

CoWriter : Two case Studies

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ABSTRACT

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Keywords

robot-supported educative activitiy, handwriting learning, learning by teaching

1. INTRODUCTION

2. THE COWRITER ACTIVITY

2.1 Children teach handwriting to the robot

2.2 Our approach

2.3 Learning and generating letters

2.4 robotic implementation

3. CASE 1 : DIEGO

3.1 Context

Diego is a five years old child. Her mother told us he had difficulties to learn writing at school, particularly in drawing cursive letters. Before experiments, she provided us with a homework of Diego to show explicitly his handwritng level (fig).

From our perspective, Diego is shy and quiet. He suffers from a poor self-esteem much more than any actual trouble in writing.

3.2 Questions

The CoWriter activity needs a child engaged as interaction leader. In this study we consider the problem of long-term interactions : is it possible to sustain this engagement over several one-hour sessions ?

3.3 Experimental settings

The experiment took place in our laboratory. Our goal was to figure out an environment in order to make Diego sustaining engagement over four sessions of one hour, one session per week. We decided to introduce an appealing scenario that justified to the child the activity where a robot wants to learn handwriting. We used two Nao robots : a blue one (called Mimi) and an orange one (called Clem). Mimi was away for a scientific mission, and the two robots had to communicate by mails. But they decided to do it “like humans”, with handwritten messages. While Mimi was good in handwriting, Clem had strong difficulties and needed the help of Diego.

The mission of Mimi consisted in the exploration of a mysterious hidden base. Each week, just before the session, it was sending a postal mail contening a picture, a curious object it found and a few handwritten words about its discoveries. The pictures was representing itself exploring a dark room of the hidden base (that was actually our laboratory’s workshop). The objects were 3D printed. In fact, there where puzzle pieces of a small 3D model of Nao robot but regarding them one by one, it was not easy to guess it.

During the three first session, Clem (the other robot) was waiting for Diego with the recieved mail. It let Diego take a look to the picture and the object, and then it asked him to read the message. Finally, Diego figured out a response and helped the robot to write it.

The fourth and last session was set as a test: Mimi, the “explorer” robot, had come back from its mission and it actually challenged Clem in front of Diego: *“I don’t believe you wrote yourself these nice letters that I received! Prove it to me by writing something in front of me!”* This situation was meant to evidence the Protégé effect: by judging the other robot’s handwriting, Mimi would implicitly judge Diego’s skills as teacher, and in turn, Diego’s handwriting.

To complement the intrinsic motivation of helping a robot to communicate with another one, we gradually increased the complexity of Diego’s task to keep it challenging and interesting (the first week: demonstration of single letters; the second week: short words; the third week: a full message – Figure ??).

Dieg had to tell the robot what to write with small plastic letters (visible behind the robot on Figure ??). A third person was here to send the formed word to the robot via the computer.

3.4 Results

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4. CASE 2 : HENRY

4.1 Context

Henry, 5.5 years old child, is under the care of an occupational therapist. He has been diagnosed with visuo-constructive deficits. As an effect in writing activities, he was frequently performing random attempts and then was comparing with the provided template. What is more, Henry is strongly careless : he rarely payes attention to advices, even to what he is doing when he is currently drawing, and he is quickly shifting his attention from one activity to another.

Henry was working on number's allographs with his therapist. During a prior meeting, the therapist provided us with a sequence of numbers written by Henry ???. Henry was sometime drawing horizontally-inverted allographs, mainly for "5".

4.2 Questions

This study focused technical adaptations of the CoWriter activity for a child diagnosed with real writing deficits. Our objective is to investigate small modifications of the activity adapted to the troubles of Henry (visuo-constructive deficits and inattention) in order to sustain him focused on the activity during forty-minutes session, and to make the robot evidently learning from his demonstrations.

4.3 Experimental settings

The experiment took place in the therapist's office. It was divided in four sessions. This time, we assumed that a scenario like the one we used for Vincent was no longer relevant with Henry. We just introduced the robot and quickly said that it was seeking help to train for a robot handwriting contest.

In order to better fit the work of the therapist, we decided to turn the CoWriter activity to teach numbers to the robot. Build on existing iPad applications actually used by occupational therapists (Dawson Toth's *ABC's Writer*), we designed an Android application for pre-test and post-test. It consisted in drawing numbers with finger following an helping pattern, that becomes more fine with levels in order to increase difficulty ??.

Since Henry was frequently drawing horizontally-inverted numbers, or even unrecognizable allographs, the learning algorithm of the robot was converging to meaningless scrawls. To fix this problem, we programmed the robot to refuse allographs that were too distant to a reference with a threshold we arbitrary fixed. In that way, the child was forced to take care on what he was providing to the robot as demonstration.

According to the therapist, it was easier for Henry to memorize the way to draw a number if it was allways done is the same order, *e.g.* if the "5" was allways drawn from the top-right tip up to bottom. Therefor we programmed the robot to refuse as well a good allographs drawn in a wrong order. But in order to reassure Henry about the right final allograph's shape, we made the robot able to recognize such a drawing, and, when it ocured, to tell the child something like : *"Oh, this is exactly the shape of the number I want to learn, but can you show me how to draw it in the opposite order ?"*

Also, to make sure the robot was going to improve its handwriting and to clearly show this improvement, we de-

cided to make it starting from scratch : for all numbers, the first try of the robot resulted in a simple vertical stroke (see the first robot's try in ??).

In this setup, we added a second tablet with one button per numbers. It was used by the child to chose a new number to teach to the robot. It also provided the possiblity to enter letters or words, and to switch to another activity (the robot telling a story).

4.4 Results

5. DISCUSSION

6. CONCLUSIONS