

**AVI 2012**

**Advanced Visual Interfaces**

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in cooperation with ACM-SIGCHI, ACM-SIGMM, SIGCHI Italy**

**Capri Palace Hotel, Capri Island (Naples), Italy  
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# **SWift: a SignWriting improved fast transcriber**

Claudia S. Bianchini, Fabrizio Borgia, Paolo Bottoni, [Maria De Marsico](#)



- **Deaf world**

**SignWriting**

**SWift**

**Conclusions**



# Deaf world

- Deaf people have **problems** in decoding the written form of **verbal** language. **W3C** addresses this problem, but less extensively than accessibility for blind people.
- Many deaf people communicate among them by a **visual-gestural** form which is **different** from the **vocal** one used by hearing people.
- This form of communication is not a mere gesticulation, or a mere transduction of a vocal language, but is a **language** in itself, a **sign language** with very complex features.

«To look»  
Italian Sign Language



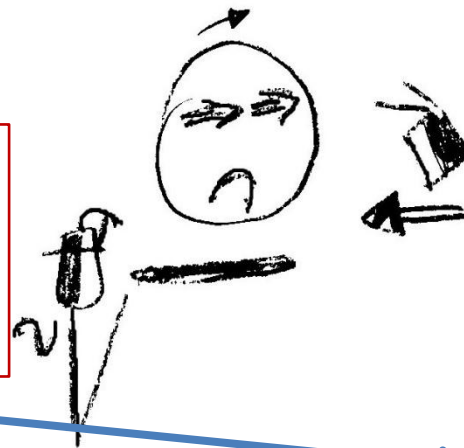
# Deaf world



# Highly Iconic Structures

- A sign does **not only** involve hands, but also expression of eyes and mouth, etc.
- **Highly Iconic Structures** condense in a single sign a great amount of semantic information, which cannot be immediately translated in verbal language

**Referents** (objects to which the message is implicitly or explicitly referred) are rendered through expression variations and deictic gesture elements of the signer



[THE CHILD], holding the basket, looks towards [THE MAN] to see if is looking at him



# A writing system for sign languages

- At present sign languages have **no** widely accepted **writing** system, therefore can be compared to oral languages.
- As a consequence, also a transcription system is lacking.
- Many written representations have been proposed since 1700, but **SignWriting** seems one of the most valid methods.
- Many studies have been performed by ISTC-CNR Istituto di Scienze e Tecnologie della Cognizione - Institute of Cognitive Sciences and Technologies



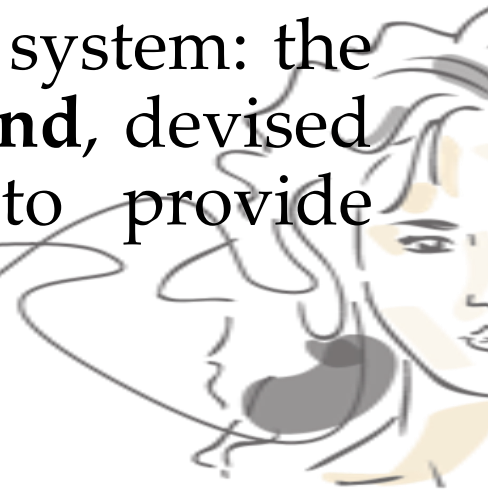
# Deaf World

- **SignWriting**  
**SWift**  
**Conclusions**



# SignWriting

- **SignWriting** (SW) exploits a set of elementary **iconic** symbols (**glyphs**) to represent the single **components** of sign languages.
- Glyphs lay in a 2D space which represents the signing person
- SignWriting is part of a wider writing system: the **Sutton Movement Writing & Shorthand**, devised by Valerie Sutton, with the aim to provide notations to track any body part.





# Glyphs

- **Glyphs** can represent a movement or a configuration for the hand, a body posture, a part of a facial expression, etc.
- The union of different glyphs allows to compose a sign.
- The set of all glyphs makes up **ISWA** (International SignWriting Alphabet), which also associates a coding to each glyph (ISWA 2008 includes about 40000 glyphs)

# Examples of glyphs

- Hands configurations



- Hands and arms movements



- Eyes



- Mouth



- Contact points



- Punctuation

- ...



# A sign and its elements



Facial Expression



Shoulders Position



Hand Configuration



Contact

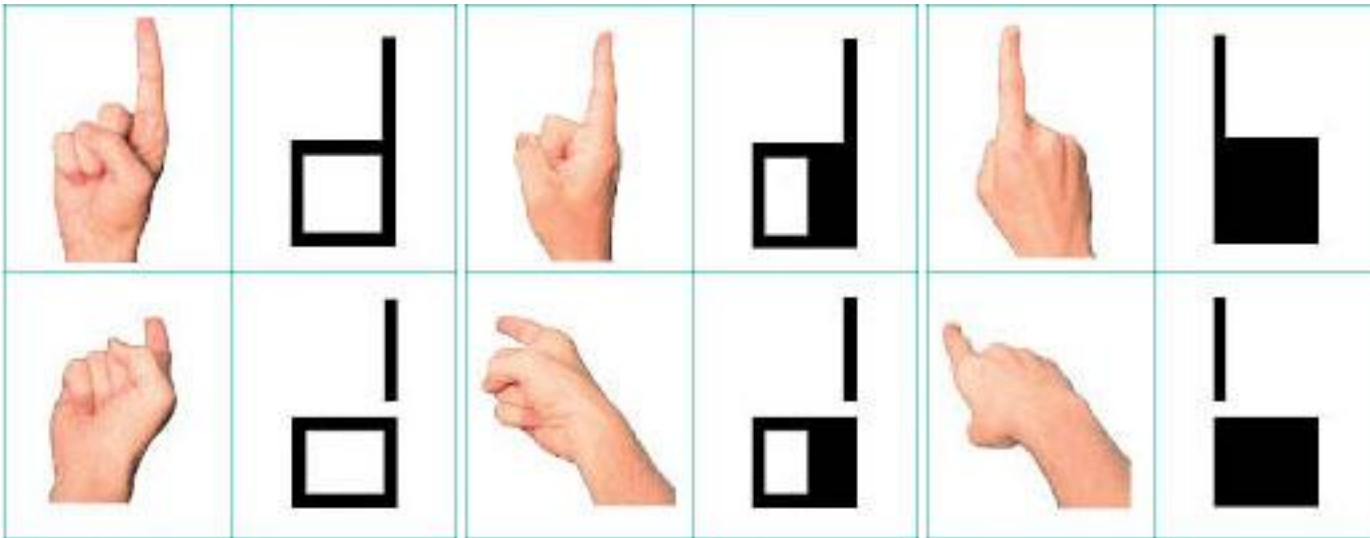


Movement

# Example (cont)

Basic glyph: 

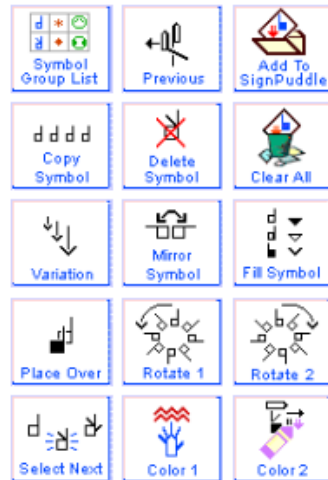
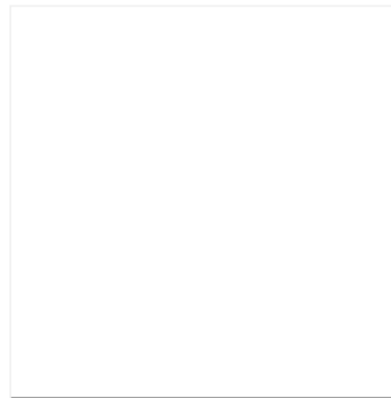
Used as **prototype** to which **variations** are applied



# SignMaker

SignMaker

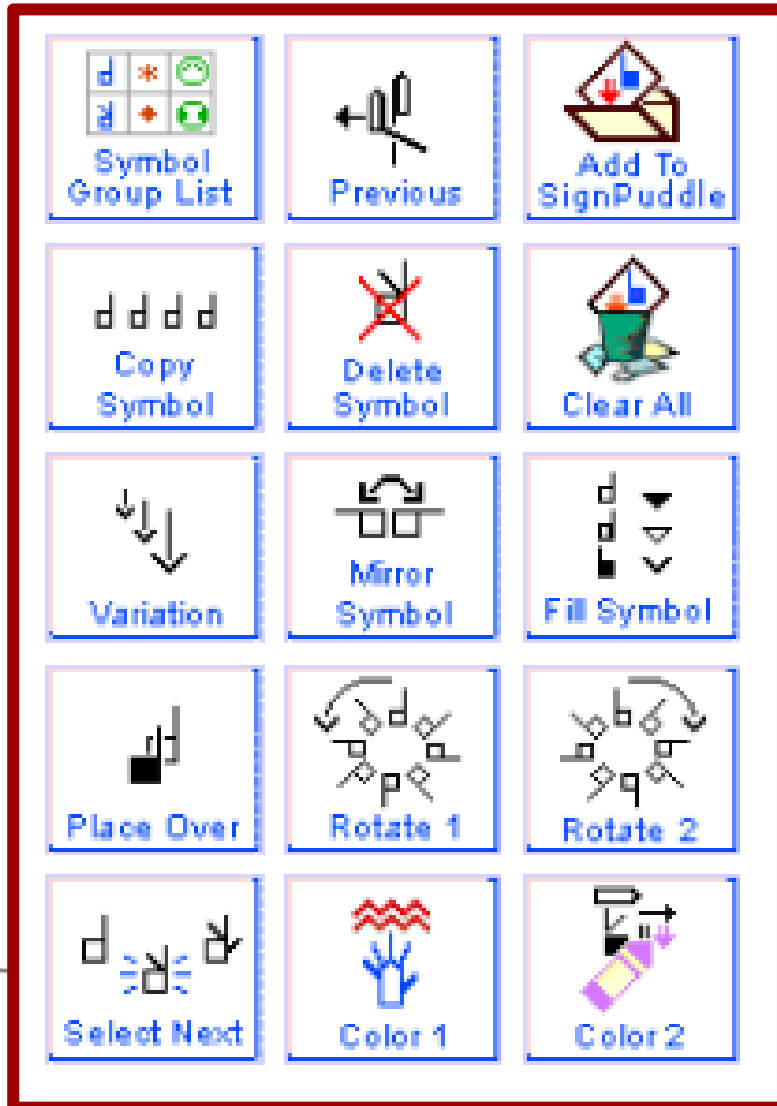
**SignMaker** is an application provided by Sutton's team to compose signs in SignWriting with the aid of a computer.



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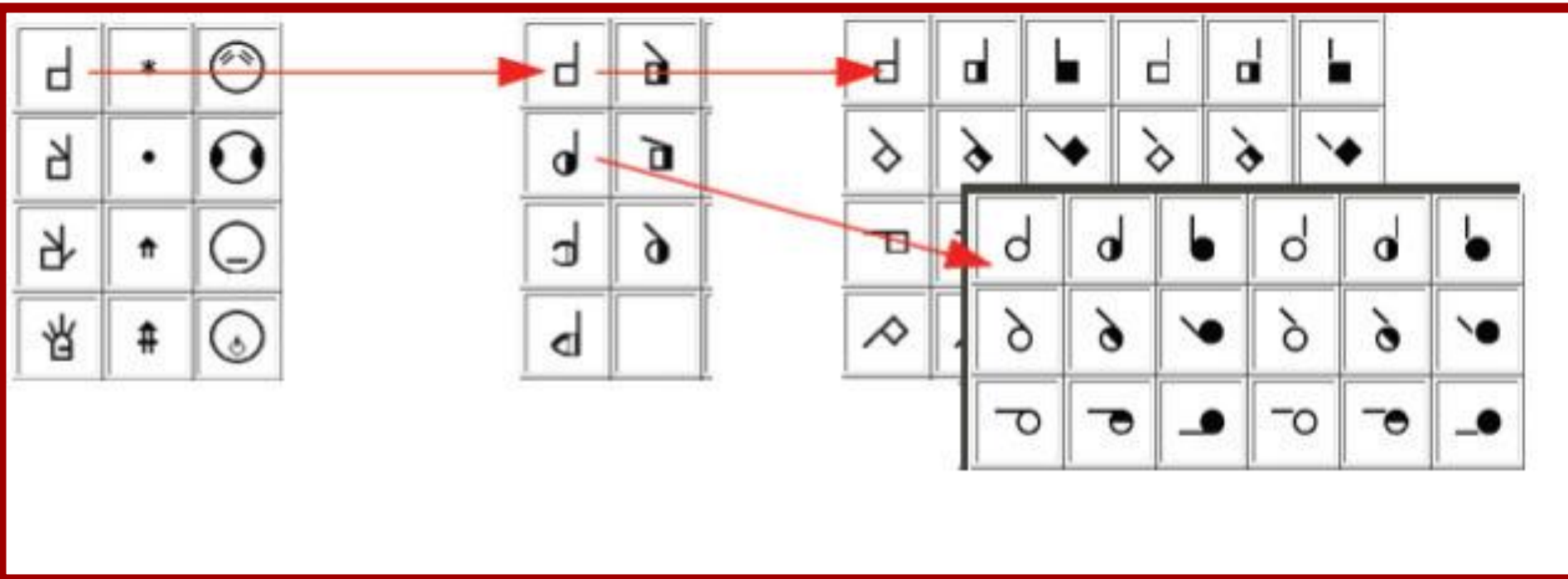


# SignMaker

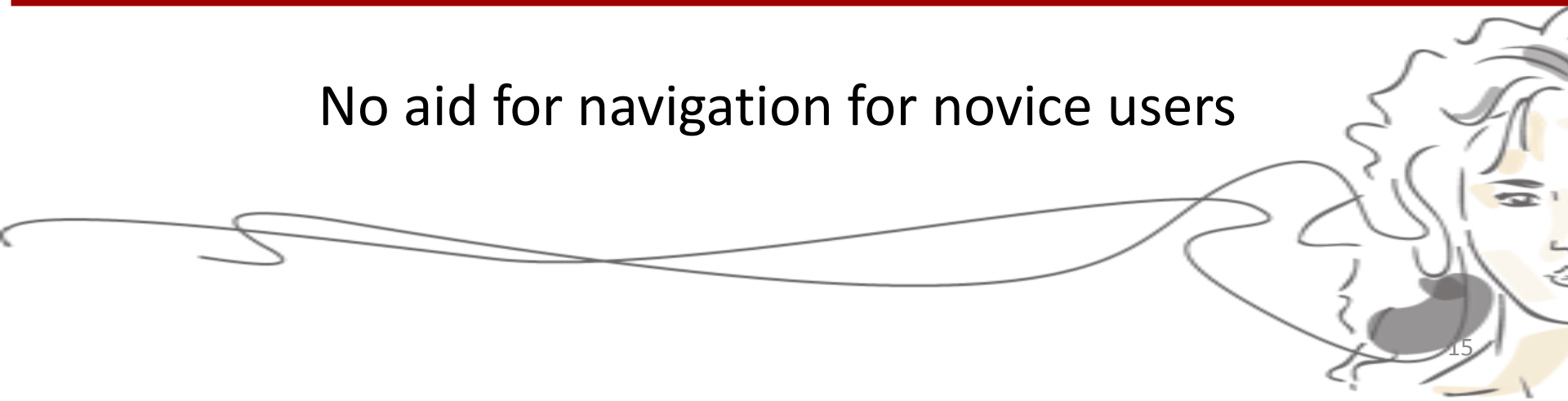


All tools grouped together far from their targets

# SignMaker



No aid for navigation for novice users



Deaf World

SignWriting

- **SWift**

**Conclusions**



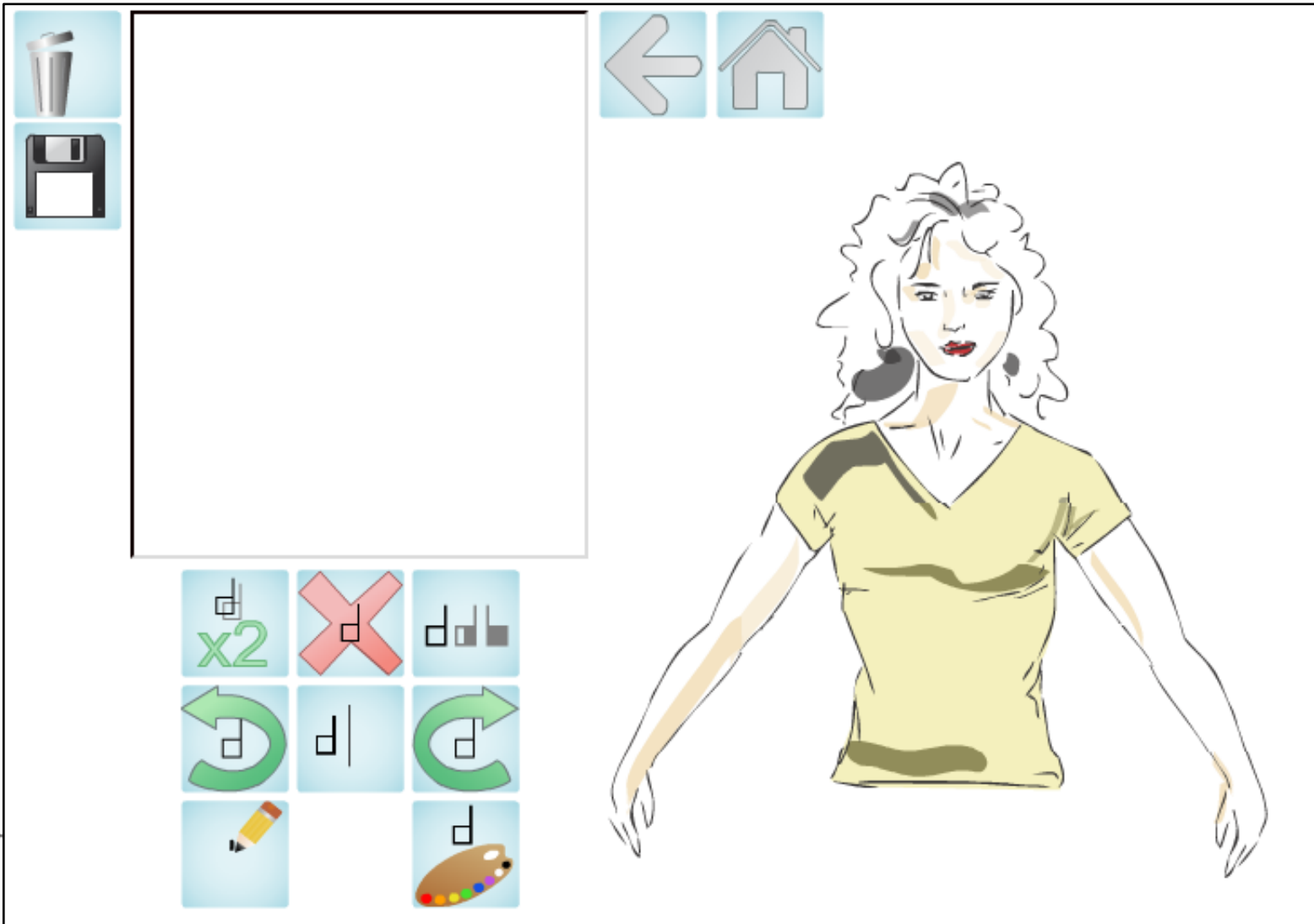


# Design approach

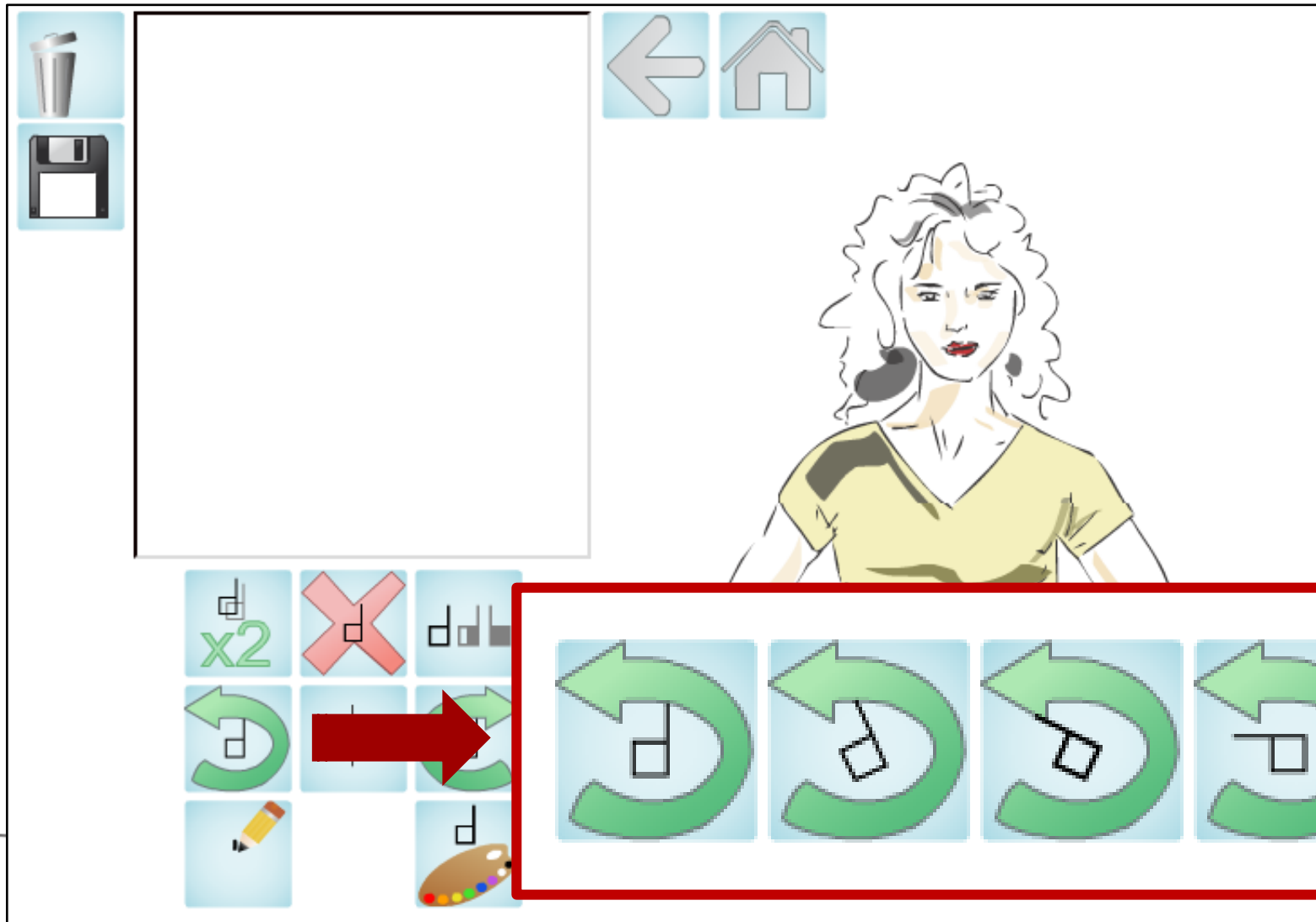
- User centered design
- Contextual design
- Design with target users = deaf researchers from ISTC-CNR (Institute of Cognitive Sciences and Technologies of the Italian National Research Council)



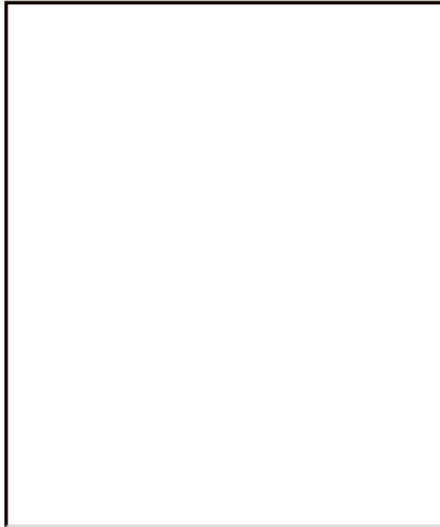
# SWIFT



# SWIFT



# SWIFT



## Configurazioni



*Numero Dita:*



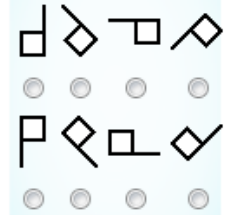
*Mano:*



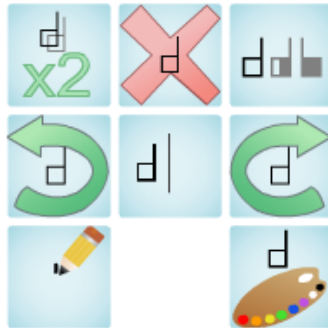
*Lato:*



*Rotazione:*



*Piano:*



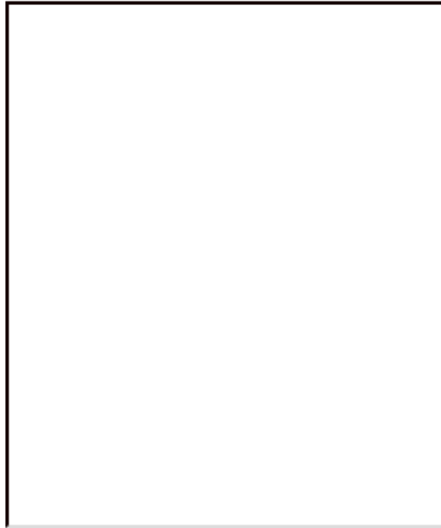
## Movimenti



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# SWIFT



## Configurazioni



*Numero Dita:*



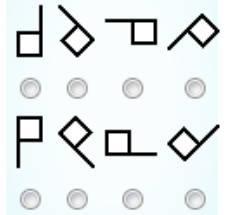
*Mano:*



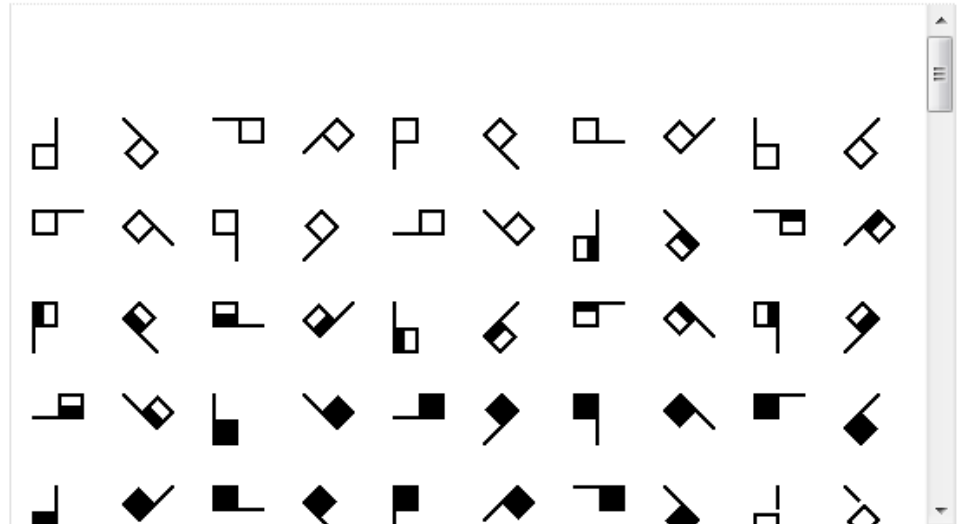
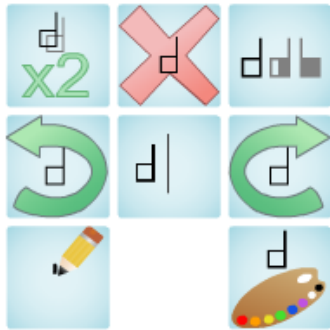
*Lato:*



*Rotazione:*



*Piano:*

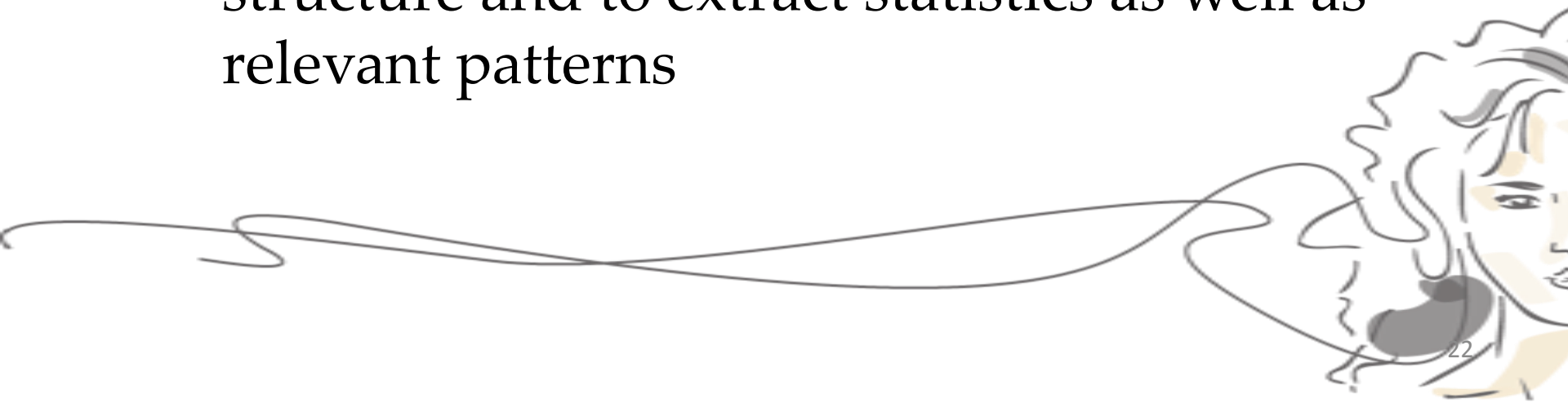


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# Sign recording

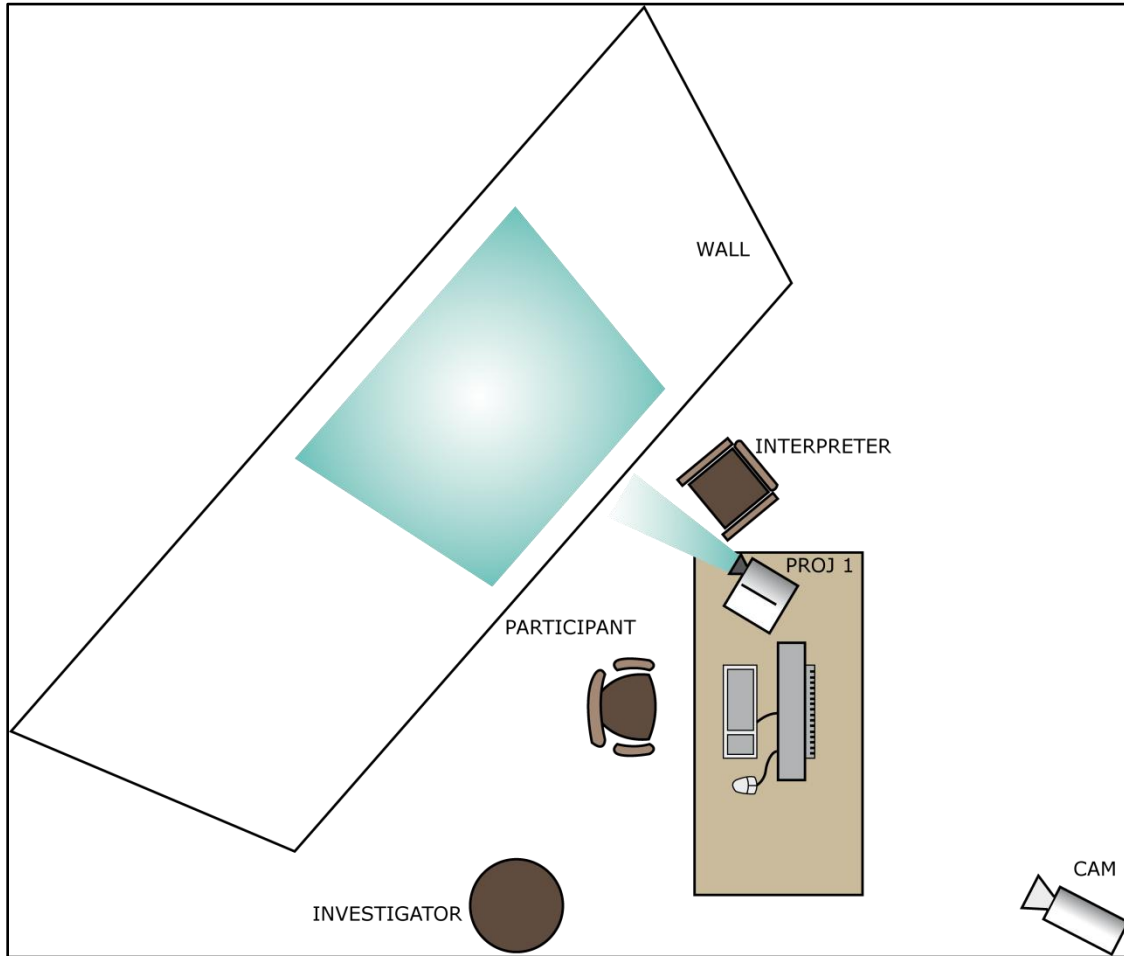
- Each sign is recorded in a database with the list of component glyphs.
- Two important results
  - It was possible to set up a suggestion strategy
  - It is possible for linguists to investigate sign structure and to extract statistics as well as relevant patterns



# Usability study

- **Welcome time:** the deaf participant (DP) is greeted and briefed by a screen containing a signed video and its transcription.
- The **“sign-aloud” test:** DP is asked to perform a list of tasks to test SWift functions and usability, and to record anything that comes to her/his mind.
  - Users need reminders for which task is being performed, what needs to be done, etc.
  - The task list should be available in both VL and SL.
  - We involved a hearing interpreter (HI), since the possibility of interaction between DP and HI increases correct understanding of the tasks.
  - HI always provided a task translation in SL at the beginning of each task.
- The final **usability questionnaire** was designed by adapting the QUIS questionnaire to the needs of deaf users. In particular, each (simplified) written question was accompanied by the corresponding SL clip.

# Usability study



A variation of the schema proposed by Roberts and Fels



# Evaluation results

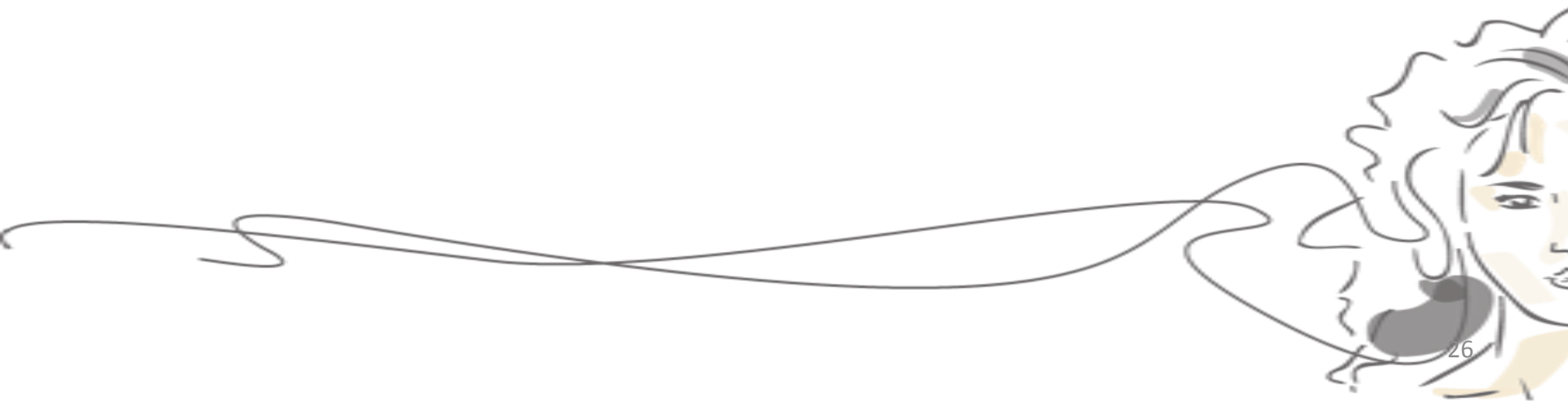
- Ten users which were SignWriters
- Low error rate in the choice of functions and sign paths
- Good users' satisfaction
- A purely quantitative comparison of average insertion time for 15 glyphs using SM (01:15:10) and SWift (00:57:30) confirms an overall positive result.

Deaf World

SignWriting

SWift

- **Conclusions**



# Conclusions and future work

- We have achieved good results till now.
  - Effective editor
  - Ability to study sign structure
- Plans
  - An editor for whole documents
  - A recognizer for handwritten signs to achieve the same sign recording (corpora)
  - A recognizer of signs in video sequences
  - Project SWORD (SignWriting Oriented Resources for Deaf)



**Mille Grazie! (Thank you very much!)**

