

THE 'IN TOUCH' PERSONAL ASSISTANT: NEXT GENERATION EMOTIONALLY INTELLIGENT MOBILE DEVICES

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WHY DO WE NEED EMOTIONALLY INTELLIGENT SMARTPHONES?

- First, because users enjoy “more intuitive interaction with mobile devices” due to the “maturing of speech and language technology” (AVIOS email 3/27/13);
- Second, because “in the long term, the Personal-Assistant Model has the potential to be the primary user interface modality on many platforms” (Bill Meisel, “The Personal-Assistant Model: Unifying the Technology Experience,” in Neustein/Markowitz (Eds.), *Mobile Speech and Advanced Natural Language Solutions*, Springer 2013)
- Third, to address the irony that “as smartphones increasingly become ‘smarter’ at understanding natural language input there doesn’t seem to be a drive at making these devices ‘emotionally’ intelligent” (Speech Strategy News, November 2012)

DISPELLING THE MYTH THAT "CUTE" MEANS "SMART"

(Excerpt of Neustein interview in SSN, November 2012)

- ❑ "Cute" doesn't necessarily mean emotionally smart.
- ❑ In fact, such ['cute'] devices that engage users in carefree conversations may appear, albeit speciously, to respond on an emotional level.
- ❑ But when the smart device produces a preposterous response either because of an out-of-vocabulary word that was not understood by the personal-assistant model or the task requested of the mobile device was unfamiliar to the system altogether, the bubble begins to burst.

HOW TO MAKE SMARTPHONES EMOTIONALLY SMART?

First, by enabling the PA (personal assistant) to accurately register the mood of the user;

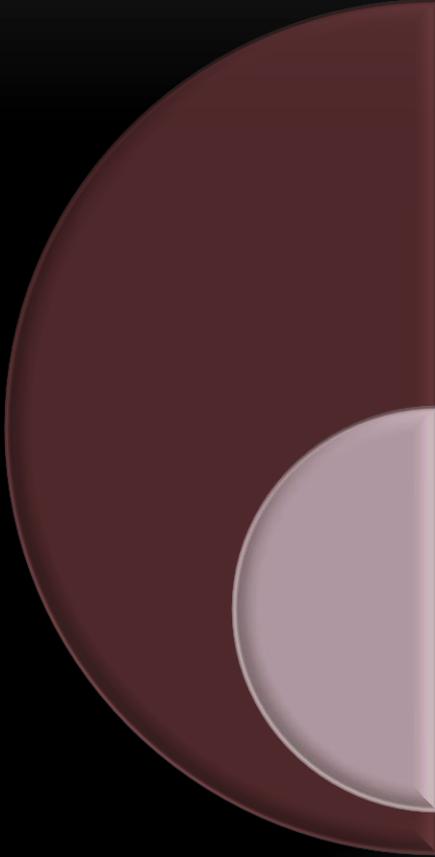
Second, allowing the mobile device to intuitively respond to the user's present mood state by suggesting/initiating the next set of actions:

Texting/talking to business associates
or family/friends

Cybershopping for specific products
or services or general surfing for
health information, news media, etc.

Calling AAA service if the user's car
won't start or if the keys have been
accidentally left inside a locked car

E-COMMERCE AND THE NECESSITY FOR AN EMOTIONALLY INTELLIGENT SMARTPHONE



Shopping for online for products/services is often an emotionally complex process: while some shoppers may need reassurance that a product is in vogue other shoppers, in contrast, may need confirmation that a product, stylish or not, represents a practical purchase.

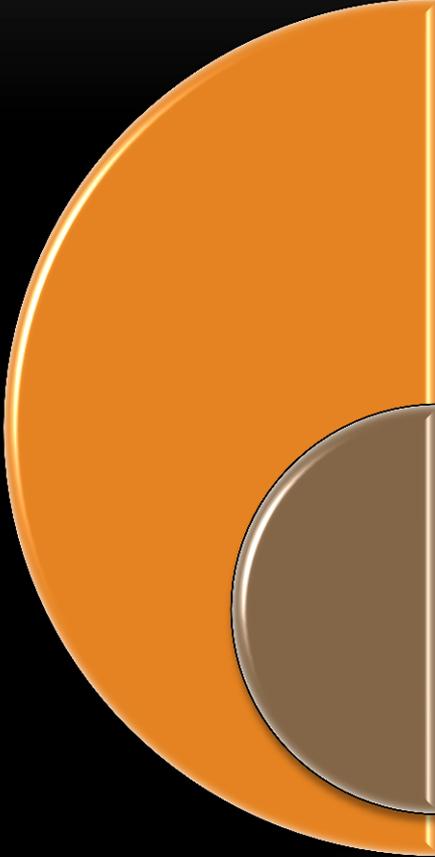
The same wide array of emotional needs are found when mobile users search for hotels and restaurants: while some restaurant seekers may prioritize the quality of the food others may be much more concerned about parking and long lines.

HOW THE 'IN TOUCH' PERSONAL ASSISTANT CAN EXPLOIT SOCIAL MEDIA FOR E-COMMERCE

The emotionally intelligent PA mines consumer-generated media to find just those postings that respond to the present emotional needs of the mobile user.

Using Sequence Package Analysis (SPA) technology – by building a special set of parsing structures that capture the subtle emotional features of natural language into the smartphone's natural language platform – the nuances and subtleties of opinion-related postings are then extracted/abstracted for the mobile user. (A. Neustein, Chapter 5 in Mobile Speech, Springer 2013)

SPA AS A UNIQUE DATA-EXTRACTION TOOL FOR ONLINE REVIEWS



The SPA-designed BNF (Backus-Naur Form) table, unlike a conventional table consisting of parts of speech (e.g., N, V, ADJ, NP, VP or ADJP), consists of *sequentially-implicative* units: what this means is that their formal grammatical representation is defined by sequence as opposed to syntax.

By relying on the sequence package in its entirety as the *primary* unit of analysis, rather than on isolated syntactic parts (such as N, V, or NP), the SPA-designed BNF table is able to depict the subtleties and other emotional elements of online reviews by identifying the sequences found in such reviews.

SPA'S HYBRID APPROACH TO NATURAL LANGUAGE UNDERSTANDING

To identify sequence packages, SPA uses a *hybrid* approach:

- In part, SPA's method is semantic grammar-based, for those clearly defined sequence packages that contain specifically marked boundaries and specifying package properties;
- In part, SPA's method is statistical, using *N-grams* to depict the probabilistic occurrence of a sequence package structure when one is not so clearly defined.

Because sequence packages are both domain-independent and language-independent, the costs of using a statistical approach are not prohibitive as they are for those applications where data changes dynamically, as is the case for seasonal applications.

USING SPA TO EXTRACT SUBTLE NEGATIVE ATTRIBUTES FROM A FIVE-STAR RESTAURANT REVIEW

<Opening Endorsement> *"I've been here 4-5 times at least and I never leave disappointed"*

<Complaint/Disclaimer (Parking)> "Parking can be tough during the lunch crowd but it is totally worth it"

<Complaint/Disclaimer (Waiting)> "There is typically a line – a good sign in my opinion!"

<Complaint/Disclaimer (Seating)> "They have small indoor seating but tons of outdoor seating"

<Opinion Review> *"The falafel is excellent. I always ask for a side of their hot sauce because it's that good! The falafel combo deal is great because it is cheap and it comes with their fantastic banana shake! The banana shake is the best I've ever had!"*

<Complaint/Disclaimer (Payment)> "They do not accept credit cards, only debit and cash so come prepared"

<Closing Endorsement> *"This place is a must if you leave [sic] in San Jose! Excellent, just excellent!"*

THE SEQUENCE PACKAGE STRUCTURES IN THE FOUR COMPLAINT/DISCLAIMER CONTRASTIVE PAIRS

First Pair Part: <Complaint>

Second Pair Part: <Disclaimer> =
<concessive connector(a/k/a contrast
marker)> + <idiom/metaphor>

In this example, the second part of each of the four contrastive pairs begins with a concessive connector (a/k/a contrast marker): “but”, “so,” “n-dash” followed by an idiomatic expression or metaphor.

Note: Idioms are defined rather broadly to include banalities, platitudes and clichés that serve as a “shorthand” way of getting the message across – in which their connotative meaning is not necessarily deducible from the individual words that make up the idiom.

GENERIC SEQUENCE PACKAGE PARKING STRUCTURES

<Complaint/Disclaimer> (Parking)

- Complaint: “Parking can be tough during the lunch crowd”
- Contrast Marker: “but”
- Idiom: “it is totally worth it”

<Complaint/Disclaimer> (Waiting)

- Complaint: “There is typically a line
- Contrast Marker: “– (n-dash)”
- Idiom: “a good sign in my opinion!”

GENERIC SEQUENCE PACKAGE PARKING STRUCTURES, CONTINUED

<Complaint/Disclaimer> (Seating)

- Complaint: “They have small indoor seating”
- Contrast Marker: “but”
- Idiom: “tons of outdoor seating”

<Complaint/Disclaimer> (Payment)

- Complaint: “They do not accept credit cards, only debit and cash”
 - Contrast Marker: “so”
 - Idiom: “come prepared”
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ANALYSIS: WHAT IS THE VALUE OF LOCATING SEQUENCE PACKAGE PARSING STRUCTURES TO THE MOBILE USER?

1. Economic Parsing of Large Corpus of Natural Language Data to Help the Mobile User Make a Decision More Quickly
2. Starting from the Location of Generic Sequence Package Parsing Structures the Mobile User is Aided in their Discovery of Important Product/Service Features in Online Review Postings
3. Assist Mobile User in Making a More Informed Purchase Decision by Extracting/Abstracting Opinion-Related Reviews for their Emotional Content
4. Consummating the Role of the PAM by Bringing Next Generation Emotionally Intelligent Personal Assistants into the Mobile World