M2R Internship

Improving fluency by computer-assisted reading: enlightening breath groups with Karaoke

Background

Reading fluency forms a bridge from decoding to comprehension [1] [2] Fluent readers put several component skills into action while they autonomously read a text [3] [4]:

1. *Accuracy*: they instantly recognize the great majority of words and common phrases in the text, and they use their phonics skills to quickly decode the few unknown words that they encounter
2. *Rate*: fluent readers group words together in meaningful units such as phrases and clauses and are able to pause at appropriate places within and at the end of sentences
3. *Prosody*: fluent readers change the tone of their voice and vary the emphasis they place on words by paying attention to punctuation.

Several methods have been claimed to enhance these skills. Reading-while-Listening (RwL) notably put forward the impact of incidental acquisition of phonological and linguistic skills (letter-to-sound rules, vocabulary, syntax, etc) [5] as well as prosody [6] when passively or actively listening to a fluent reading.

Fluent	**Level 4**	Reads primarily in larger, meaningful phrase groups. Although some regressions, repetitions, and deviations from text may be present, these do not appear to detract from the overall structure of the story. Preservation of the author's syntax is consistent. Some or most of the story is read with expressive interpretation.
	Level 3	Reads primarily in three- or four-word phrase groups. Some small groupings may be present. However, the majority of phrasing seems appropriate and preserves the syntax of the author. Little or no expressive interpretation is present.
Nonfluent	**Level 2**	Reads primarily in two-word phrases with some three- or four-word groupings. Some word-by-word reading may be present. Word groupings may seem awkward and unrelated to larger context of sentence or passage.
	Level 1	Reads primarily word-by-word. Occasional two-word or three-word phrases may occur—but these are infrequent and/or they do not preserve meaningful syntax.

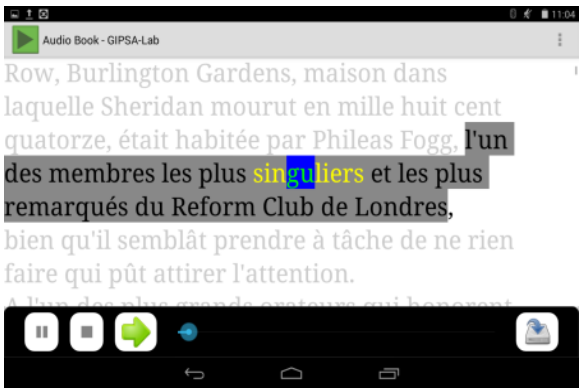
SOURCE: U.S. Department of Education, Institute of Education Sciences, National Center for Education Statistics, National Assessment of Educational Progress (NAEP), 2002 Oral Reading Study.

Figure 1. Evaluation grid for Oral Reading Fluency (ORF).

Objectives

This work will be performed in the framework of the e-FRAN project *Fluence*, recently funded by the French Ministry of Education. The overall objective of this project is to develop and assess computer-assisted language learning (CALL) systems that aim at improving reading fluency in the classroom.

GIPSA-Lab has developed and assessed such a system – called RAKE – based on the principle of Karaoke (see snapshot). The key idea is to augment the target text with audiovisual resources that enlightens the part of speech/text currently heard/fixated by the tutor/trainee. The purpose of this audiovisual entrainment is to trigger sensorimotor resonance and an implicit transfer of skills between the reading tutor and



the trainee.
We have already studied the transfer of skills at the word level by enlightening the current word [7] [8]. We would now want to explore the impact of enlightening speech/text chunks, notably breath groups on reading skills.

Proposed work

As shown in the snapshot above, RAKE offers the possibility to enlighten several speech units – i.e. the current syllable, word & breath group. The pause duration between breath groups is cued by a vanishing cursor positioned on the corresponding space or punctuation, if any.
We will test here if a close-shadowed reading [9] of a text with vs. without breath groups' enlightening has a significant impact of text comprehension[10] (notably using Maze tests[11]) as well as subsequent reading performance. Syntactic boundaries are known to attract pause placement[12,13] and pauses contribute to the encoding of discourse structure[14]. We will also monitor breathing patterns via a respiratory belt[15]. Please note that we already have pre-recorded performances of speech & respiratory traces of 8 subjects reading 14 short passages[15].
The internship will essentially consist in four tasks:

- State of the art review on RwL and reading fluency assessment
- Defining the experimental protocol (control condition, pre- and post-tests, evaluation of performance, etc)
- Conducting the preliminary experiments with a dozen of children
- Exploitation of qualitative and quantitative (correlation between respiratory signals) results

Expected competences

- Mastering stats (Matlab or R)

Research themes

- Experimental psycholinguistics
- Experimental phonetics, notably coordination between speech & respiration

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Traineeship grant

Interns will be provided with a monthly stipend of about 530€, according to French law regulations.

References

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