NAZARBAYEV UNIVERSITY
SCHOOL OF ENGINEERING AND DIGITAL SCIENCES

ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

CoWriting Kazakh: Learning a New Script with a Robot

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Motivation:

1) A recent decision of Kazakhstan's authorities to transition from Cyrillic to Latin alphabet is a risky endeavor and raises many challenges.
2) Considering the need for the current generation of primary school children to be fluent in both scripts, this project aims to assist children via human-robot interaction in learning a new script and its associated handwriting.

ALIZE

SAR

DragonBot

EASEL

Pretend Play Testbed

Robovie in Japan

KASPAR

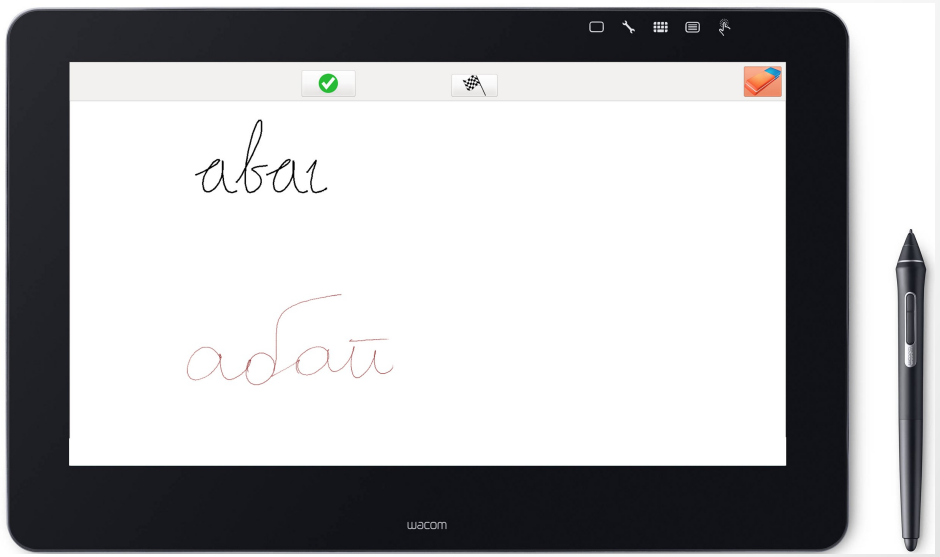
CoWriter

LIREC

DREAM

CoWriting Kazakh HRI system

- CoWriter project was developed at the CHILI lab in EPFL.
- It aims to help children with the acquisition of handwriting via learning by teaching approach.
- We adapted original CoWriter to Kazakh language and also added OCR for automatic conversion of children's handwriting.



Hypothesis:

It is more effective for learning a new script when a child performs conversion of the word spelling mentally and attempts to write the word in Latin and then observe correctly written Latin spelling by the robot (Latin-to-Latin condition).

Experimental conditions:

- **Latin-to-Latin demonstration:**
  - the child does the conversion mentally and writes directly in Latin

- **Cyrillic-to-Latin demonstration:**
  - the robot does the conversion. The child writes in Cyrillic and observes the Latin writing provided by the robot.

SCENARIO

NAO: - Hello. I am a robot. My name is Mimi. [Waves his hand]

Child: - ...

NAO: - I study Kazakh language. Can you help me?

Child: - ...

NAO: - How do you say ``Hello'' in Kazakh?

Child: -Salem

NAO: - How do you write it? [In Latin-to-Latin case: Please write it using Latin letters so that I can read it.]

Child: [Writes on a tablet the word in one of the scripts]

NAO: Let me try to write it too [gesticulates]. This is a correct writing using Latin letters.

... repeated for another 12 words for a total of 13 words

NAO: - You are a great teacher. Thank you very much! Goodbye! [waves]

HRI Study

- 67 children aged (32 F) 8-11 years old
- Between-subject design with each child for approximately 15 minutes
- Primary school in the capital of Kazakhstan
- Children did a pre-test and a post-test on their knowledge of Latin alphabet
- Ethical approval by NU IREC committee

Results

- Hypothesis is rejected. No differences between conditions.
- However, a two-way ANOVA demonstrated a significant difference between gender and robot condition: $F(1, 64) = 6.17$, $p = .016$.
- Males learned more in Cyrillic-to-Latin condition (5.06 ± 3.28 vs 3.59 ± 2.89) while females learned more in Latin-to-Latin condition (3.00 ± 2.87 vs 6.07 ± 5.31).

Discussion

- Exploring strategies of choosing a vocabulary:
  - Foreign language vocabulary: e.g. hello, cat, dog, open, etc.
  - Use of cognates: e.g. robot -> robot, hot dog -> hot dog, but football, computer are written as they are pronounced, thus futbol was mistakenly spelled as footbol.
  - Non-existing/unknown words to avoid confusion with prior knowledge: e.g. nao, uno, etc.
- Child's own choice of the vocabulary to teach the robot

Future Work

- Towards cognitive learning of a new script
- Improvement of handwriting recognition
- Adapting to child’s mistakes for personalized learning strategy.

Thank you for your attention!

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