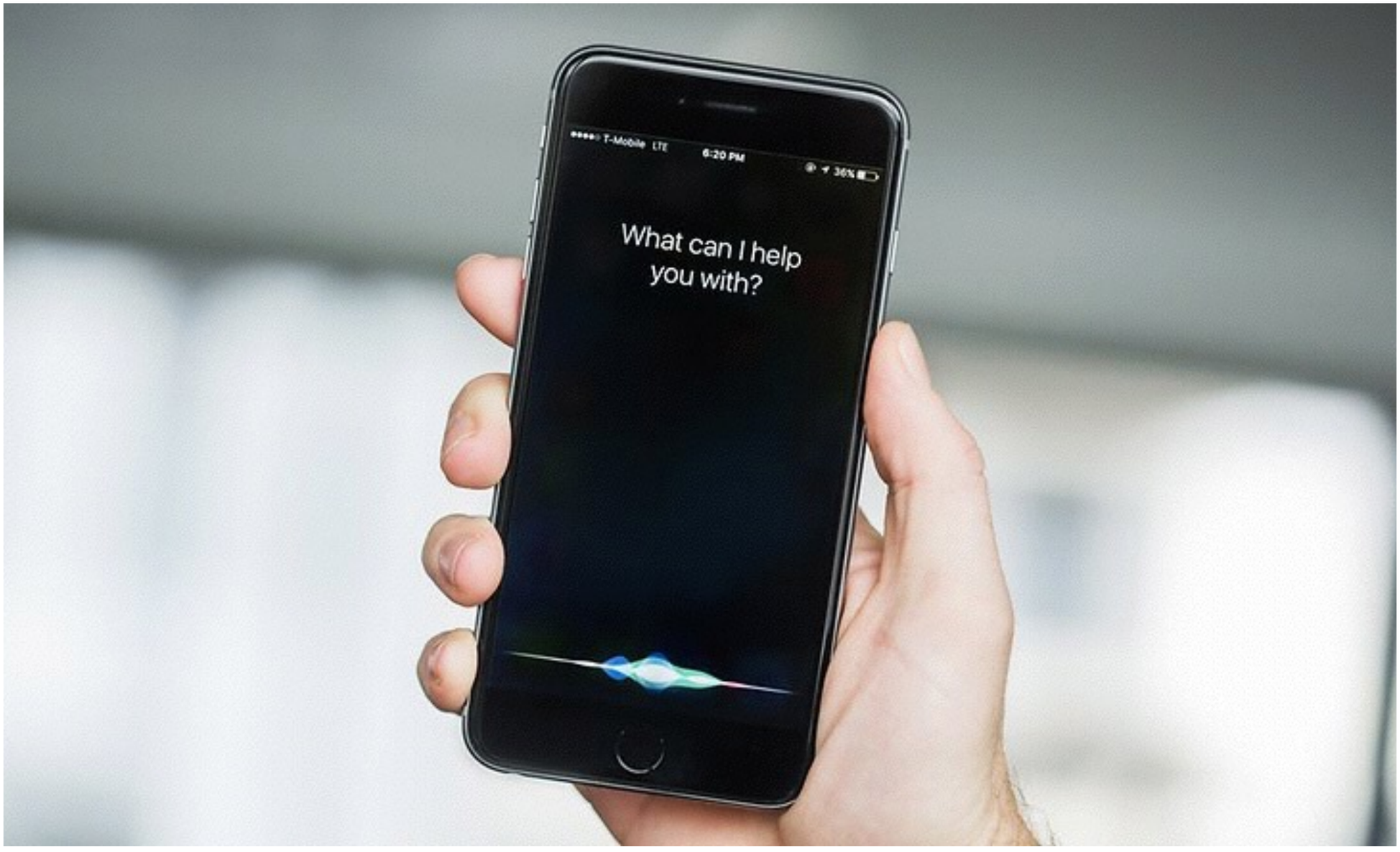

Human Communication in Mobile Devices

Paula Garcia


H
E
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H
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L
L
O

Tense

Pronoun

Verb

Structure

Sound

Syllables

Gender

Multiplicity

Stress

Part of speech

Noun

Adjective

Intonation

Meaning

Filler

Conjunction

Adverb

Consonant

Vowel

Tense

Pronoun

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Intonation

Meaning

Interjection

Phrase

Conjugation

Question

Adverb

Consonant

Sentence

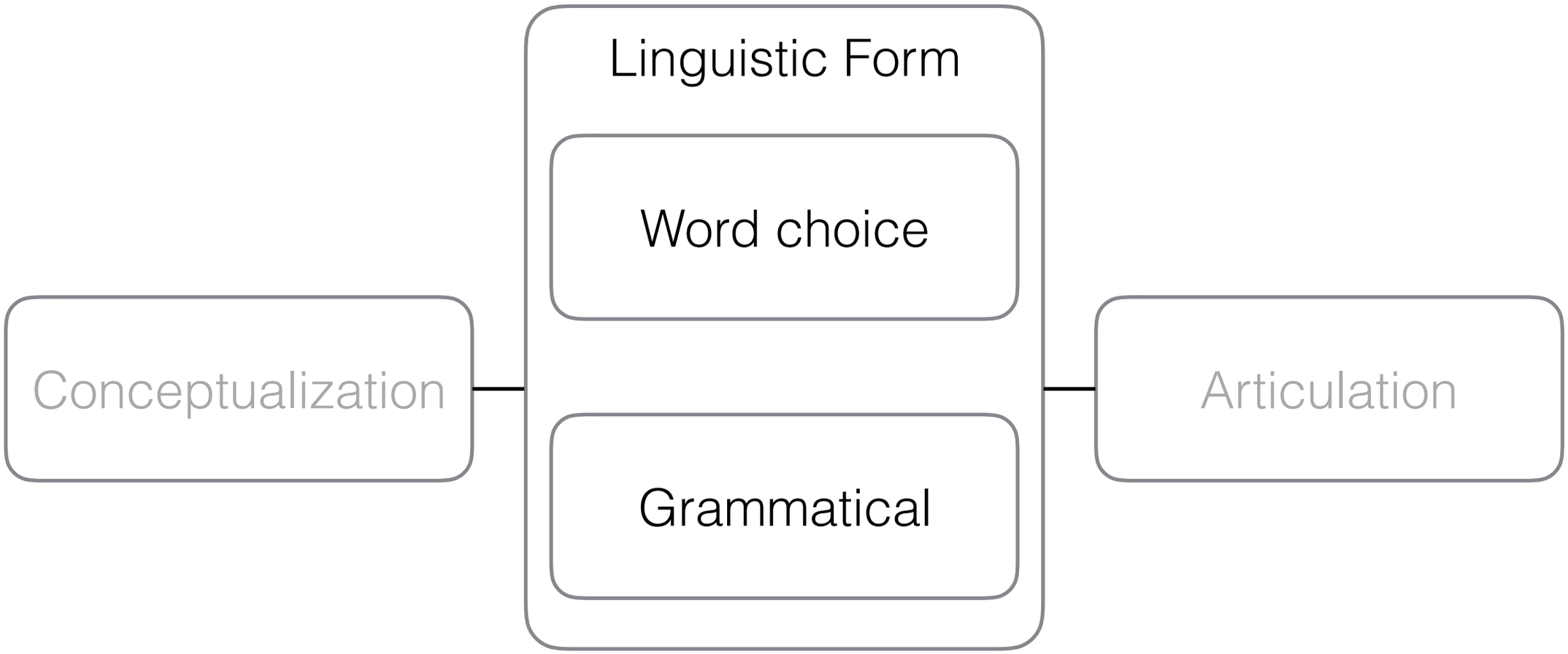
Vowel

Interjection

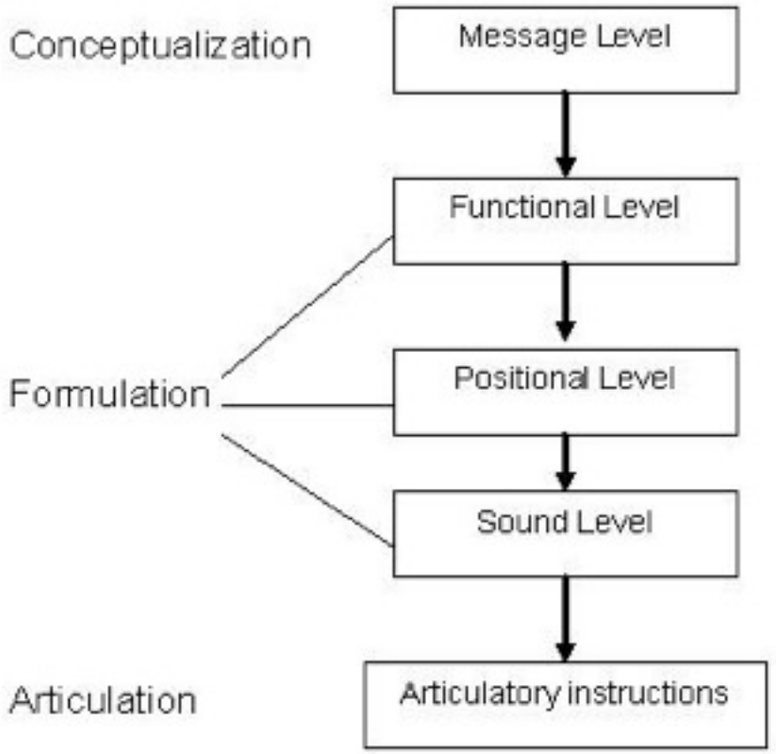
Linguistic Form

Conceptualization

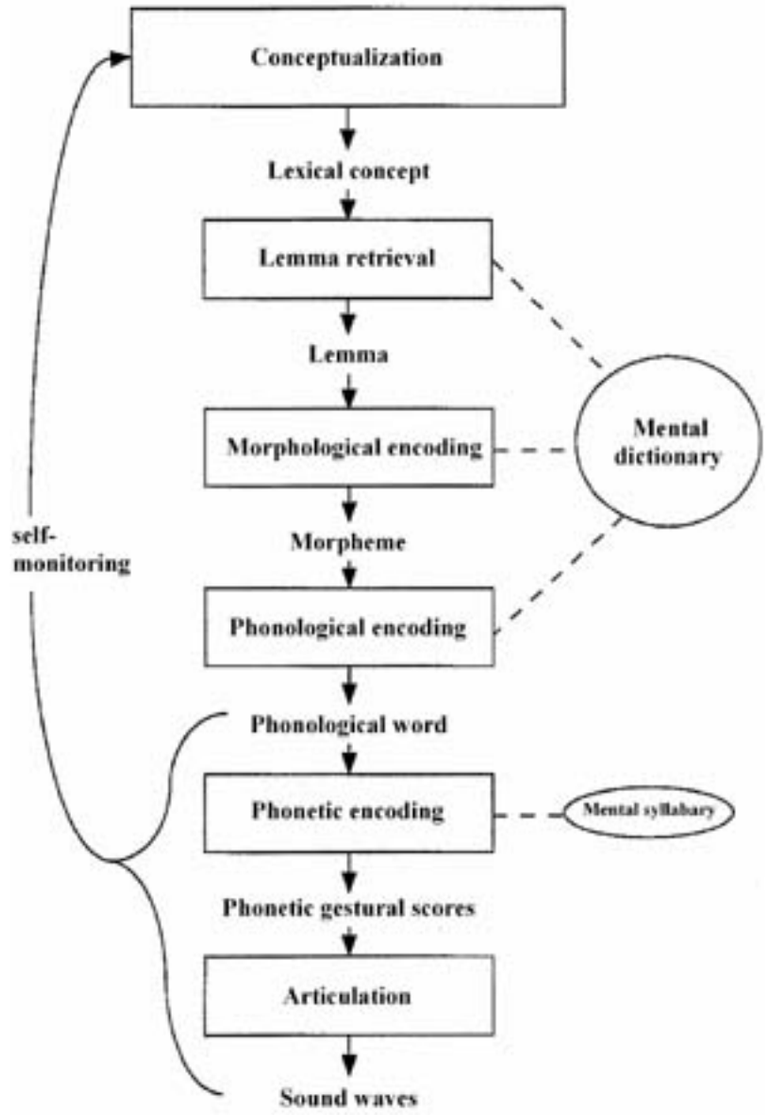
Articulation


Linguistic Form
Word choice
Grammatical
Conceptualization
Articulation

Linear Language Models



Garret (1980)



Levelt, Roelofs, and Meyer's (1999)

Sound
Stress
Intonation
Syllable
Structure

Prefix/suffix
Gender
Tense
Number
Meaning

Word choice

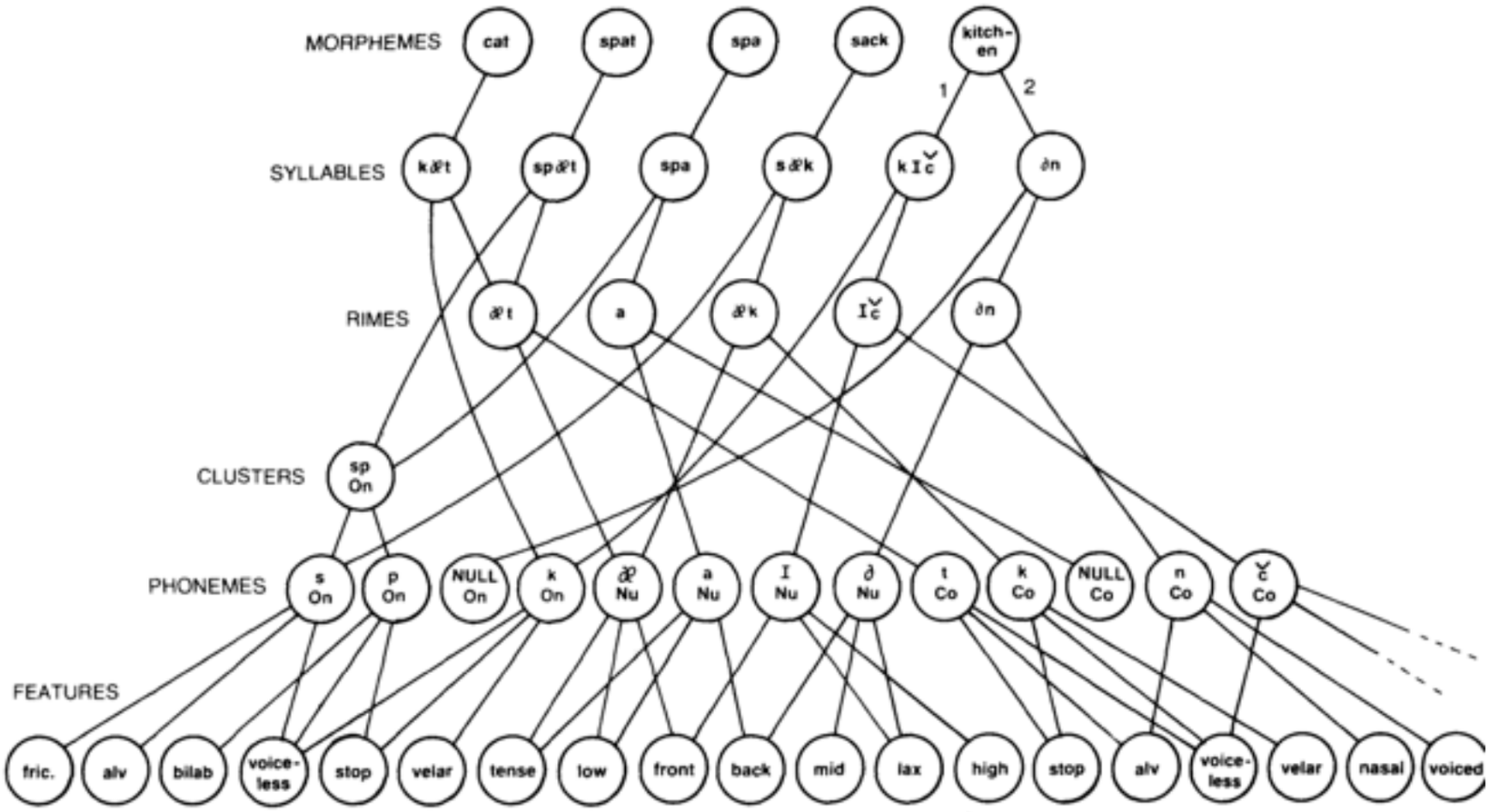
Conceptualization

Articulation

Grammatical

Structure
Noun
Adjective
Verb
Pronoun

Spreading Activation Theory



Phonological Encoding, Dell (1986)

Additional Models

- Feedback (adaptation)
- Neuro-models (brain activation)
- Dynamic systems (behavioral: *self*-organizing)

Limitations

- monolingual vs bilingual
- writing, listening comprehension
- sign language
- connected language production
- conversational speech
- brain lesions

Speech Prediction

Problem: User's confidence can impact stuttering

Participants: 90 training, 10 testing, split by 3 token sequences (trigram)

Method: Probability of predicting the third word through a Markov model, n-gram, by comparing the training and test sets

Results: 87% accuracy

Algorithm 1: Speech Prediction

Input : An audio file of speech
Output: Predicted Speech

if *Stuttering is Detected* **then**
  inputText ← Convert speech to text
  Initialise freqOccurence to 0
  Initialise count to 0
  Eliminate repeated word
  //Predict Next Word
  Open n-gram corpus as file
  while *not at end of this document* **do**
    if *inputText in line* **then**
      read count
      Add count to freqOccurence
    end
  end
  //Condional Probability cP[w]
  //calculated as given in Eqn (3)
  while *not at end of this document* **do**
    if *inputText in line* **then**
      w ← Read word after inputText
      Read count
      cP[w] ← count/freqOccurrence
    end
  end
  predictedWord ← Select w with maximum cP[w]
  Convert predictedWord to Speech
end

Speech Prediction Algorithm, Kalwad et al. (2015)

Word Finding

Problem: Some individuals with aphasia experience difficulties recalling words

Participants: 8 participants (50th percentile CADL-2, WAB), 14 participants (46-75 (M=61, SD=8.1), CADL 31-99th percentile, WAB)

Method: Semi-structured interview, observational

Results: Physical buttons are easier to use, left navigation was preferred, gestural UI, market was a more beneficial contextual task

https://www.youtube.com/watch?v=H5qMCl4SgVw

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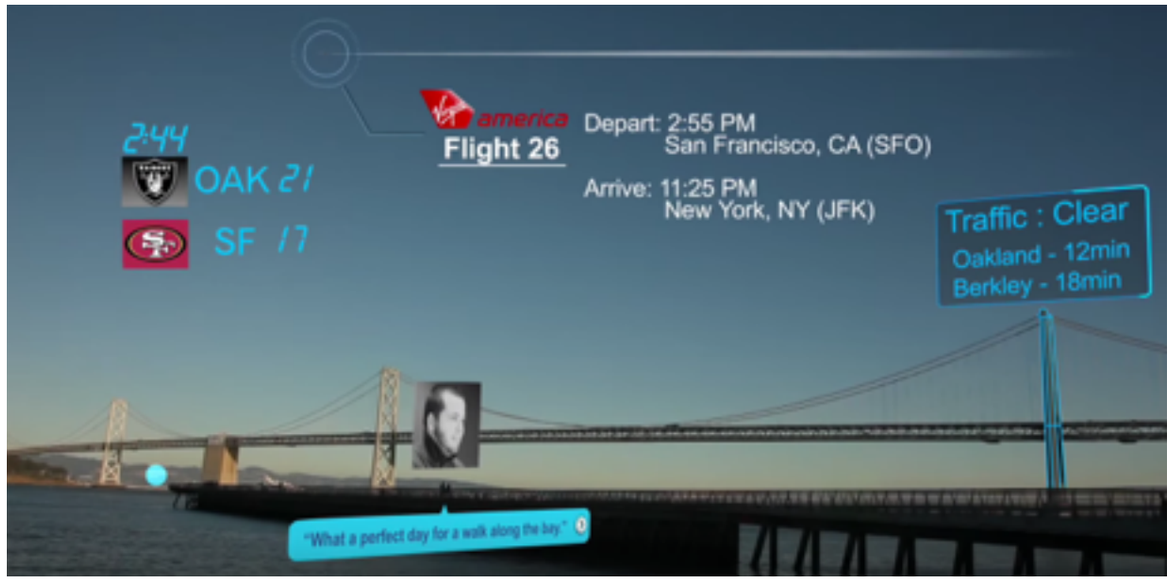


https://www.youtube.com/watch?v=H5qMCl4SgVw

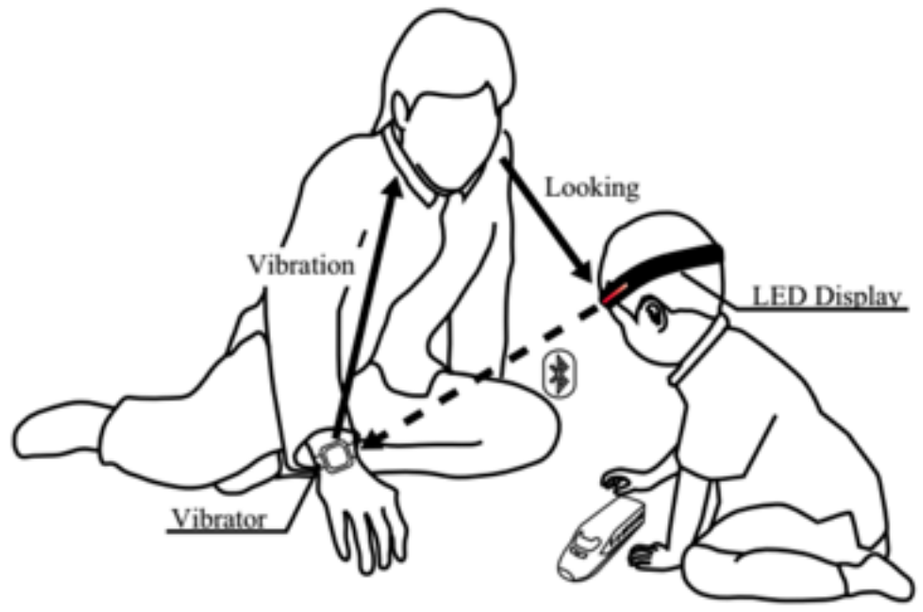
Non-verbal Communication

Problem: Facial expressions can go unnoticed, but are important to real-time communication with individuals with autism.

Participants: 9 participants (one female, 20-30)

Method: Compare classification of participants versus computer based on the facial coding system

Results:
Neutral expression no motion: 100%,
Neutral expression w/ motion: 95%,
Smile: 90%



Takano, Y and Suzuki, K. (2014)

Other areas of Research

- Gestural communication
- Functional Neuroimaging
- Human electrophysiology
- Computer modeling, artificial intelligence
- Computer vision, AAC
- Data visualization, big data