Affect in Bot Conversations

Wolf Paulus

wolf_paulus@intuit.com
Intuit - Innovation & Advanced Technology
Dear applicant,

Thank you for submitting a strong resume, which has put you on the short list of the final five applicants for the position of Executive Assistant. We will determine who to offer the job, after a brief conversation over the phone.

We expect every applicant to answer only this questions: "What's the weather in San Jose, California today?" followed by "and how about tomorrow?"

We’ll be making our decision right away and there is really no need, trying to prolonged the phone call.

Again, thanks so much for your interest and good luck.
1. Conversations with bots have limited or no GUI.


3. Most / many conversations with bots (voice or text) are rather short.

4. In short conversations, limited information is exchanged. I.e., opportunities for data-driven differentiation remain limited.

5. Information provided to a user, may come from the same source, e.g. weather, stock-market, financial accounts, etc.
What's my credit score?

705
Your credit score is GOOD

What's my balance?
Prologue
An introductory section of a literary or musical work.

Prelude
An introductory piece of music, poem, or other literary work.
Hey, what's up?

"Got my MBA"

"Wow, can you believe it? I got my MBA."
Talk to Siri, like talking to a friend
Can likability be a differentiator?  

A practical approach for creating an emotional response
WordNet® is a large lexical database of English. Nouns, verbs, adjectives and adverbs are grouped into sets of cognitive synonyms (so called synsets), each expressing a distinct concept.

Each of WordNet’s 155,000 synsets is linked to other synsets by means of a small number of “conceptual relations.” Its’s structure makes it a useful tool for computational linguistics and natural language processing.

WordNet superficially resembles a thesaurus
SentiWordNet, a lexical resource explicitly devised for supporting sentiment classification and opinion mining applications; annotating all WordNet synsets according to their degrees of positivity, negativity, and neutrality.
<table>
<thead>
<tr>
<th>POS</th>
<th>ID</th>
<th>PosScore</th>
<th>NegScore</th>
<th>SynsetTerms</th>
<th>Gloss</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1459422</td>
<td>0.625</td>
<td>0</td>
<td>loveable#1 lovable#1</td>
<td>having characteristics that attract love or affection; &quot;a mischievous but lovable child&quot;</td>
</tr>
<tr>
<td>A</td>
<td>1459949</td>
<td>0.625</td>
<td>0</td>
<td>sweet#2 seraphic#2 cherubic#1 angelical#2 angelic#3</td>
<td>having a sweet nature befitting an angel or cherub; &quot;an angelic smile&quot;; &quot;a cherubic face&quot;; &quot;looking so seraphic when he slept&quot;; &quot;a sweet disposition&quot;</td>
</tr>
<tr>
<td>A</td>
<td>1460266</td>
<td>0.375</td>
<td>0</td>
<td>cuddly#1 cuddlesome#1</td>
<td>inviting cuddling or hugging; &quot;a cuddlesome baby&quot;; &quot;a cuddly teddybear&quot;</td>
</tr>
<tr>
<td>A</td>
<td>1460421</td>
<td>0.333</td>
<td>0.667</td>
<td>hateful#1</td>
<td>evoking or deserving hatred; &quot;no vice is universally as hateful as ingratitude&quot;- Joseph Priestly</td>
</tr>
</tbody>
</table>
The WordNet-Affect Lexicon is a hand-curate collection of almost 1,903 emotion-related words (nouns, verbs, adjectives, and adverbs), classified as “Positive”, “Negative”, “Neutral”, or “Ambiguous” and categorized into 28 subcategories (“Joy”, “Love”, “Fear”, etc.).

<table>
<thead>
<tr>
<th>Category</th>
<th>Example Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>emotion</td>
<td>anger</td>
</tr>
<tr>
<td>cognitive state</td>
<td>doubt</td>
</tr>
<tr>
<td>trait</td>
<td>competitive</td>
</tr>
<tr>
<td>behaviour</td>
<td>cry</td>
</tr>
<tr>
<td>attitude</td>
<td>skepticism</td>
</tr>
<tr>
<td>feeling</td>
<td>pleasure</td>
</tr>
</tbody>
</table>

WordNet-Affect is an extension of WordNet Domains, including a subset of synsets, suitable to represent affective concepts correlated with affective words.
Revised Dictionary of Affect in Language


Pleasantness [unpleasant - pleasant]
How pleasant is a word?

Activation [passive - active]
How aroused or active is a word?

Imagery [poorly imaged - Highly imaged]
How easy is it to form a mental picture of a word?

“I love you, but hate your cold sister.”
Recursive Neural Network built on top of grammatical structures.

All previously mentioned systems work on words in isolation, (summing up points for positive words and negative words.) Stanford’s system analysis whole sentences.

"Regarding your loan application I received the following message. “
"Regarding your loan application I received the following message. "

https://nlp.stanford.edu/sentiment

Sentiment Analysis

Sentiment of a Sentence
IBM Cloud

Text to Speech

Convert written text into natural-sounding audio in a variety of languages and voices.

LumenVox

Speech Understood

“Synthesizes written text into spoken speech with the most realistic voices on the market.”

CEPSTRAI

WE BUILD VOICES

“Realistic synthetic voices that say anything, anywhere, with personality and style.”

Bing Speech API

“Voices not only sound real, they have character, making them suitable for any application that requires speech output.”

Our in-house speech technologies and solutions are designed to provide a smart and pleasant spoken audio result.”
SSML, think of it as the HTML and CSS of Speech Synthesis
Speech Synthesis Markup Language to impact affect

**SSML**

- `<emphasis level="..">` enclosed text be spoken with **emphasis**
- `<prosody pitch =""...""> modifies the baseline pitch e.g., **low** / **high**
- `<prosody rate =""...""> change in the speaking rate, e.g., **slow** / **fast**
- `<prosody volume =""...""> modifies the volume, e.g., **soft** / **loud**
- `<prosody range =""..."> modifies pitch range (variability) e.g., **low** / **high**
- `<prosody contour =""..."> sets the actual pitch contour for the contained text. (time position, target)

**Voice transformation SSML - none standard**

- `<glottal_tension pitch =""..."> **tense** or **lax** speech quality e.g. low / high (low value is perceived as more breathy and generally more pleasant.)
- `<breathiness level=".."> perceived level of the aspiration (drawing breath) noise e.g., low / high

**Expressive SSML - none standard**

- `<express-as type="GoodNews">` expresses a **positive, upbeat** message.
- `<express-as type="Apology">` expresses a message of **regret**.
- `<express-as type="Uncertainty">` conveys an uncertain, **interrogative** message.
Based on algorithms by Paul Boersma, professor of Phonetic Sciences at the University of Amsterdam, who is the main author of the speech analysis software Praat, Vokaturi measures directly from voice, whether the speaker is happy, sad, afraid, angry, or has a neutral state of mind.

Acoustical Analysis

[Graph showing emotion levels]

.. not intended, but can also analyze synthesized voices.
Acoustical Analysis

Speech: IBM Cloud

Text: DAL

Consider
regard
affect
view
see
involve

Sentiment Analysis

Regarding your loan application, I received the following message. [negative]

Dictionary of Affect in Language / Sentiment Analysis

WordNet

DAL

Revised Dictionary of Affect in Language

Sentiment Analysis

SSML

<xml version="1.0" encoding="UTF-8">  <speak version="1.0" xml:lang="en-US">Regarding your loan application, I received the following message.</speak></xml>
Demo