming the decisive factor for hand-held devices success.
- Solutions requiring dedicated hardware, such as touch-screens, are not applicable to the vast majority of phones currently on the market.
- Cameras are widespread even amongst low-end cellphones.

We propose a system that allows the user to control the pointer’s position by waving a hand in front of the camera.

Method
- Implemented on a Nokia N95 cell phone.
- GUI implemented in Python S60.
- Image processing algorithm implemented using Symbian C++, using only fixed point arithmetic.

Performance
- The viewfinder frame is QVGA, 8bit per channel.
- Algorithm runs at approximately 20 ms on a single viewfinder image (faster than the frame-rate).
- Cluttered backgrounds can be problematic.

User study
- Several subjects were asked to count people with red eyes in a picture that was larger than the screen using two different strategies:
  - Scroll through the image using the cell-phone keys.
  - Scroll through the image by waving their hand in front of the camera.
- We measured the time to complete the task.

Results of the user study
- We used a total of thirteen subjects whose completion time is shown in the graph. The average time to complete the task was:
  - 16.3 s (std 6.1 s) with our method.
  - 23.2 s (std 5.9 s) with the phone’s keys.

Conclusions
- We proposed a novel pointing interface for mobile devices, which exploits the ubiquity of cameras.
- We designed an algorithm capable of tracking a hand in real-time on uncluttered backgrounds.
- We confirmed the effectiveness of the proposed method with a user study.

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