Adaptive Reading Assistance for Dyslexic Students: Closing the Loop

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Dyslexia Overview

- Effect: Significantly reduced reading and writing skills
- Core skills affected => dyslexic people become low achievers
- Frequency: 10% of all people in EU (estimation)
- Supposedly results from brain defect (genetical)
- Cannot be healed, but effects are reduced through training
- No generally accepted teaching methods
Accommodative Learning Environment

- Problem: Dyslexic pupils are often trained separately
- Better: Assist their skills in normal teaching environment
- But: Direct teacher support will normally be limited
- Idea: Complementation by eLearning system
- Requirements:
  - sensitive to learner’s specific capabilities
  - sensitive to learner’s current emotional and mental state
- Thus: We need a highly adaptive assistance system
Accomodative intelligent educational Environments for dyslexic Learners

- Project Aims: reading assistance system for 8-10 yr old pupils
- Consortium: 9 partners (developm., evaluation, projectman.)
- Project-Lead: ICCS (scientific), ATOS (project-man.)
Travel to 2012 to find out whether your best friend makes the Olympic team. Zoom to 2020: Have robots taken over kids' chores? Take a trip to 2025 to check out the newest virtual reality games.

TIME AND SPEED
Time travel isn’t something only for the future. You’ve already time-traveled often yourself. Flying in an airplane or even riding in an automobile results in teeny bits of time travel.

relative. That principle just means that different conditions cause time to pass at different rates.

Time doesn’t tick by everywhere at a constant speed. Imagine, for instance, two identical, highly

it returns to Earth. If you could compare the time shown on the earthbound watch to that on the identical watch that had traveled in space, you would find that the earthbound watch showed a later time. Time would have

- Karaoke like highlighting of words
- manual adjustment of features
agent-DYSL: Innovative Features

- **Text adaptation** (highlighting speed, font attributes, preemptive reading decisions) based on user specific reading error profiles
- **Reading error detection** based on speech recognition techniques
- **Mental state recognition** based on face analysis techniques
Problem: Dyslexia experts unable to provide adaptation knowledge related to reading error profiles.

Dyslexia Teaching Theories

Based on new insights, the adaptation knowledge of the system is improved by dyslexia experts.

Analyze

The reading skills development of a large sample of learners is analyzed from a scientific point of view regarding the effectiveness of certain teaching strategies.

Learner Progress Evaluation

At regular intervals reading skills and error types are analyzed using speech recognition software.

Adaptation Knowledge

Improving rules are applied at runtime to support the learner.
Rulebased Adaptation Knowledge

- Observation: Adaptation knowledge naturally expressible as sets of rules
  1. **IF** the learner's current mental state is normal, **AND** the learner's preferred font size is \( n \) points, **THEN** adapt the font size to \( n \) points.
  2. **IF** the learner's current mental state is **NOT** normal, **AND** the learner's preferred font size is \( n \) points, **THEN** adapt the font size to \( 120\% \times n \) points.

- Plan: Encoding adaptation knowledge directly as rulesets
- Advantage1: Allows faster adjustment of adaptation knowledge
- Advantage2: Easier communication with dyslexia experts
Ontology based User Profiling

- Adaptation rule sets work on knowledge bases
- Idea: Ontologies enable common conceptual modeling with dyslexia experts
Outlook

- Current state: Finalizing system’s architecture specification
- Start implementation phase: October
- FZI tasks:
  - Ontology based knowledge infrastructure
  - User profiling and text adaptation (with ULBS, Romania)
- Evaluation: Testbeds for English, Greek, Danish