Project history and overview
Intro: 3D UI Origins

Front Light

Reciprocity

Qualcomm
3D UI

Key features
- Peripheral sensors
- Light guide
- Turning features
Intro: imaging appl geom

LC display
Light emitted in the shape of Q
Placed over light guide

*not to scale

Light guide with facets:

Sensor aperture

Linear sensor
1280 detectors – ~60 um/detector
What we did

- Proof of concept demonstration of lensless imaging of an object in close proximity to the light guide
Intro: stylus appl geom

- turned light
- sensors

no addition bezel height above the coverglass surface

- stylus
- light guide
- turning surface
Intro: stylus appl results

Features
• Low cost touch
• Scales well to large area
• Can be put into cover glass/add on
• Optical
Intro: touch geom

Cover glass

Camera

Light scattered

Display/Backlight

IR LEDs
Intro: touch results - see demo

Features
- Low cost touch
- Active/passive stylus
- Scales well to large area
- Can be put into cover glass
- No additional bezel height above cover glass
- Easy to tile

Demo characteristics
- 24” diagonal
- LCD underneath
A Novel Three-Dimensional User Interface Technology
Let’s enable complex, multimodal interactions with mobile displays.
Can we extend the richness of multi-touch to 3 dimensions?
Can we extend the richness of multi-touch to 3 dimensions?
We can track multiple fingers above a smartphone display.
The tracking is fast.

Video of demo running at 60 FPS
Here’s how it works.
The film is transparent.
Illumination
Light collection
The film allows a flat bezel and works on curved displays.
This sensor enables multiple levels of interaction.
Passive and active styluses are detected.

Video of passive stylus
The sensor estimates a depth map of the user’s hand.

Depth maps

Surface  20 mm  40 mm  60 mm  80 mm  100 mm

Distance from the display surface (mm)
Finger-tips are accurately located and tracked.

On surface touch accuracy is similar to projected capacitance touch.
Complex gestures are recognized.

Video of air pinches and rotation gestures
It is scalable to large areas.

Video of low cost, large area touch system
One technology enabling a seamless transition from touch, to complex 3D gestures, to stylus interaction
Thank you

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