Scuola di Robotica

Semantic and epistemological continuity in educational robots'

Emanuele Micheli – Marco Avidano –Fiorella Operto

Scuola di Robotica

(micheli,operto)@scuoladirobotica.it

Simpar 2008 – Teaching with Robotics

Let's introduce ourselves

Scuola di Robotica

Mission

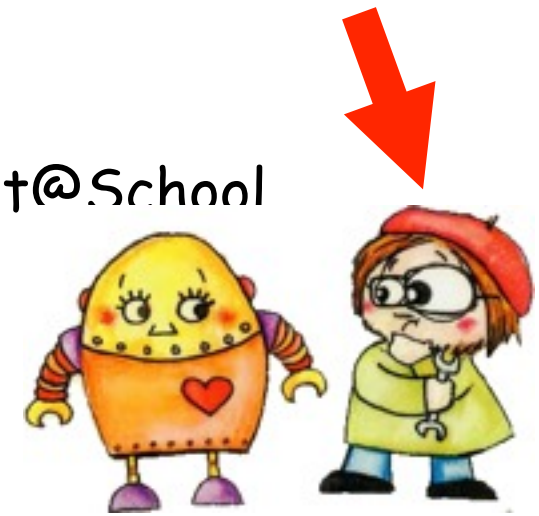
Promotion and spreading of culture through training, learning-educational (edutainment) and dissemination activities of all those arts and sciences involved in the development process of robotics.

School of Robotics co-ordinates a network of 60 schools from primary to secondary where Robotics is employed as educational platform to learn many subjects and to improve abilities.

Scuola di Robotica

Emanuele Micheli

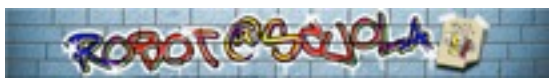
- Mechanical engineer
- Educational Robotics
- Roboethics
- Coordinator of the project Robot@School
- Tutor of teachers in "Roberta"

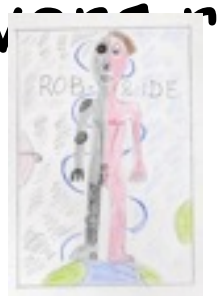


Scuola di Robotica

Our projects

- Robot@School
- Robodidactics
- Rob&Ide
- Roberta – Girls discover robotics



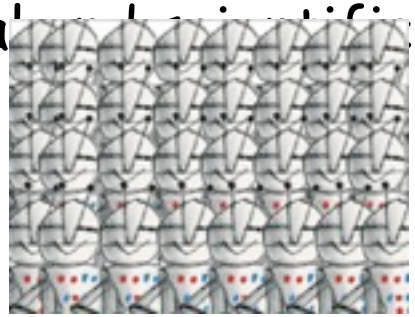


Roberta®
Girls discover Robots

Scuola di Robotica

Introduction

The increasing availability of robotic kits used for educational robotics from pre school to high school, demonstrates the interest in and the usefulness of these technological teaching methods, both in curriculum subjects and to increase the students' technica abilities.



Scuola di Robotica

The problem: Different Languages 1/2

The problem that the authors have noticed during several years of national and European projects in Educational Robotics is that there exists a gap and a discrepancy between the substance of that which is communicated and learn through educational robotics, and the different pieces of software that the robots themselves use.

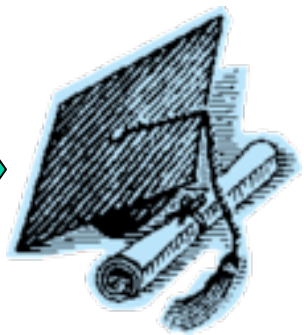
Simpar 2008 – Teaching with Robotics

The problem: Different Languages 2/2

This problem is a general problem, in our school system, when the teacher changes language to teach "concept", students have a lot of difficulties to learn.

GAP

GAP



Different language to solve the same problem

Following international projects Robodidactics and Roberta, many teachers have noted the difficulty that using different language to solve the same problems presents. The crux is that there is a risk that the student will be tied by the technical specificities of the language used and will not be able to find a pattern in the more complex languages.

Programme languages in robotics

Scuola di Robotica

Human language

Gap

Iconic language

Gap

Code language

Scuola di Robotica

The challenge

The language change presents a stumbling block for the students, and the challenge is to make this **transition as linear and logical as possible.**

Scuola di Robotica

General Algorithm

What is needed is a transition which allows the student to understand that behind all forms of language found in software there exists a common algorithm. If it were possible to find a constant technique used by the students in their curriculum, this technique would allow them to understand the origin of the algorithm and not just allow them to master the language.

General algorithm is a solution with human language.

Robopal - Robodidactics

The university of Amsterdam has develpoed an iconic software which is capable of translating the icons chosen by the student into a Java script. This characteristic, which is also highlighted in the European Robodidactics project, has improved the students' abilities of deduction and their ability to not be limited by the language used. The software used and developed by the university of Amsterdam is ROBOPAL.

Simpar 2008 – Teaching with Robotics

The continuity problem

- This problem is a learning problem and the solution is the base of the future educational robotics.
- Lego itself has, in its market projects, highlighted this continuity problem by introducing a new kit (WeDo) and a new language which is more easily understood by pre school children

Scuola di Robotica

Lego Wedo

- Link program's language to real application

immagini\wedo.mp4

Scuola di Robotica

A continuous path

The first step needed in order to understand, and to be aware of the existence of, different languages, is the creation of a personal, personalised language.

Scuola di Robotica

Roberta project

In Roberta project, the personalisation of the robotic artefact has allowed the female students to develop the robot more quickly, and to face scientific technological issues with more interest, passion and enthusiasm. Today, there are still no didactic normative paths which provide for the development of personalised program languages.

Roberta®
Girls discover Robots

Scuola di Robotica

Personal Language

The first part of the introduction to robotics and to programming is distinguished by the possibility for the children to personalise software commands found in the robot, thus rendering the language used unique and personal to them

Scuola di Robotica

Emoticons

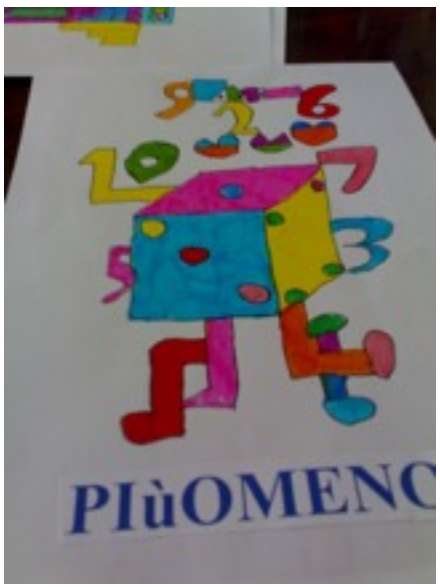
Primary school

Use emoticons to "programm" robot

Scuola di Robotica

My Bloc

Students creates a personal iconic language



Scuola di Robotica

My bloc

This first observation raises the need to produce new programming software for the NXT LEGO kit, software which is capable of adapting to the skills of the user. The Staff at School of Robotics, therefore, is working to meet this objective. The first step in the creation of new software will be to modify the icons of the NXT software with the "My Bloc" function

Scuola di Robotica

My bloc

Sharing personal language

The students will be able to personalize their own icons, getting them to correspond to their own language, and create macro actions. In this way, the program will become a personalized product to be shared with others. The teachers will easily be able to create blocks of commands capable of meeting the teaching needs and share these new blocks with other teachers.

Scuola di Robotica

Language's convergence

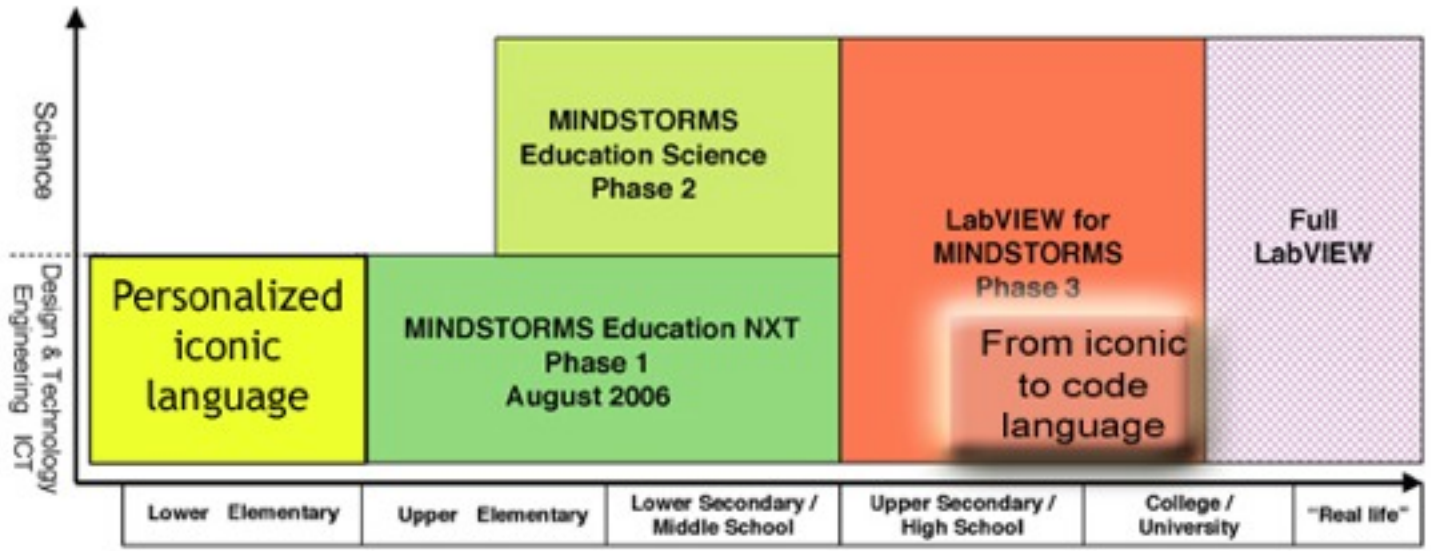
Immediately after the sharing there will be a convergence towards the standard iconic language.

Personal language is a learning process

The creation of a personal language improves the learning process of the children. The sharing step allows to improve our awarness of the knowledge.

Scuola di Robotica

A software and a methodology applicable from pre-school to high



Simpar 2008 – Teaching with Robotics

Scuola di Robotica

From 5 to 8 years

The first stage is only **oral**, each child must give vocal commands to their classmate (**who simulates a robot**). The second stage is linked to **drawing** the oral commands. The teacher can thus discover the multiplicity of the language corresponding to a common action. At this stage **the programming becomes matched with the narration.** Both verbal and graphic narration capable of describing the actions of a robot.

From 9 to 10 years

The teacher should promote more the students' activity of **assembling** the kit than the programming. The kids will combine together the NXT robotic kit on the basis of the standard models proposed by Lego Manuals. The teacher adapts the version of Lego NXT Education to the needs and specificities of his/her students. The programs written in this context have to be simple, with little use of the information from robotic sensors.

Simpar 2008 – Teaching with Robotics

Scuola di Robotica

From 11-13 years

In this phase the teaching shifts from a student-centered software (which was designed by the teacher) to **a standard language** which is the iconic language proposed by Lego, with no distinctive feature. The teacher will suggest the students to overcome programming by trial-and-error, previously **designing their program on paper**, drawing the program with self imagined flux diagrams, and then designing the software on their pc.

Simpar 2008 – Teaching with Robotics

Scuola di Robotica

From 14-17 years

The teacher will invite the students to formalize the program previously written on paper with the help of simple flux diagrams, or algorithms. In fact, it is important for the students to start writing algorithms **abandoning the iconic language and using words, which is the first step towards learning program codes**. At this point our converter can be usefully used – a shifter from iconic to code lines.

Scuola di Robotica

Future Prospects

- Online platform to share personal and common languages.
- Open source software to programme robot with continuity.
- **The growth of the network**

The end

Any questions?