

Enhancing NLP Personalisation of Assistive Technologies for People with Motor Neurone Disease

Tatjana Shigailow

Imperial College London

Supervised by Dr. Ahmad Abu-Khazneh and James Arney
(Rolls-Royce)

Outline

- Introduction
- Rolls-Royce Quips
- Imperial Quips
- Personalisation
- Conclusion and Future Work

Motor Neurone Disease

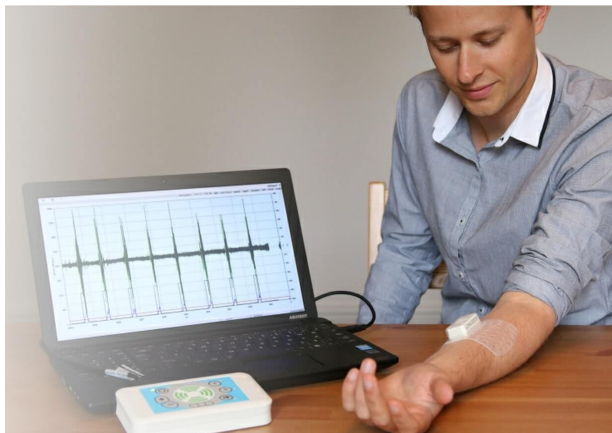
- Group of neurodegenerative diseases that destroy the motor neurones in the brain and spinal cords
- Up to 5000 people are affected in the UK
- Symptoms:
 - Weakness and shrinking of muscles
 - Difficulties with breathing, speaking and swallowing
 - Complete loss of muscle movement including the ability to walk and speak

MND Assitive Technology



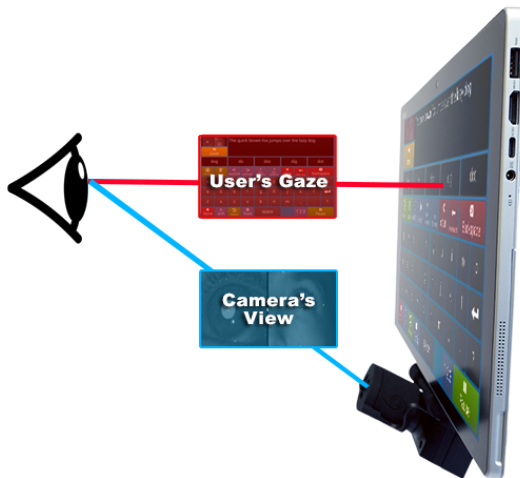
Source: <https://sharonfriel.wordpress.com/2017/02/08/losing-my-voice-to-mnd/>

MND Assistive Technology



Source: <https://emego.co.uk/>

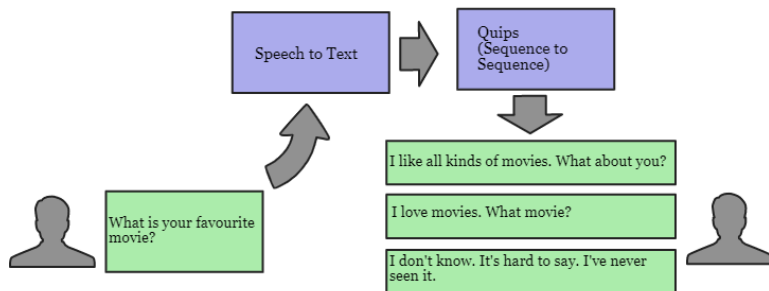
MND Assistive Technology



Drawbacks


- Patient needs to spell out each word individually
- Frustration
- Isolation

Rolls-Royce Quips



Rolls-Royce Quips

RR Quips

 R² Data Labs

do you want a drink

some tea would be great

some tea would be great no i don't a small glass

1 2 3 4 5 6 7 8 9 0

q w e r t y u i o p [bksp]

a s d f g h j k l <<

z x c v [space] b n m >>

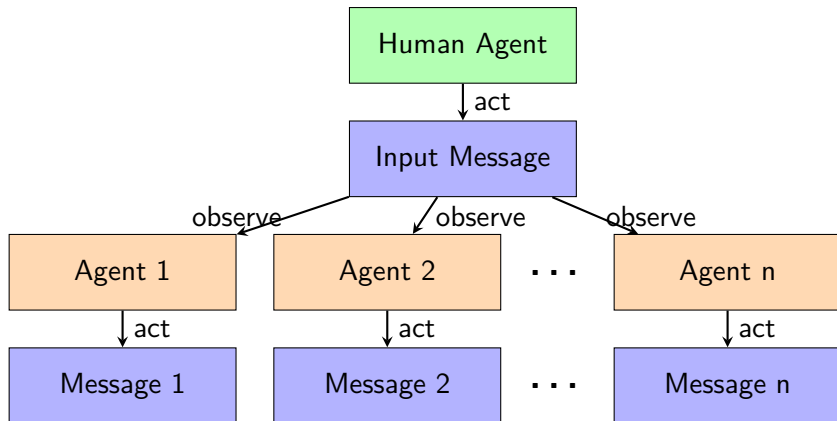
Limitations

- Lack of qualitative datasets
- Lack of hardware to fine-tune models
- Diarization
- Model architecture
- Semantic classification
- Personalisation

Imperial Quips

- incremental upgrade of Rolls-Royce Quips
- uses ParAI which comes with
 - 80+ datasets
 - pretrained models
 - core concepts: **Agents** talk to each other in **Worlds** by **observing Messages** and **acting**

Overview



Examples

```
Enter Your Message: What is your favourite movie?
ImperialQuips suggestions:
1.CONVAI2: i love the movie the great gatsby .
2.EMPATHETIC_DIALOGUES: i like all kinds of movies . what about you ?
3.BLENDED_SKILL_TALK: i don ' t really have a favorite movie . i ' m more of an action
    movie person . what about you ?
Choose suggestion:
```

Personalisation

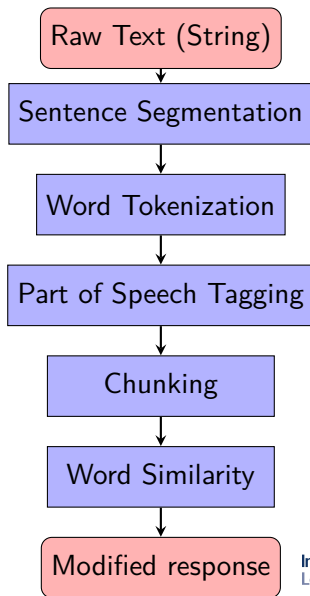
```
Choose suggestion: 3
Do you wish to modify the selected response? (y/n): y
1. i don ' t really have a favorite movie .
2. i ' m more of an action movie person .
3. what about you ?
Do you wish to delete a sentence? (y/n): n
Do you wish to modify a sentence? (y/n): y
Choose sentence to modify: 2
1.i
2.'
3.m
4.more
5.of
6.an action movie person
7..
Do you wish to delete a phrase? (y/n): n
Do you wish to modify a phrase? (y/n): y
Choose phrase to modify: 6
1.an
2.action
3.movie
4.person
```

Personalisation

```
Choose word to replace or type 'none': 2
1.activeness
2.activity
3.military_action
Choose replacement word or type in own replacement: anime|
1.an
2.anime
3.movie
4.person
Choose word to replace or type 'none': none
1.i
2.'
3.m
4.more
5.of
6.an anime movie person
7..

Do you wish to modify a phrase? (y/n): n
1. i don ' t really have a favorite movie .
2. i ' m more of  an anime movie person .
3. what about you ?
Do you wish to modify a sentence? (y/n): n
Modified response: i don ' t really have a favorite movie . i ' m more of  an anime
movie person . what about you ?
```

Pipeline



Evaluation

Pipeline Step	Chosen method	Evaluated on
Sentence Segmentation	Unsupervised learning algorithm by Kiss & Strunk	11 European languages
Word Tokenization	Rule-based	-
Part of Speech Tagging	Averaged Perceptron Tagger	3 English datasets and Russian, Spanish, German & Indian dataset
Chunking	Bigram Tagger	English dataset
Word Similarity	WordNet	English & Russian dataset

Conclusion and Future Work

- Improvement of some major limitations of Rolls-Royce Quips:
 - lack of datasets
 - model architecture
 - personalisation
- Next step: Include usage data