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LETTER AND WORD PREDICTION FOR VIRTUAL BRAILLE KEYBOARD

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Presenter

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  - Assistive Technology, Human-Computer Interaction, Game Accessibility, Mobile Devices
- Other
  - Expert of the National Centre for Research and Development
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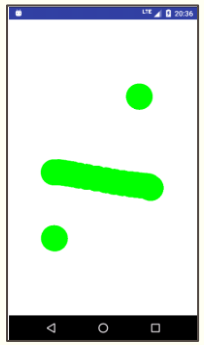
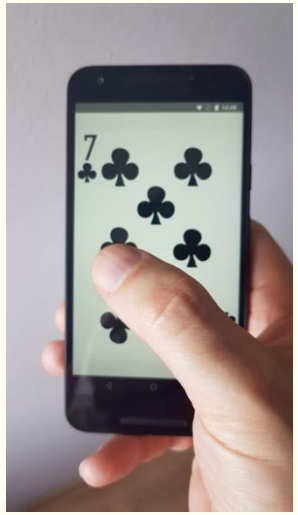
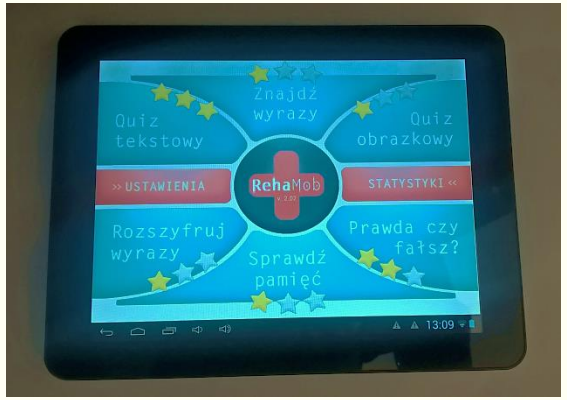
Research Areas

- Text Entry Methods



- Game Accessibility





Agenda

- Background
- The project
- Prediction for Braille Keyboards
- Proposed Method
- Evaluation
- Conclusions

Background

- Typing on a touchscreen
- Six, three, two or a single finger?
- Methods with taps and swipes
- Various active areas on a screen surface
- Word prediction

The Project

Objective

- Application of prediction to a virtual Braille keyboard

Assumption

- The use of touchscreen with a single indicator

Method

- Taps, simple swipes, voice feedback

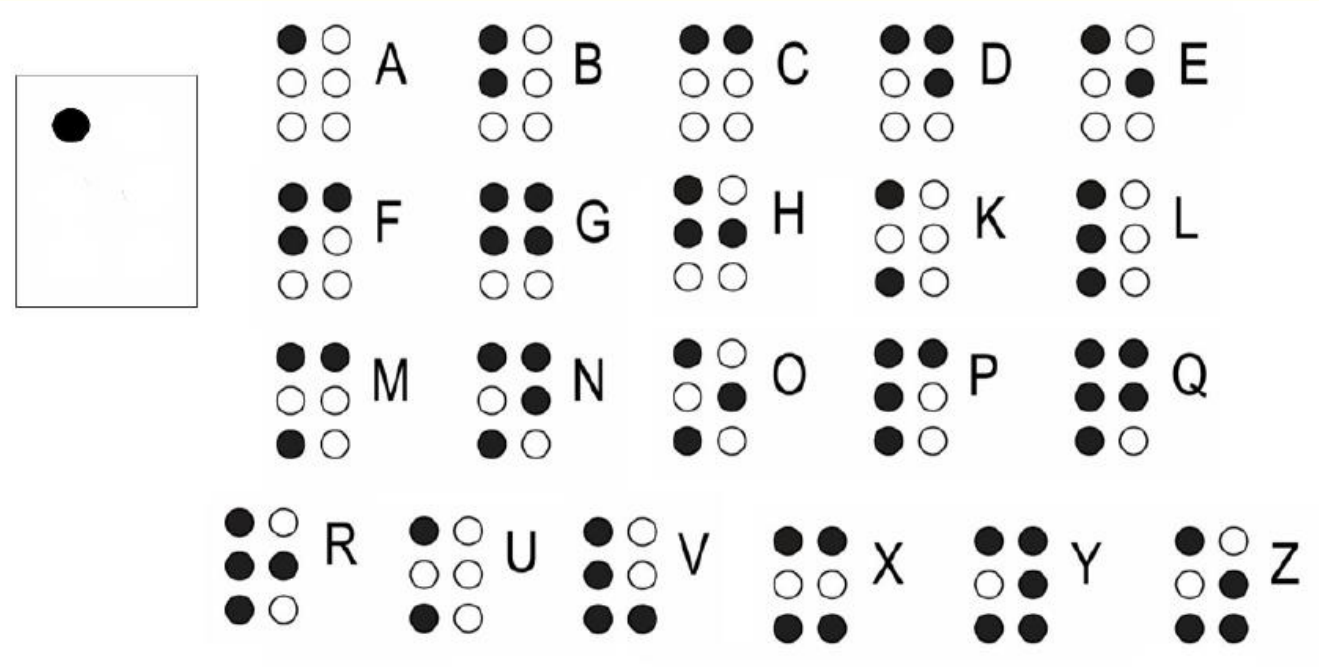
Expected results

- Improvement of a Braille keyboard efficiency

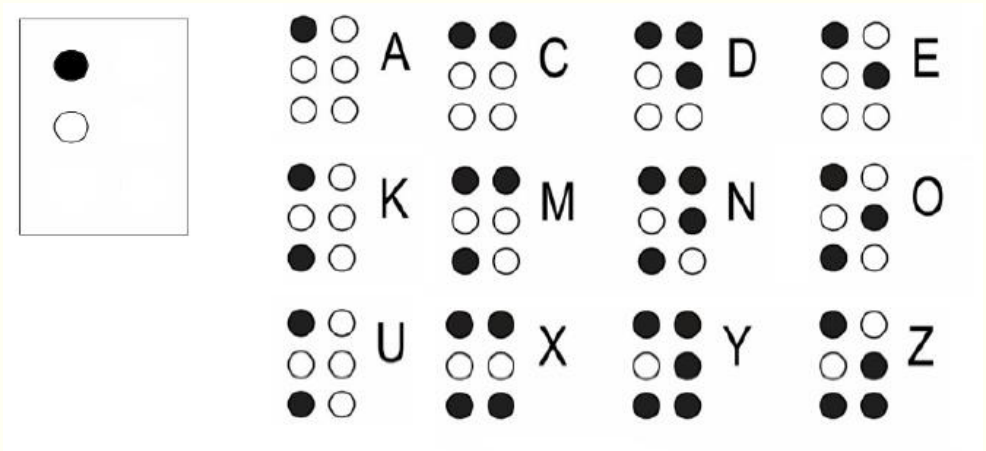
Proposed Method

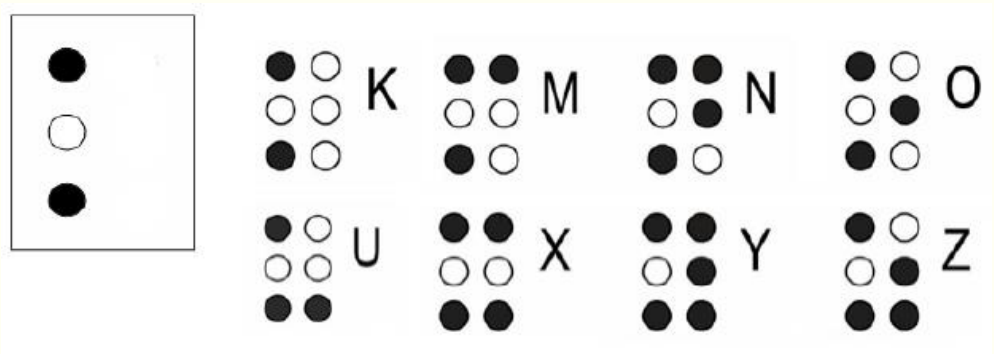
- Interaction template of the *BrailleEnter* method
- Gestures:
  - *Single tap* – adding an empty dot
  - *Long press* – adding a raised dot
  - *Swipe left/right* – reading aloud next suggestion from the list
  - *Swipe down* – acceptance of suggested letter or word
  - *Swipe up* – clearing entered letter or word

Investigate a way to ’M’ – first dot

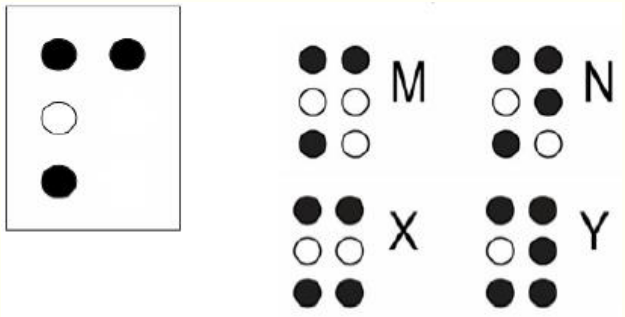


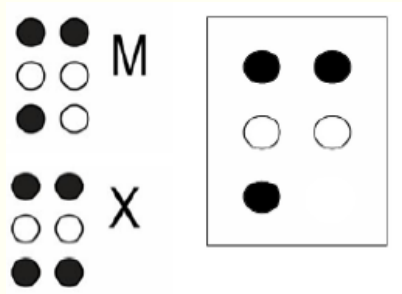
Investigate a way to ’M’ – second and third dot

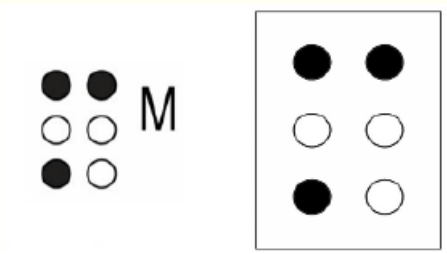




Investigate a way to ’M’ – last dots







Evaluation - Procedure

- First estimation uses an average time for a single….
  …..tap, long press, swipe, double tap, letter speech, word speech
- Second estimation uses average typing time for each letter multiplying by its frequency
- Selection of the typed text
- Measurement of the real test using a smartphone application

Results

Gesture	1^{st}dot	2^{nd}dot	3^{nd}dot	words	*BrailleEnter*
tap	0.06	2.50	3.95	0.52	10.09
press	22.36	35.47	51.66	20.82	87.12
double tap	1.72	1.72	1.72	1.72	1.72
swipe	23.48	13.00	9.92	21.20	-
letters	52.27	31.69	24.19	50.87	-
words	-	-	-	-	-
total	105.46	**84.37**	91.43	96.76	98.93
2nd estimation	119.24	142.21	165.72	**112.05**	162.80
measurement	214.25	246.25	255.02	**205.17**	284.90

- Letter prediction after 2nd dot is the best when the estimation uses average gesture time for letters
- Word prediction after the 1st dot and 4th letter wins when estimation uses letter frequencies and when the real test is measured

Conclusion

- Obtained the best result (2.46 WPM) is better than the reference value (1.77 WPM)
- Not all of Braille keyboards can be improved by prediction
- Typing speed for some letters could be increased by 1 to over 3 seconds using a letter prediction
- English words are generally short - in the case of used pangram only three words were long enough to apply a word prediction
- Word prediction saved only 9 seconds – it is about 4% of the time used by the attempt with the letter prediction after 1st dot

Future Work

- Letter prediction can be improved, taking into account the frequency of letters in English
- Word prediction can be improved by more advanced algorithm
- Experiments with a speed of voice feedback
- More experienced users will obtain better results for Braille keyboard with prediction

Thank you for attention