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Voice Controlled Quiz for People with Hearing Impairment

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Human-centric Communications in Smart Networks (HUTS)
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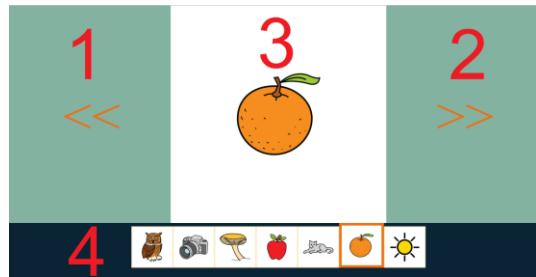
Zagreb, Croatia, 30 June 2017

Outline

- Native user interfaces analyzed during the HUTS project
- Biofeedback treatment method
- Biofeedback for prosodic skills
- Voice Controlled Quiz
- Hearing-aid evaluation web application

Native user interfaces (1/2)

- AAC with eye-gaze based HCI

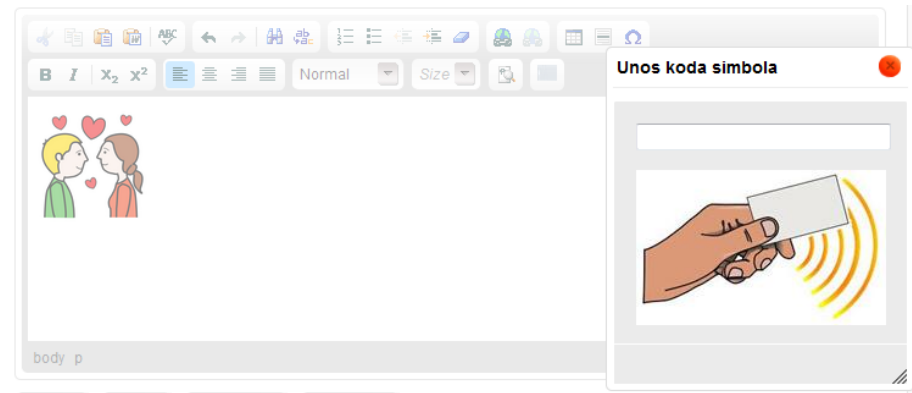


- AAC with gesture based HCI



Native user interfaces (2/2)

- ◆ RFID based HCI



Communication band

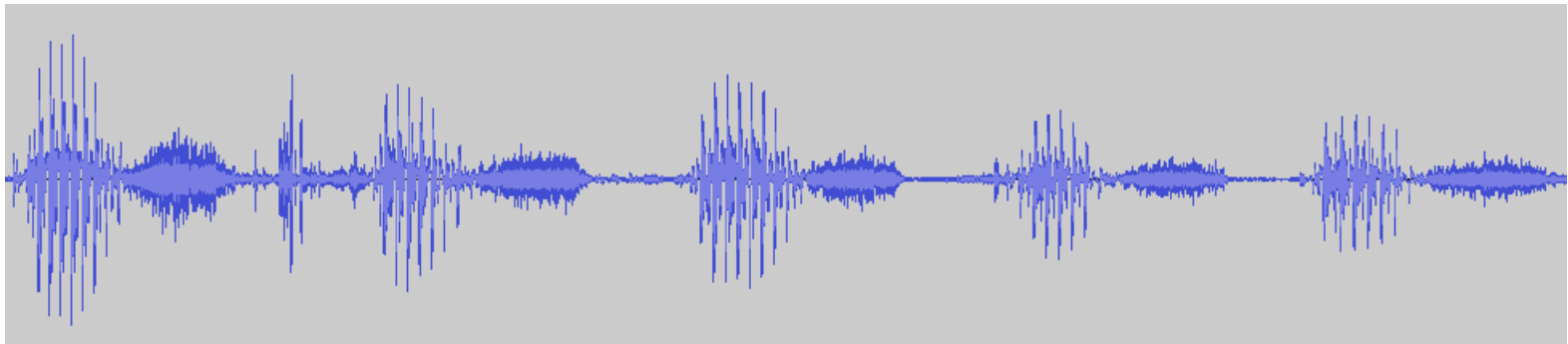


AAC on Wearables



Biofeedback treatment method (1/2)

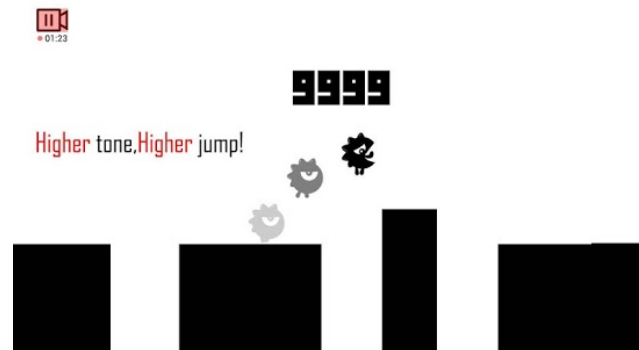
- ◆ Control of voice production in speech rehabilitation of **persons with hearing impairment (HI)** treated by **visual** or **tactile** feedback
- ◆ Hearing and auditory feedback significantly affects the production of standard speech



Biofeedback treatment method (2/2)

- ◆ Speech training facilitated with visual representation of the speech
 - software applications with graphical representation of speech movements in real time - attractive and stimulating
 - positive impact on learning of correct speech production
 - more relaxing and accessible clinical atmosphere
 - clearer instructions from the therapists,
 - more effective training of voice and speech production

Big Mouth: Voice Control
Game



Biofeedback for prosodic skills

Computer games with visual feedback

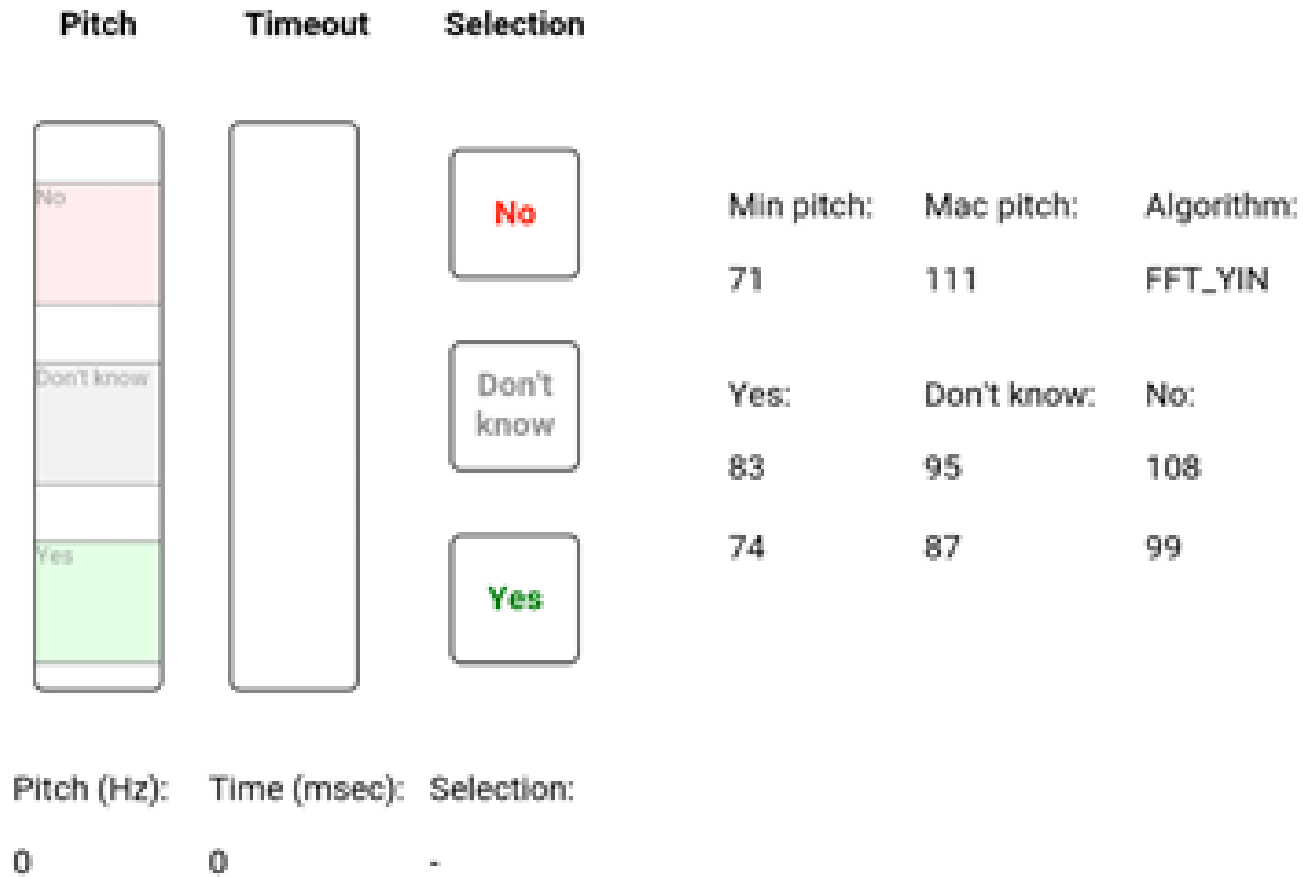
- ◆ achieve better results:
 - coordination of breathing and phonation
 - control of the voice pitch and its variation
 - intonation, speech intensity, voiced-voiceless contrast
 - accent and speech tempo
- ◆ Several biofeedback software solutions, especially for the training of voice skills
 - creativity and innovation, user friendliness
 - high level of personalization
- ◆ Motivation for ICT solution extended with improvements in speech signal processing, graphic and acoustic improvements
 - ⇒ goal for the development of Voice Controlled Quiz.



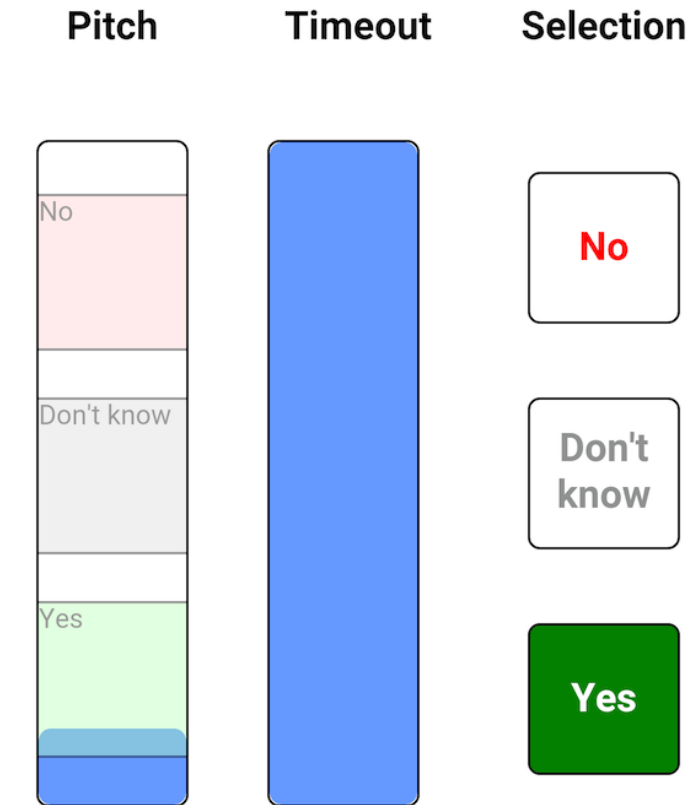
Voice Controlled Quiz

- ◆ Biofeedback software tool for vocal training
- ◆ Android application for smartphones and tablets
- ◆ Interactive graphics providing feedback to the users
 - controlled by continuous phonation into the device microphone
 - phonation is adapted according to the levels of desired pitch managed by a speech rehabilitation therapist
 - recognizes the desired pitch levels and transforms them into visual representation

Voice Controlled Quiz - User interface (1/2)



Voice Controlled Quiz - User interface (2/2)



Pitch (Hz): Time (msec): Selection:
80 200 Yes

Voice Controlled Quiz - technical details

- ◆ TarsosDSP Java library for pitch detection
 - various algorithms for pitch detection

- ◆ selection of the following parameters
 - pitch estimation algorithm (used for evaluation)
 - the lowest pitch value to be recognized
 - the highest pitch value to be recognized
 - ranges between each answer
 - timeout (how long should the user hold a certain pitch in order to be selected as an answer within certain range)

Hearing-aid evaluation web application

- ◆ Developed previously
- ◆ Plays prepared texts and then requires the users to answer several questions about the text
 - See whether the users understood / heard the text correctly
- ◆ Various levels of text difficulty
- ◆ Various levels and types of background noise
 - E.g. cafe with people talking, road, busy office...

Hearing-aid evaluation web application

- ◆ Voice controlled quiz Android application as an input for selecting answers: *yes, no or don't know*

MAIN MENU

DIFFICULTY

EASY MEDIUM HARD

BACKGROUND NOISE

TYPE VOLUME

NO BACKGROUND NOISE 20%

QUESTION FORM

TEXT VOICE TEXT AND VOICE

START

[Results](#)

Conclusion

- ◆ Software applications for rehabilitation purposes managed by user voice show great potential in helping pronunciation and language forming in general
- ◆ Each user is different and there is a high need for personalization in various aspects
- ◆ Future work: applying machine learning methods to achieve automated personalization of voice controlled solutions