Automotive Voice: A Long Road, Much Progress with the End in Sight?

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Topics

Let’s put Voice in context, our beginnings
Megatrends driving HMI development
And the best Auto HMI is..”the envelope please”
Multimodal HMI Design
Voice technology defining the Auto HMI
The End Game - Challenges and Strategies
Voice in Context, A long Road

Automotive Voice - A Brief History

① Elec. Voice Alert on Chrysler K cars in the mid-1980s
② Voice synthesis of turn instructions on navigation systems in the late 1990s
③ Jaguar S-Type world’s first voice-activated audio and climate control system in 1999
④ Honda Accord navigation with voice in 2003
⑤ Ford SYNC introduces voice for hands-free and media access to the mass market in 2007
⑥ Apple with SIRI introduces conversational voice to the mass market in 2010
⑦ Message dictation on BMW Connected Drive in 2012
⑧ SIRI on Chevy Sonic in 2013
MegaTrends to Consider

- Urbanization with a focus on safety and enjoyment while riding

- Active safety features usher in the unparalleled safety. But, driver distraction is intractable with increasing legislation

- Connectivity and cloud-based features dominate, but the market is segmented

- Voice is now complimented by new input modalities – gesture, HUDs, multi-touchscreens and touch pads (handwriting)

Automotive excellence was defined by styling and powertrain attributes. Tomorrow the driving experience will have the highest levels of safety, enjoyment and efficiency.

The user interface now becomes the car’s key design attribute!
HMI on the Main Street

When will HMI Technologies hit Main Street? - Significant Growth in Input Modalities

<table>
<thead>
<tr>
<th>Technology</th>
<th>Next 2 years</th>
<th>Within 2-5 years</th>
<th>Within 5-10 years</th>
<th>10 years+</th>
<th>Never</th>
<th>I don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Center stack touch screen</td>
<td>46%</td>
<td>33%</td>
<td>12%</td>
<td>3%</td>
<td>0%</td>
<td>6%</td>
</tr>
<tr>
<td>Natural language recognition for selection and control</td>
<td>33%</td>
<td>36%</td>
<td>20%</td>
<td>5%</td>
<td>2%</td>
<td>3%</td>
</tr>
<tr>
<td>Capacitive switches</td>
<td>27%</td>
<td>32%</td>
<td>16%</td>
<td>1%</td>
<td>2%</td>
<td>22%</td>
</tr>
<tr>
<td>Steering wheel touch pad</td>
<td>15%</td>
<td>36%</td>
<td>16%</td>
<td>8%</td>
<td>8%</td>
<td>17%</td>
</tr>
<tr>
<td>Natural language recognition for complex data entry (e.g. Speech to text)</td>
<td>18%</td>
<td>35%</td>
<td>34%</td>
<td>5%</td>
<td>5%</td>
<td>3%</td>
</tr>
<tr>
<td>Hand Writing Recognition</td>
<td>17%</td>
<td>24%</td>
<td>31%</td>
<td>6%</td>
<td>22%</td>
<td>11%</td>
</tr>
<tr>
<td>Gesture recognition</td>
<td>9%</td>
<td>35%</td>
<td>7%</td>
<td>10%</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Face recognition</td>
<td>31%</td>
<td>31%</td>
<td>31%</td>
<td>31%</td>
<td>31%</td>
<td>31%</td>
</tr>
<tr>
<td>Thought control (emotive</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
<td>3%</td>
</tr>
</tbody>
</table>

Source: Telematics Update survey, 2012 (responses = 97)

Do we design the Auto interface around voice ...or rather use voice tactically for complex functionality, such as connected services??
## HMI Design Decisions

### System level
- Multimodal
- Master Controller

### Component level
- Cluster Displays
- Center stack display
- Instrument cluster
- Touch Pad

### Technology level
- Projection Technologies
- Handwriting recognition
- Control panel surfaces
- Laser light sources
- Speech recognition
- Capacitive Switches
- OLED Displays
- LCD Displays
- Handwriting recognizer
- Connectivity

### Increasing Integration
- Touch Screen w/Voice
- Navigation/Audio
- Separate displays/Switches
- Center stack module
- Contact analog HUD / HUD
- Software platform
- Steering wheel switches
- Haptics controller
Best-in Class HMIs

“BMW’s iDrive the slickest and clearest interface .. its closest competition Audi’s MMI”

MultiModial HMIs

Percentage (%)

0% 5% 10% 15% 20% 25% 30%

BMW iDrive 25% Audi MMI 16% Mercedes Command2 13% Ford Sync 11% Cadillac Cue 10% Lexus Entunes 7% Other 6%

Jaguar Land Rover 3% Renault R-Link 3% Nissan (Altima, Leaf) 2% Lincoln 2% Hyundai ASIA 1%

NB Multiple responses were allowed, so data show percentage of total number of responses.
MultiModal – Combine Input Modalities
Complimentary or Redundant

Multimodal HMIs using a “central data” model allows the user to combine input modalities, such as voice, based on user preferences or as the driving situation dictates.

Dumas et al 2009
MultiModal Design is an Integration Challenge
Keys to Exceptional Usability

- Conduct Drive Alongs to Discover User Needs
- Develop Experiential Theme
- Model Design in Multimodal Environment
- Generate Code for Reference Hardware
- Test In-Vehicle Usability
- Tweak Model Where Required
- Generate Code for Production Hardware
- Validate System Integration
- Congratulate the Team

Slide compliments of altia
PHOTO CREDIT:
http://shutto.wordpress.com/2010/11/20/user-centered-design-the-key-to-a-usable-website/
Voice is Best for Most

NA and Europe CAGR of about 16%

China CAGR of 32%

Voice based HMIs will show significant growth. Provides an extensible HMI by allowing OEMs to respond quickly to ever growing consumer feature demands.
The Road Ahead – Voice emerges as principal automotive Interface

In spite of the need for improved accuracy and development cost, voice becomes the principal interface on mid-line and entry level vehicles.

Smartphones and cloud-based services driving tectonic shift in user preferences, that is the acceptance and use of a natural voice interface.

Driver distraction calls for “non-contacting” interfaces, voice and gesture. Personalization and workload managers also a solution.

Other input modalities, gesture recognition, eye recognition, touch pads, haptics and even thought (emotive vs. control) to compliment voice.

Knight Rider 1982 becomes SIRI on Chevy Sonic in 2013 everyone’s car (31 yrs later)
Thank you for your attention

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