s..Stutter
An IBM Watson Approach to deal with Stuttering

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Introduction to Stuttering and Disfluencies

- **STUTTERING** : characterized by disruptions in the production of speech sounds, also called "disfluencies"

- Two fundamental measures

  - frequency of disfluency

  - types of disfluency

- Basic procedure involves observing a speech sample and counting fluent and disfluent words (either video tape, audio tape or in person).

TYPES OF DISFLUENCIES

➢ **Hesitations**: silent pause of 1 second or longer (ie: I.. (pause)..want the red one)

➢ **Interjections**: meaningless words irrelevant to the message [um/like/well/uh]   (ie: I um want the red one)

➢ **Revisions**: change in content, grammar, or pronunciation of a message (ie: I want the blue...the red one)

➢ **Unfinished words**: a word that is abandoned and not completed later in the message (ie: I want the oran....red one)

➢ **Phrase repetitions**: repetition of at least 2 complete words of the message (ie: I want...I want the red one)

➢ **Word repetitions** (up to 2x): repetition of a whole word in a slow casual way (ie: I I want the red one)

Current methods to measure stutter

Utterance	Disfluency	Coding
1. S-s-s-see the duck.	part-word repetition	[PW3]SEE THE DUCK.
2. I-I-I want to go there.	single syllable word repetition	[WW2]I WANT TO GO THERE.
3. Whe----re is it?	disrhythmic phonation	[DP]WHERE IS IT?
4. I - um – go there.	interjection	I [I] (UM) GO THERE.
5. I want the remo—remote.	multisyllabic word repetition	I WANT THE [M] REMOTE.
6. I go—I go to the store.	phrase repetition	[P] (I GO) I GO TO THE STORE.
7. I ride my bike—scooter.	revision	I RIDE MY [R] (BIKE) SCOOTER.
8. I want to go to ---.	abandoned	I WANT TO GO TO>.

PW (part-word repetition) IIIX IIXI III	= 13
WW (single-syllable word repetition)	
DP (disrhythmic phonation)	
I (interjection)	
M (multisyllabic word repetition)	
P (phrase repetition)	
R/A (revision/abandonded)	
PW units (part-word repetition units)	
WW units (single-syllable word repetition units)	

- To create a tool to be used by speech language pathologists for analyzing stutter patterns in the speech (AUTOMATIC ASSESSMENT)

- As a self-help tool to be used by patients themselves in order to understand their speech and disfluencies

  - Record your practice sessions and get detailed results at your own convenience

- Accurate time stamp markings of hesitations

- Documenting all the repetitions to get an idea of the syllables uttered incorrectly most of the time

IBM Watson's Speech-to-text API

▶ It uses speech recognition capabilities to convert following languages from speech into text

- Arabic

- English

- Spanish

- French

- Brazilian

- Portuguese

- Japanese

- Mandarin

▶ Upload pre-recorded audio (.wav, .flac, or .opus only)

▶ To transcribe the human voice accurately, the service uses machine intelligence to **combine information about grammar and language structure with knowledge of the composition of the audio signal.**
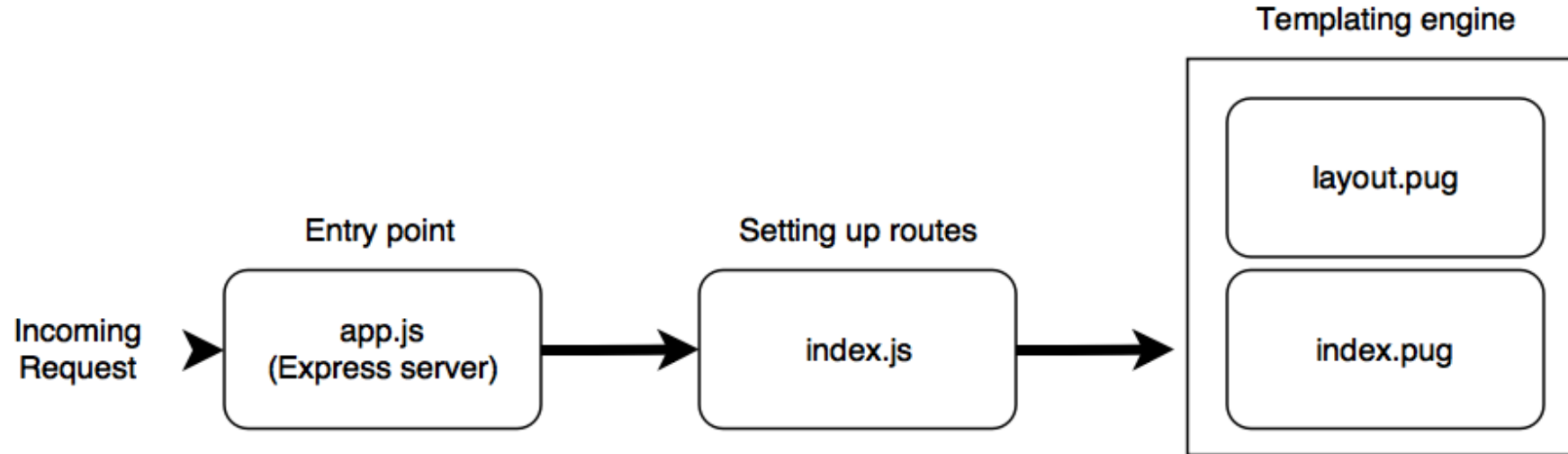
Flow

Speech-to-text API
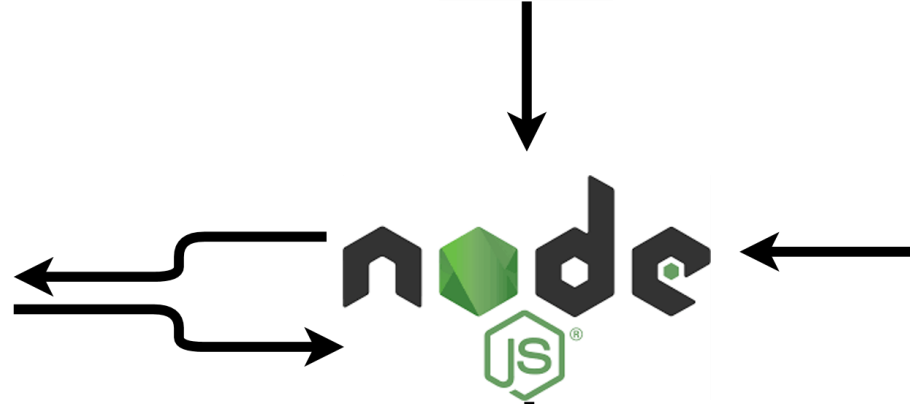
Web development framework

Pug – Templating Engine

Code Structure

https://s-stutter.mybluemix.net/ → Deployed to Bluemix

Dataset

University College London's Archive of Stuttered Speech (UCLASS)

- Recordings of speakers who stutter and background details about these speakers and the conditions in which the recordings were made
- DIVISION OF PSYCHOLOGY AND LANGUAGE SCIENCES - SPEECH TEAM
  - Peter Howell, Stephen Davis, Jon Bartrip and Laura Wormald

- Special thanks - Dr. Tino Haderlein (Researcher, Speech processing Group, FAU)

Future scope

- Creating a chatbot -> "Personal Speech pathologist"
  - Converses with the patient encouraging repetition of words detected through previous step
  - Or facebook Messenger chatbot
- Detect improvement in user's speech through repeated use and displaying graphs
- Extend for real-time analysis – Websocket interface

Client ⟶ requests/audio ⟶ service

receives

results

single connection

{asynchronous fashion}
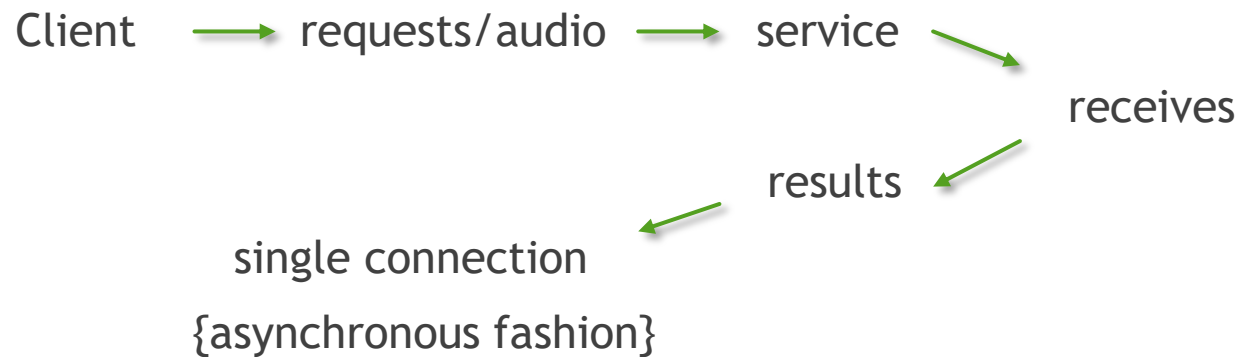
- Audio streams directly from browsers (HTML5 WebSocket clients) to the service
- Reduces latency

References

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thank you!