The Evolution of Mobile Technology
Part 6:
“A new paradigm in mobile user interfaces”

December 10, 2009

Moderated by Jim McGregor
Chief Technology Strategist
In-Stat
Introduction

- Welcome to the Evolution of Mobile Technology webinar series, featuring:
  - Designing of High-Performance and All-Day Battery life
  - Design Challenges of Supporting Multiple Connectivity Technologies Architectures
  - The Evolution of Mobile Processing Architectures
  - Breaking Down Challenges in Open Source – Tricks of the Trade
  - The Impact of the Cloud on Mobile Devices
  - A new paradigm in mobile user interfaces (Dec. 10)

- Today’s host:
  
  Jim McGregor, Chief Technology Strategist, In-Stat

- Agenda:
  - 5-minute overview
  - 35-minute discussion by panelists
  - 20-minute live Q&A

- Webinar archives for previous presentations and today’s available at:
  - www.ti.com/wirelesspresentations
  - www.instat.com
Panelists

Fred Cohen, TI
- Director, OMAP wireless ecosystem, wireless business unit
- Identifies, engages and retains TI’s partners in the service and software IP domains; leads a technologically-rich, diverse software ecosystem that works to deliver the best return on investment to the wireless and ASP business units, and provides maximum value for TI’s customers

Ludvig Linge, TAT
- Co-founder, vice president
- Develops TAT business in new directions, looking into future applications for mobile user interfaces; has a strong interest in both human factors and the technology that is needed to make gadgets more exciting and user-friendly

Andrew Hsu, Synaptics
- Technology strategist
- Primary technical contact for Synaptics’ worldwide customers in the handheld space since 1999; led company’s efforts in establishing presence in the mobile handset market, and developed Synaptics’ ClearPad technology
Overview

- Designing to a new paradigm (Jim)
  - How UIs are changing the direction of technology
  - The impact on the consumer & industry

- TI and its partners together deliver exciting UI experiences (Fred)
  - Importance of the ecosystem
  - TI’s role in advancing mobile UIs

- Intelligent sensors: What they look like today and tomorrow (Andrew)
  - Synaptics’ customized interface solutions
  - The evolution of mobile UIs: Today and into the future

- UI innovations that will make an impact in 2010 and 2011 (Ludvig)
  - Features that will be realized with intelligent UIs
  - TAT’s glimpse into the future, provided today
Link to the digital world
Link to the physical world
Bridging the gap
Bridging the gap
The new paradigm

Augmented Reality
Industry impact

- Devices
  - Higher complexity
  - Increasing performance demands
    - Processing
    - Graphics
    - I/O
    - Connectivity
  - SW Stack is critical
    - UI
    - Browser
    - Applications
  - User and application initiated
  - Increased usage

- Services
  - Bandwidth is critical
  - Increased data traffic
  - New opportunities through network intelligence
    - Content aggregation and storage
    - Services
    - Virtual environments
  - Mixed business models
    - Voice
    - Data Messaging
    - Data Access
      - On-line (Nav, social networking, productivity...)
      - Off-line (tracking user info, monitoring information...)
Forecast

2009 Worldwide Mobile Revenues
- Voice: 77%
- Data Messaging: 16%
- Data Access: 7%

Source: In-Stat 12-09

2015 Worldwide Mobile Revenues
- Voice: 49%
- Data Messaging: 22%
- Data Access: 29%

Source: In-Stat 12-09
Innovate. Partner. Succeed. TI and its partners together deliver exciting UI experiences!

Fred Cohen
TI
Mobile devices’ evolution

Calls, SMS, productivity
Mobile devices’ evolution

Technology convergence and device proliferation

Calls, SMS, productivity

Entertainment

Life style

Health

Search

Security

Creativity

Education

Ultra low power

Synaptics

In-Stat

tat

Texas INSTRUMENTS
Key ecosystem component: TI and partners together create the best user experiences

- 300+ software vendors, 50+ service partners
- 15K+ Beagle Boards
- 2K+ Zoom MDPs shipped
- To join TI’s OMAP™ ecosystem, contact Guy Harris (gharris@ti.com)
- beagleboard.org

Your OMAP processor-based projects

300+ software vendors, 50+ service partners
15K+ Beagle Boards
2K+ Zoom MDPs shipped
http://www.omapzoom.org/index.html
beagleboard.org

To join TI’s OMAP™ ecosystem, contact Guy Harris (gharris@ti.com)
OMAP™ processors enable immersive user experiences

- OMAP market momentum
- OMAP performance fuels innovation
- OMAP roadmap secures your investments

Open Development Platforms

OMAP 2 processors  OMAP 3 processors  OMAP 4 platform

Zoom-I  Beagle Board  Zoom-II

OMAP 3 community

OMAP 4 community
Proven partner success: OMAP™ 3 processor-based devices hitting the market

Partners' contributions include: UI, game, imaging, graphics, players, security, codecs, browser, flash, integration and more
Leverage OMAP™ platform to develop exciting user interfaces!

- Powerful CPUs
- Powerful DSP
- 2D and 3D Graphics accelerators
- Support multiple displays, HDMI (OMAP 4 platform)
- Complete platform with sensors and drivers (Zoom board)
- Sensor interface
- Video acceleration
- PicoDLP support (OMAP 4 platform)
- Energy management
- Audio subsystem (OMAP 4 platform)
Me and my device: Game changers in the new UI paradigm

- Open source, Linux, Android, more
- Apps stores
- Social media
- User based content/upload
- Localization
- Projection
- Virtualization
- Mobile TV
- More possibilities to come!

Consumers cite the UI as one of their top criteria for choosing a device, with brand, design, service, content and price. (OEM)

The UI is the window between me and a world of infinite apps (a user)

The UI is a gateway to the Mobile Web. (Carrier)
Versatile and intelligent user interfaces

More unique ways to interact
- Touch the screen: Touch screen controllers
- Touchless gesture in front: Camera(s)
- Read the screen: Multiple displays
- Write on the screen: Wireless pen
- Rotate, Roll, Shake: Sensor array
- Speak and listen: Mic, speakers
- Squeeze the device: Sensors

Phones pick up senses around you and about you

Users don’t want to search, they want to find! And work, play, communicate, share, create, learn…
## More UI innovation

### User experiences

- Multitask and multi displays
- Augmented reality
- Share multimedia experiences
- Interact with a projected image
- Enjoy real 3-dimensional UI display

### Technology Stack

- Multiple display technology
- Augmented reality technology
- Projection technology
- 3D stereo display technology
Intelligent Sensors: What they look like today and tomorrow

Andrew Hsu
Synaptics
Synaptics enables innovation

Industry leader for innovative human interface solutions
> 600M solutions shipped, > 1500 unique designs to market
Industry firsts: TouchPad, ClickWheel, Touchscreens, MultiTouch, Proximity

Marquee customer base in growth markets
Market leadership in Notebooks and Mobile
New deployment in adjacent PC Peripheral and Digital Entertainment markets

Strong core competencies and systems know-how
Founded in 1986 as neural network research company
~ 300 engineers (~ 60% of total headcount), half with advanced degrees
~ 200 patents issued or pending

Synaptics Customized Human Interface Solutions
Advanced User Interfaces  New Usage Models  Sleek Industrial Designs
Current evolution of the mobile UI

<table>
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<th>Early Days</th>
<th>1990s</th>
<th>2000s</th>
<th>2010s</th>
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<td>Nav keys (2 -&gt; 5-way)</td>
<td>Touchscreen -&gt; MultiTouch</td>
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Display-based controls dominate

- Efficiency of space
- Direct manipulation UI
- Contextual UI (application-based)
- Adaptive UI (environment-based)
- Personalization of UI ("skinning")
- Enhanced interaction (gestures)
- Fashion-forward Industrial Design
Challenges of existing touch-only interaction

Operating the device necessitates persistent gaze...

Single-handed operation (especially while on the go) is cumbersome...
Enhancing display-based interaction

- Grip sensing
- Proximity
- Alternative touch input
- Haptics and Visual Feedback
Future directions: Augmenting reality through mobile devices

New bio-sensory input integrates user data into fitness and medical applications:

- Heart rate
- Power
- Temperature
- ...and more
The future

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The future

Existing sensors will evolve and collaborate to enrich the device’s interaction with the user’s environment.

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UI innovations and trends that will make an impact in 2010 and 2011

Ludvig Linge
TAT
UI/UX in mobile moving forward

FEATURES: LIMITED SETS
- text entry
- multimedia content
- GPS
- touch screen
- 3D
- always on connectivity
- Gyros accelerometer
- haptic feedback
- projected UI:s
- Gestures
- voice recognition
- QR codes
- distributed networks
- Augmented reality
- computer vision
- bio
- modularity
- nano

UNLIMITED
INTELLIGENT
Importance of a clear UI/UX vision: Fast sketching and prototyping, low-fi on device
Augmented reality: Visualise the world, in real-time

• Using passive input from GPS, compass and camera feeds
• Digital information is superimposed on images in the real world
• A natural way to “search” things around you e.g. buildings, people and other objects

TAT Concept demo, Augmented ID (http://www.youtube.com/watch?v=tb0pMeg1UN0)
UI projections using pico projectors

• Embedded pico-projectors will provide a whole range of new interaction paradigms beyond simple projection

• The convergence of projector and camera offers the richest interaction

• A projected display will have to adapt to the environment it is shown on

TAT Concept demo, ProjectoUI
(http://www.youtube.com/watch?v=RAJ1SxHCqVc)
Accelerometers and camera motion tracking

Example: For graphics are altered depending on viewing angle

**Intuitive direct manipulation**
- It is natural to tilt an object to change viewpoint

**Clear spatial metaphors**
- A comprehensive way to extend screen space by looking under the edges of the screen

**High information density.**
- With layers in 3D it is possible to look behind objects to access more information. Reduce clutter

**Impressive realism**
- Illusory "trompe l’oeil" effects are beautiful and fun

TAT Concept demo, 3D Eyetracking
([http://www.youtube.com/watch?v=7SlmOlMcMlk](http://www.youtube.com/watch?v=7SlmOlMcMlk))
Delivering attractive UIs using hardware accelerated graphics

*Open*GL *ES 1.x* and 2.0

**Key drivers for GPUs**
- Display evolution
  - High resolutions WVGA/720p/1080p
  - Multiple screens
- Responsiveness and quality
- 3D graphics
- Media acceleration

**Applied to UIs**
- Provides a range of new opportunities to create such more visually compelling UI experiences with 3D, shaders etc.

**Different values of 3D in UIs**
- Visual Style & Feedback (VSF). The WOW factor - a stylistic element
- Flexible Information Visualization (FIV). 3D UIs can be used to create more extensive overviews and exploit various navigational metaphors.
- Naturalized Interaction (NI). Build on human understanding of space and physical materiality of objects
Delivering the future of mobile UIs

- TAT technology in 350 million devices/200+ different models
- In 10% of all mobile phones in 2009
- In more than 20% of all touch phones
Summary

- Designing solutions for the personal experience
  - User: connectivity between the physical and digital world
  - Carrier: device & service differentiation

- Requirements: a complete solution & ecosystem
  - Processing & graphics performance
  - Interconnect technology
  - Software solutions
  - Intelligent information

- Requirement: multimodal integration for advanced functionality

- Result: UIs will enable and increase the number of future devices
Q & A

- To participate, click on the Ask a Question link on the left side of the interface; enter your question in the box on the screen; hit “Submit.” We’ll answer them during the Q&A session or after the webcast.

www.ti.com/wirelesspresentations
community.ti.com/blogs/mobilemomentum
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