Issues, Insights, and Interactions on Touch HMI

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***File Download*: www.walkermobile.com/SID_2014_Seminar_M1.pdf**

Introducing…

Geoff Walker
&
Gary Barrett

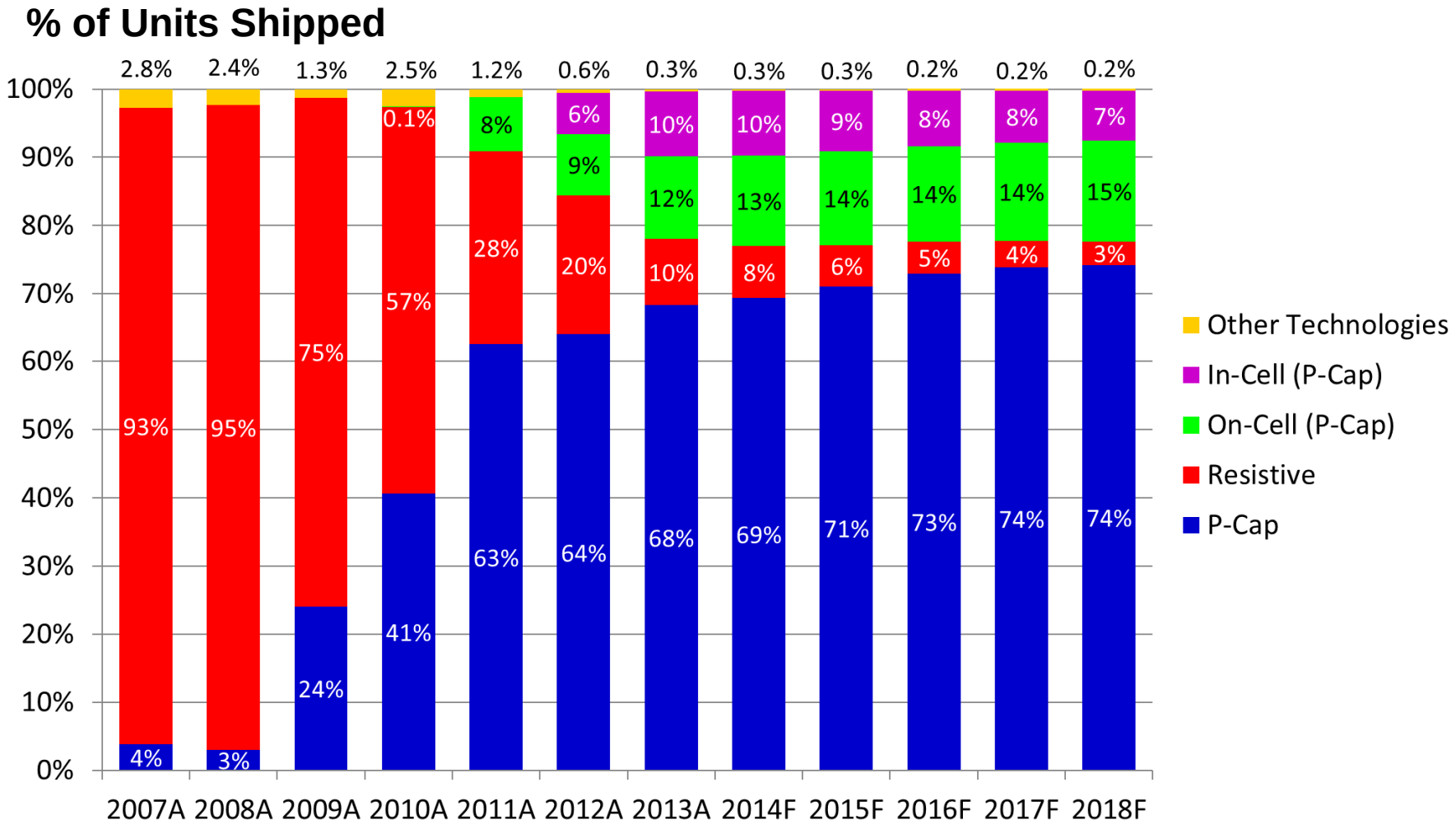
Seminar Concept

- **Two experts in touch-technology addressing 14 current issues in touch**
  - Very topical
  - Fast-paced
  - Interactive
- **This seminar is being recorded for video streaming**
  - The presenters encourage you to purchase access
  - $75 for all 16 Seminars (go to booth in Hall A next to Registration)
- **Our plan is to add content to these slides reflective of the actual discussion some time after the seminar**
  - Go to **www.walkermobile.com/SID_2014_Seminar_M1.pdf**

Topics

- ITO-replacement materials
- Hover
- Stylus
- Touchscreen coatings
- Touchscreen cover-glass
- Touch user-experience
- Touch performance
- Touch middleware
- Commercial touch applications
- Flexible touchscreens & displays
- Future of large-format touch
- Future of embedded touch
- Multiple forms of HMI
- What's after p-cap

Introduction: Touchscreen Market 2007-2018 by Technology (Units)



Source: DisplaySearch Touch-Panel Market Analysis Reports 2008-2014

ITO-Replacement Materials…1 (Background)

❖ Materials

Now

- ✦ Metal mesh (silver & copper)
- ✦ Silver nanowires (AgNW)

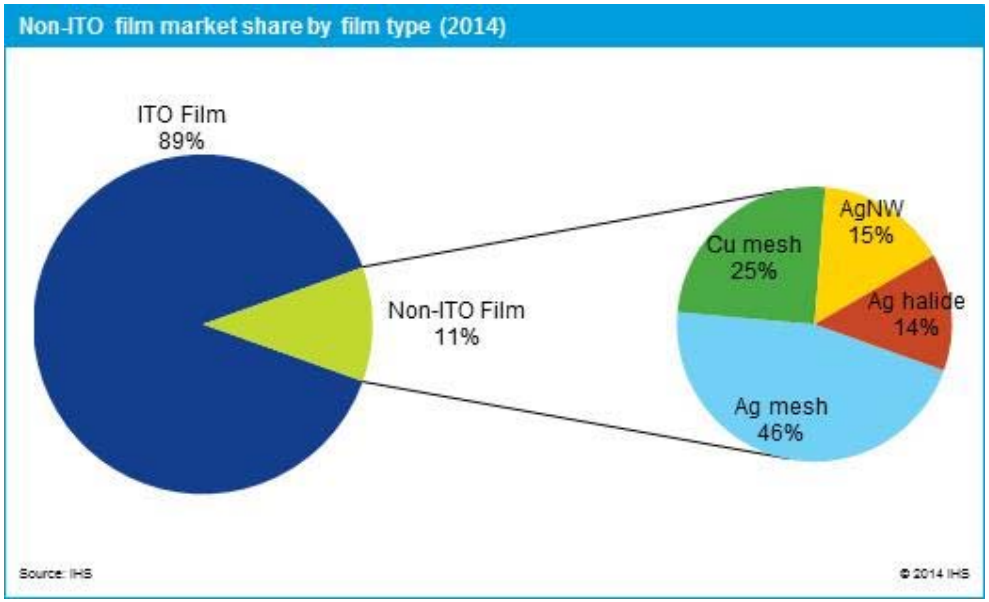
Emerging

- ✦ Carbon nanotubes (CNTs/CNWs)
- ✦ Conductive polymer (PEDOT)

Future

- ✦ Graphene (may never happen)

❖ 2014 market forecast (IHS)



ITO-Replacement Materials…2 Questions

- **Are ITO-replacements having a significant effect on the market today?**
  - If not, why not and when will they?
- **Are ITO replacements cheaper than ITO today?**
- **Will they ever totally replace ITO in touchscreens?**

Hover…1 (Background)

- **Hover defined**
  - Holding your finger (or a passive stylus) < 1 cm above the screen
  - Moving your hovering finger is like rolling a mouse without clicking (“mouseover”); touching the screen is left-clicking

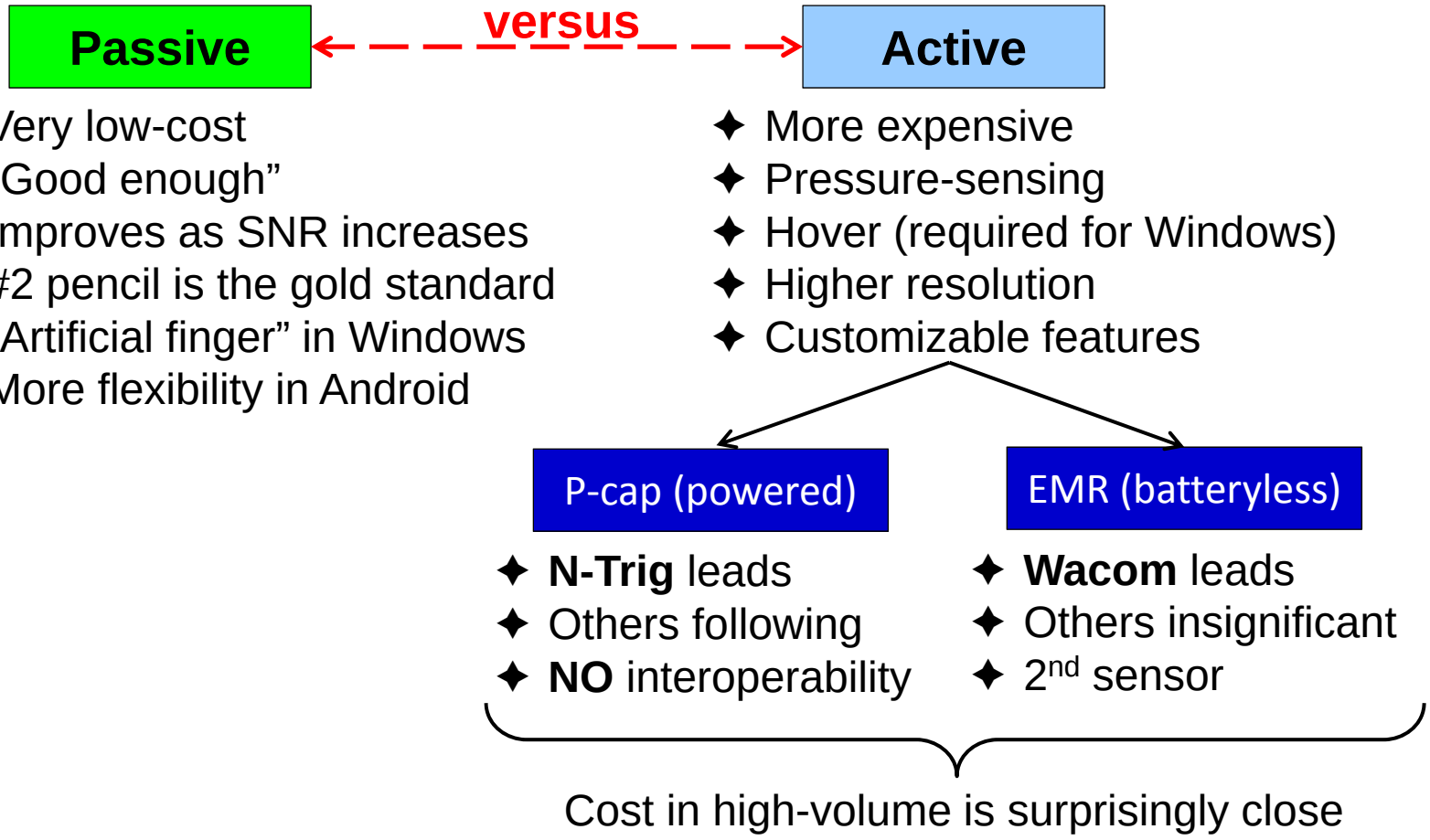
- **What you can you do with hover**
  - Enlarge small links when you hover over them
  - View a link before you click on it
  - Make a passive stylus seem to hover like an active stylus
  - Magnify an onscreen-keyboard key as you approach rather than after you’ve touched it
  - Preview interactive objects such as an array of thumbnails
  - Use it as an alternative to standard proximity detection
  - Use multi-finger gestures for more complex operations… and more

Hover…2 Questions

- **VOTE: Which would you rather do?**
  - Hover above the screen to view choices then touch to select
  - Press lightly to view choices then press harder to select
- **Suppose you had hover AND pressure-sensing in p-cap. What could you do with pressure sensing?**
- **How likely is it that true absolute finger pressure-sensing will ever come to p-cap?**
  - Startups: NextInput, FloatingTouch

Stylus…1 (Background)

- **This battle's been going on since the 1990s…**



Stylus…2 (Usage)

- **Taking notes (in both Windows and Android)**
  - Notes are automatically converted into text in the background; being able to search your “ink” notes is very powerful
  - Support for many languages
- **Annotating documents**
  - Typically Office or PDF
- **Quick sketches**
  - Typical whiteboard-type sketches
- **Precision pointing device, e.g. with Windows 8 Desktop**
  - Selecting tiny UI elements
- **Artistic drawings**
  - It’s amazing what a real artist can do…

Source: N-Trig

Stylus…3 Questions

- **Have we learned to use our fingers so well that a stylus simply isn't going to be necessary in the future?**
  - How does screen size affect the answer?
- **Will the value of any stylus (even a thin, passive, 50¢ one) ever be greater than the nuisance it represents?**
- **Is simultaneous stylus and touch important?**
- **Which stylus technology is going to become mainstream: active, passive, or none?**

Touchscreen Coatings…1 (Background)

- **What's available**
  - Anti-glare (AG): Common, but only in enterprise & commercial
  - Anti-fingerprint /anti-smudge (AF/AS): Much more common now
  - Anti-reflection (AR): Still too expensive
  - Anti-microbial/anti-bacterial (AM/AB): Rare
  - Anti-corruption (Sharpie ink): Rare
  - Anti-stiction (reduces finger-sticking friction): Rare

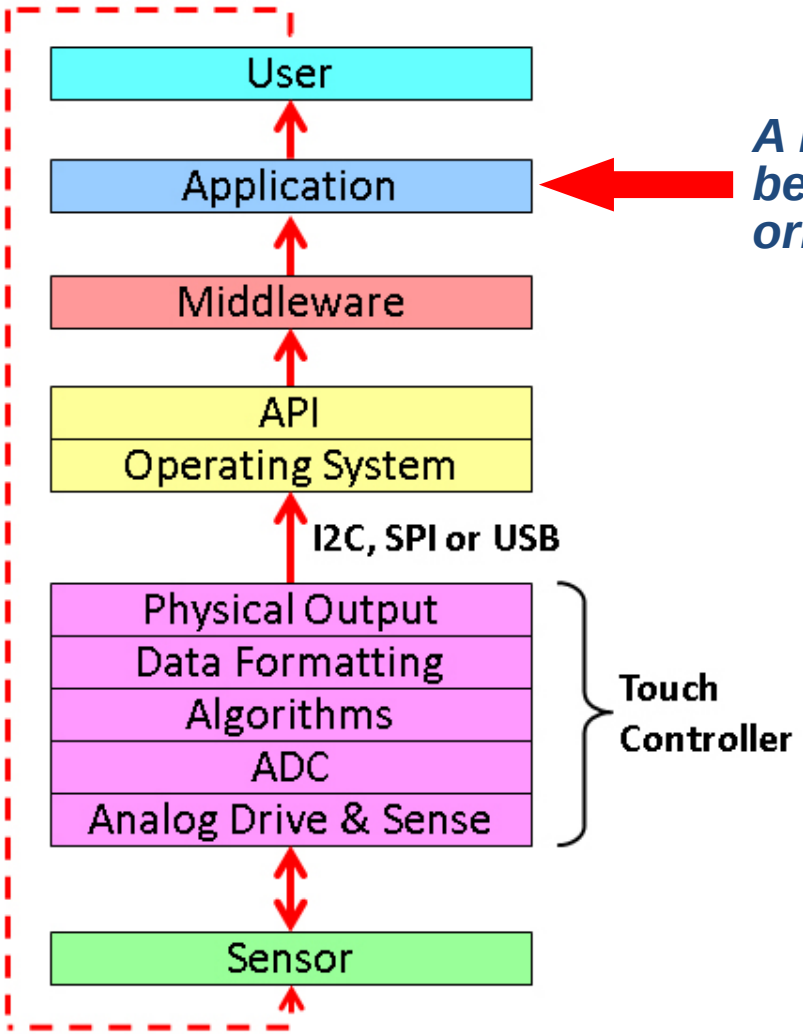
Touchscreen Coatings…2 Questions

- **Will anti-fingerprint coatings ever become a broad market requirement?**
  - Commercial vs. consumer?
- **Will anti-reflection coating ever be low-cost and durable enough for most consumer applications?**
  - Is having to find shade to use a device outdoors “good enough”?
- **Will consumers ever be willing to trade the “pop” of glossy screens for the practicality of anti-glare?**

Cover-Glass ("Lens") Questions

- **Glass has been king for a long time – will PLASTIC cover-glass ever become mainstream?**
  - Why or why not?
  - Why isn't it already here?
- **Will we ever be able to get rid of the cover-glass entirely?**

Touch User-Experience…1 (Background)



A lot of bad touch behavior actually originates here!

You don't believe it?

*Download "**Touch Explorer**" by Synaptics from Google Play and see if you can make your touchscreen fail to respond properly*

Touch User-Experience…2 (Background)

- **What it means when someone says, "*Touch should just work!*"**
  - 99.9%+ of all touches should be recognized (that's 1 in >1,000!)
  - It shouldn't fail to highlight a touched link sometimes
  - It shouldn't stop working when it's near a florescent desk lamp
  - It shouldn't work erratically when you're using a cheap charger
  - It shouldn't work differently on the desk vs. in your hand
  - It shouldn't stop working when the screen gets sweaty or wet
  - It shouldn't stop responding when your thumb is on the edge
  - It shouldn't stop working when your skin is very dry

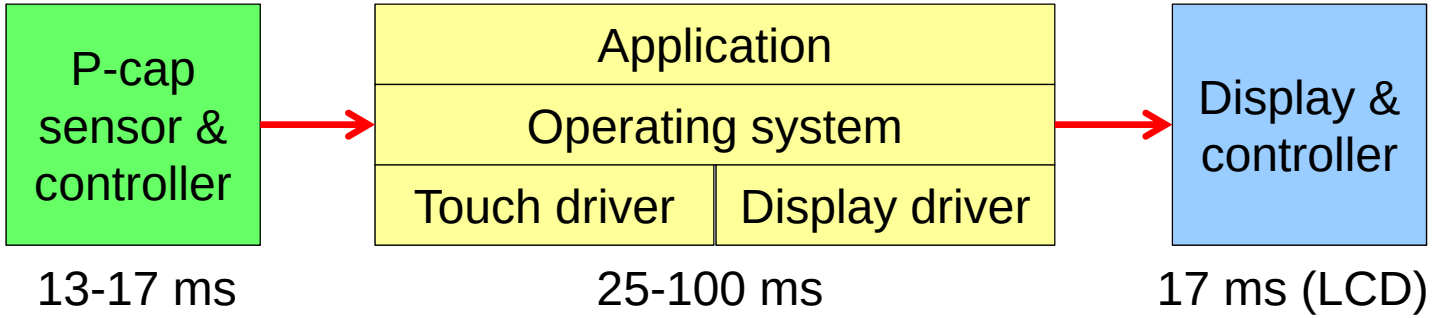
- **Basically, <u>you shouldn't have to think about it</u>; touch should just work everywhere all the time**

Touch User-Experience…3 Questions

- **Are we ever going to get to the point where touch just works?**
- **Some OEMs/ODMs seem to be satisfied with touch that is barely "good enough" – is that OK? If not, how can it be changed?**
  - Does "good enough" vary by device size and application?
- **Microsoft recently relaxed the AiO touch Logo spec so that it only requires 2 (not 5) touches – is that OK?**

Touch Performance…1 (Background)

- **Touch latency: Delay between touch & visual response**
  - Especially a problem in games



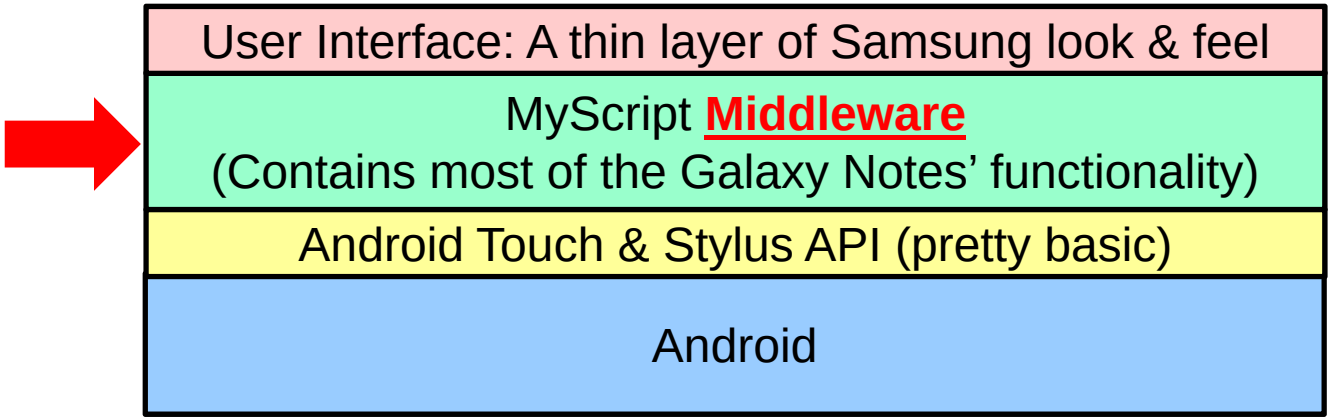
Touch Performance…2 Questions

- **Latency is one important aspect of touch performance; what's being done to improve it?**
  - Startup: Tactual Labs
- **What is "high-performance touch"?**
  - Other than marketing BS, what does it actually mean?
  - What capabilities are missing?

Touch Middleware…1 (Background)

- **Middleware defined**
  - A software layer between the OS touch API and the user interface that (a) adds functionality, and/or (b) makes it easier to write touch applications

- **Best example**



Source: The author

Samsung Galaxy Notes' software stack

Touch Middleware…2
Questions

- **What touch middleware is available today for Windows and Android?**
  - Why isn't there more?

- **VOTE: Which/who do you think has more impact on touch, Windows /Microsoft or Android/Google?**

Commercial Touch Applications…1
Questions

- **Will the extreme industry-focus on consumer touch marginalize commercial touch, or will consumer-touch popularity and capabilities drive a “renaissance” in commercial touch?**

Commercial Touch Applications…2 Questions

- **Which of the major commercial touch applications are most likely to adopt p-cap, and why?**
  - Automotive
  - Healthcare
  - Casino gaming
  - Point-of-information (POI) & digital signage
  - Education & training (“interactive whiteboards”)
  - Self-check-in, ticketing, & ATM
  - Industrial & factory automation
  - Point-of-sale (POS)
  - Military & aerospace

Flexible Displays & Touchscreens…1 (Background)

- **Levels of flexibility defined**
  - Conformable = Can be bent once in a large radius in production
  - Bendable = Can be bent in a large radius by the user
  - Rollable = Can be rolled up in a 5-25 mm radius
  - Foldable = Can be folded in a radius of < 1 mm
- **Flexible displays are shipping now**
  - The Samsung Galaxy Round smartphone uses a flexible OLED built on peel-off polyimide; only the touchscreen is glass
- **Flexible touchscreens have been demoed for a while**
  - Built on Willow glass or polyimide with ITO-replacement (flexible) transparent conductors

Flexible Displays & Touchscreens…2 Questions

- **When will we see working samples of flexible touchscreens and flexible OLED displays combined?**
- **How long will it be until there is at least a "bendable" product with a color display and touch in the market?**
  - Will it be wearable, or something else?
  - What are the main impediments?

Future of Large-Format Touch Questions

- **Is the market for touch on large displays shrinking?**
  - Interactive media walls
  - Point-of-information/wayfinding
  - Digital signage
  - Education & training
  - Horizontal home-gaming tables
  - Other large-format applications?

- **Will metal-mesh p-cap eventually replace all current forms of large-format touch (IR, optical, waveguide, etc.)?**

Future of Embedded Touch…1 (Background)

- **Embedded touch defined**
  - Touch supplied by a display-maker, NOT a touchscreen-maker
- **Embedded touch configurations**
  - On-cell (Samsung, Feb. 2010)
  - Hybrid in-cell/on-cell (Japan Display, May 2012)
  - In-cell (Apple, Sept. 2012)

Future of Embedded Touch…2 Questions

- **How successful is embedded touch today?**
- **Will embedded touch ever be dominant?**
  - In smartphones, tablets, notebooks, all-in-ones, & large displays?
  - If embedded touch becomes dominant, does that mean that the current touchscreen industry going to shrink significantly in the future?
- **Does embedded optical touch have any chance at all?**

Multiple Forms of HMI…1 (Background)

- **In the early 1990s, during the first "pen computing craze", everybody thought that the pen was going to replace the keyboard and mouse. It didn't.**

- **Now we have…**
  - Keyboard (real & virtual)
  - Mouse
  - Trackpad
  - Pointing sticks ("TrackPoint")
  - Touch
  - Stylus (active & passive)
  - Eye-tracking
  - Voice
  - Simple in-air gestures
  - Sophisticated 3D-tracking of in-air hand & body movements

Multiple Forms of HMI…2
Questions

- Will all 10 of these forms of HMI continue to co-exist, or will some replace others?
- Are any of them truly complementary?
- Will there be any interoperability between any of them?

What's After P-Cap…1 (Background)

- **P-cap (in discrete & embedded forms) is forecast[1] to be used in 96% of all touchscreens by 2018**

- **Many p-cap enhancements have been developed but not widely rolled out yet**
  - Hover
  - Touch with a 1.5-2.0 mm-tip passive stylus, a #2 pencil, a ballpoint pen, or long fingernails
  - Touch with gloves (even thick ski gloves)
  - Water resistance (including running water)
  - Charger-interference resistance
  - "Palm"/"Grip" (unintended touch) rejection
  - Active stylus
  - Higher frame rates

1 – DisplaySearch Quarterly Touch-Panel Market Analysis Report, Q1'14

What's After P-Cap…2
Questions

- What are the remaining unmet needs with p-cap?
- Will p-cap ever be replaced by a new technology?

1 – DisplaySearch Quarterly Touch-Panel Market Analysis Report, Q1'14

Audience Questions

(If there's time…)

Thank You!

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