

vlingo

Adaptive HLMs: The Next Generation of Language Modeling March 2008



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Vision

Unlocking access to mobile content with mobile Voice User Interface



Why Voice?

- Mobile Internet penetration held hostage by 12 keys
 - And even miniature full keyboards can be inconvenient/unsafe at times
 - Barriers: triple-tapping, discoverability
 - Less than $\frac{1}{3}$ use mobile web browsers¹
 - Less than $\frac{1}{4}$ download applications²
 - Barely half (54%) have bought ringtones, games, or other content
 - 85% of mobile TV users abandoned the service after just one viewing, underscoring the user interface difficulties facing mobile multimedia services³
 - > 70% of subscribers who signed up for content bundles failed to actually consume any mobile content, indicating that usability, not price, was the culprit³
- Vlingo voice UI unlocks the promise of the Mobile Internet

Statistics are US only

(1) Merrill Lynch, June 2007

(2) Telephia bill & survey analysis of subscriber behavior during Q1 2007

(3) Cellular News - *Ease-of-use Outranks Price As Key Barrier to Mobile Data Usage*, Feb 2008

Why Now?

- Increasing functionality in Mobile Devices
 - Communication: email, SMS/IM, voice
 - Entertainment: ringtones, music, video
 - Internet: search, maps and directions
 - Adoption limited by user interface
- Devices and network limitations going away
 - 3G networks being deployed
 - Mass-market devices capable of audio and complex applications
- Technology now capable
 - Speech recognition hardware costs lower
 - Network-based open-grammar ASR now possible

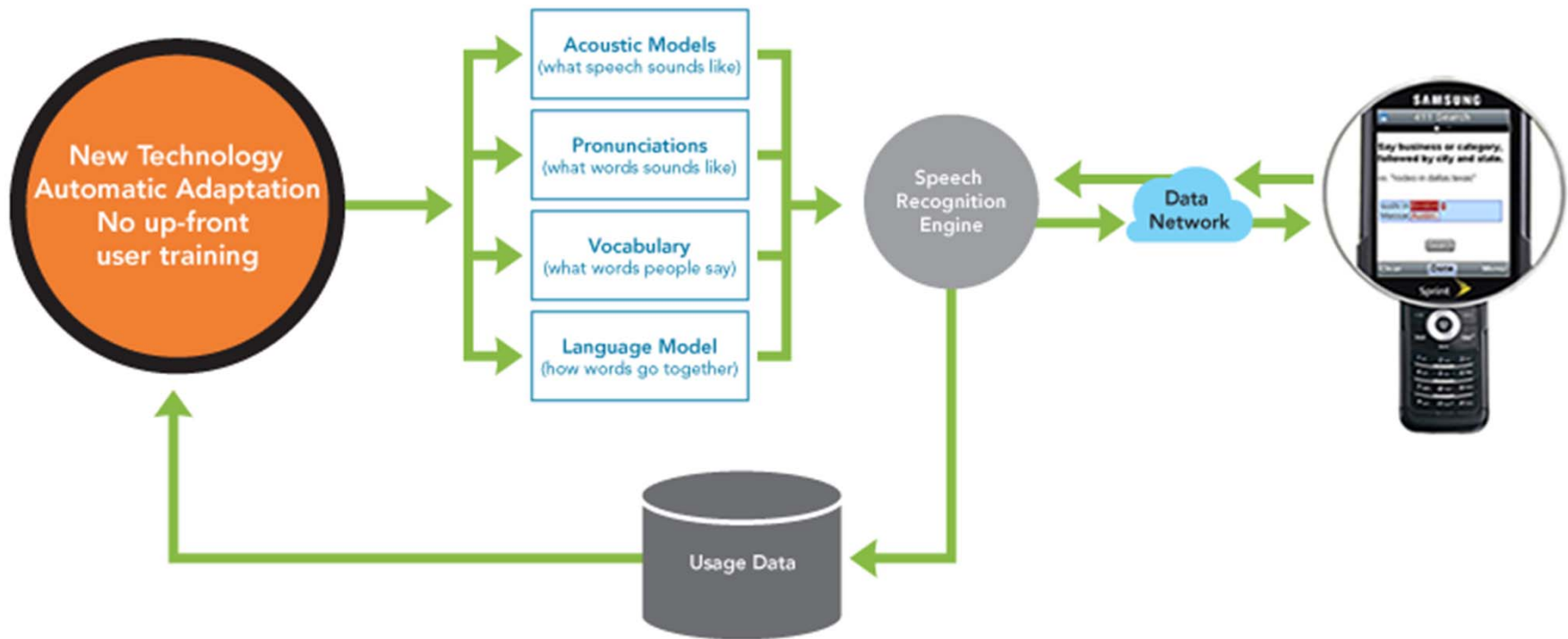
The Challenge

- Support consistent interface across applications
 - Music/content search
 - Business search
 - Addresses
 - Open web search
 - Messaging
- Avoid application-specific effort
- Ensure high success rates

Characteristics of Mobile Devices

- We know
 - user
 - Application
 - Application context
- Consistent audio path
- Display
- Keypad/buttons

Technology

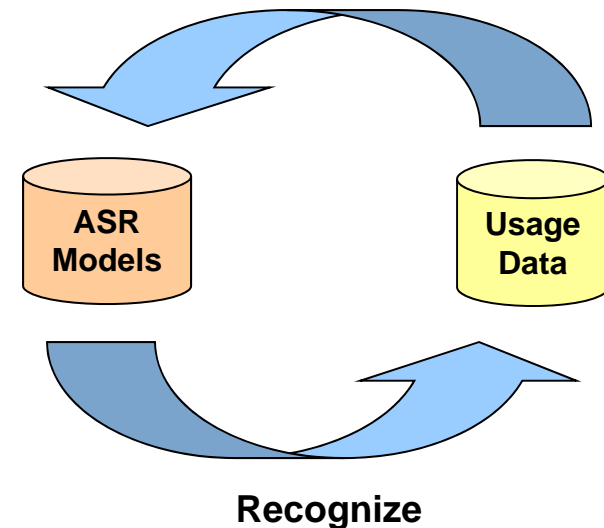


Adaptive HLMs

- HLMs = Hierarchical Language Models
- Based on Statistical Language Models
- Efficiently scale to millions of words
 - General Web Search
 - Directory Assistance / Yellow pages / Local Search
 - Navigation Destination Entry
 - Messaging
 - Social networking
- Adaptation
 - Per user
 - Across users

Better User Interface— Allows for Adaptive Loop

- Drop down list for possible mis-recognitions for easy corrections
 - Speak type over words to correct them
 - Freely mix talking and typing
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- Corrections captured to improve recognition for individual users and across users
 - Network effect— the more users the better the system, creating barrier to entry



Industry Adoption

- Transition to 3G data networks
- Carriers expanding functionality of mainstream phones
- Increasing consumer adoption of open devices
- Early stages of advertising-based business models

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