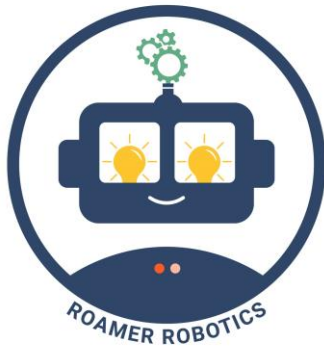




# ABOUT PROCEDURAL COMPUTING: THE ROAMER ROBOT

White Paper

## ABSTRACT

This paper is a reprint of an article written by Daniel Jacquet and Christian Sarralié professors at CNEFEI in Paris. They used Roamer to explore its use in special education. CNEFEI is charged with the responsibility of training French special education teachers.

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# About Procedural Computing: The Roamer Robot

## White Paper

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# Roamer Robotics About Procedural Computing

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The approach called procedural computing applied to pedagogy, with the development of activities linked to Logo language, experienced during the eighties in France, a strong flood of interest followed by a just as abrupt ebb during the following decade. Some experiments with a British designed robot, the Roamer gave a CNEFEI team the opportunity, with other professionals of the AIS, to develop an interest in the steps associated with this type of tool- presently almost totally ignored in France- with disabled children and youths.

The first observations tend to show that the pedagogic robot is very pertinent and can be used profitably with youth from the AIS; but for this its modes of utilisation must be re-thought and developed, depending on the public, to be integrated. An illustration of the development steps with the Roamer applied to a specific public of handicapped youths with the after-effects of cranial trauma is developed in a second part.

Abstraction, Procedural, computing, Logo, Active pedagogy, Resolution of problems, Robot and Cranial trauma.

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By Daniel Jacquet: Professor at CNEFEI

We can observe, from reading what follows, that innovation sometimes follows detours and it is the right moment to come back to what we already know- or we think we know well enough- to perceive more correctly the interest of one “ex” novelty, which was partially forgotten. It is, in fact, a kind of rediscovery for the CHEFEI team who is interested in the robot’s pedagogic vocation, baptised Roamer by its British designers.

It was during a meeting with Eric Greff, Teacher trainer at the IUFM of Versailles that we came to know this robot. This teacher, having some time before completing a doctoral thesis on educational software, had discovered this product in Great Britain with a strong link to his research. He wished to share with us his curiosity for this, with the idea that this tool would be of interest to the practical adaptations for the public of the AIS. Which public and which adaptations? This remained to be explored and determined. To be honest, our first impression of this machine was not immediately enthusiastic, but created a vague curiosity limited by the impression of déjà vu. It was only after a second look that we saw the potential of this tool, beyond the prejudices based on previous bad experiences.

For those reading this who doesn’t know the problems with pedagogic computing in the eighties, because of their age or other preoccupations then, it is necessary to go back. At the beginning of those years, we hear of a “new” idea in the school with the arrival of the first computers: the child is an actor in his learning, he builds his knowledge himself, learns through action, experiments and computing will give him the means. Seymour Papert, a psychologist and mathematician, researcher at the MIT (Massachusetts Institute of Technology) and disciple of Piaget, is the prophet of this philosophy. His book, “Computer- spirit effects and learning” (Flammarion 1981) makes a lot of noise. The major tool of this paradigmatic change is a computer language, Logo, whose characteristics are presented as



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giving a particularly favourable context for the development of diverse competencies, especially reflexive, critical and methodological. Of this language, we often only remember its graphic component, the programmed movement on the screen of an isosceles triangle identified as a turtle (as well as other virtual elements called im.) which traces different geometric shapes; in fact the possibilities of Logo were going far beyond this but this functional wealth might have been seen as an excessive complexity. Moreover, a more concrete version of the turtle was developed in France by the Jeulin Company, as a robot with a transparent shell, moving on the floor. This “ground turtle” programmable by a card-reading system was a little successful, especially in nursery school and this, even with a defective reliability. Logo itself was a widespread language in many computers from IBM’s to Apple’s personal computers, without forgetting Thomson, which were in most French schools, especially during the famous (and controversial) CFA plan (Computer For All, 1985). With the launching of this ambitious governmental plan, this language and the projects related to it were highly encouraged within the National Education. In this respect, Logo, its tools and processes were for a while largely presented and prescribed as computer practice indispensable for all primary school teachers. Armed only with their enthusiasm and a sometimes basic or non-existent training, many teachers went into the adventure with varying degrees of pleasure. Many enriching pedagogic situations were created by these pioneers and well experienced by the pupils. But it wasn’t always the case and the fervour finally calmed down.

Many factors led to deception and weariness, and progressively to the semi-abandonment of Logo and finally it was forgotten. Today a single exploration on Francophone internet with an immediate search engine is enough to notice the absence of information- and of activity- on what was, for a time, one of the spearheads of the emerging pedagogic IT.

Let’s analyse here the possible reasons for this disappearance. We can note: The lack of reliability of the first equipment as well as the high cost of the ground turtle (about 10000€ in 1987):

- The lack of training and lack of stepping back towards the practice created an inefficient understanding of a complex tool despite an easy first impression. The poor knowledge of Logo as a pedagogic tool in a theoretical context sometimes had as a consequence practice built from superficial notions.
- Some zealous, with excess of enthusiasm or even a lack of discrimination in the speeches and practices encouraged- as in a mirror- violent criticism of these distracters and disqualified practices which were to be constructed, consolidated and validated.
- In geometry, which was a field (too) often privileged, (justified) criticism on the risks of confusion caused by Logo concerning the representation of angles.
- Later, with the evolution of computer techniques, the attraction of computers and multi-media software, apparently easier and more attractive to implement. With CD ROMs, everything is (or seems to be) already pre-built; the teacher only needs to accompany the pupil. This new situation, which will eventually worry some, seems to be a comfortable advantage in a context where pedagogy integrating new techniques can seem difficult.
- Finally, the evolution of ministerial orientation for computer tool, more as a support than as a learning object. The Logo approach appears linked by its algorithmic dimension to a technical learning, which isn’t recommended anymore.
- The beginning of the nineties is the end of this procedural computing linked to Logo. Only recently, some wondered whether we didn’t (apologies for the expression) “throw the baby out with the bathwater”. In exchanges with former actors of this pedagogic agitation, who



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now have other commitments, they told us about their regret and conviction towards the relevance of this approach.

Looking outside our borders we saw that the French situation was not similar abroad, especially in Anglophone countries where the Roamer robot has a different dynamic. In fact in 1989, this pedagogic robot started being commercialised. At the same time in France, the practices coming from it fell off. Since then more than 85,000 robots have been commercialised and used in schools in the nineties, mainly on the other side of the Channel (but also in twenty six other countries, sometimes very far: some Roamers have been bought for schools in Shanghai). This shows a very different evolution. The British pedagogic politics- more decentralised than in France- has probably something to do with it.

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The Roamer, in English is one who wanders the streets, a vagabond, or someone who explores the world. We note that it is a machine whose main characteristic is linked to space exploration, and measurement. Since 1999, this robot has been imported to France by the company Nathan and has been renamed Logor. Considering the derogatory (and, in our opinion undeserved) representations of out-dated and surpassed technology associated with Logo, and wishing to distance this model, which has been renewed, we regretted this explicit reference. We liked the name Algor chosen by E. Greff in his thesis (1997) to refer to his virtual robot; for this article we preferred to keep the original name.

The Roamer (Logor) is a grey, 130 cm in diameter, and lentil-shaped, plastic object with two-wheel drive on its lower part and a bright control keyboard on its upper part. In the centre, there is a gap to put a tracer, with an on/ off button (it works with batteries) and a plug to link it to a PC with a cable; optional software Roamer World allows control from a PC. The robot can have other optional elements: tracing kit, different coloured shells, pedagogic files, movement pads (foam paving), an entry/ exit module to add accessories activated by programming: lamps, engines, sound, light or contact detectors, etc. It is regrettable, that these complementary elements haven't been imported (or translated) by Nathan yet.

The Roamer basically knows how to move. It can also emit sounds and- if added the entry/ exit module- can be programmed to control or act according to the information received by peripheric elements (lamps, engines, sound, light or contact detectors, etc).

The Roamer can be entirely parametered and programmed from the keyboard. There are five different coloured keys on it:

- Yellow, numbers 0 to 9.
- Green, to launch the execution of programmes stored in the memory.
- Red, two keys to erase. One erases the last command, the other the whole memory.
- Blue, on one hand, four arrows to move forward, backward, turn left or right. On the other hand four keys to repeat the procedures and pause when moving.
- Finally, there are some pink keys, whose use is rarer or even non- existent. They allow the transmission of notes and sounds as well as the programming of the peripheric control module, not in the standard Roamer.

The adjustable, moving units are:



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- 30 cm for linear movements: one step of the Roamer corresponds to its own diameter. It gives the children a concrete perception clue and is easily integrated.
- A rotation degree: this adjustment is in general non-significant for children and for most activities, it is set on 90°.

The basic syntax is as follows: one instruction (or command: 1 blue key) + data (or argument: 1 or 2 yellow keys). A mistake in this syntax (for example, data missing) and the Roamer gives a sound warning.

For example, to programme a square (specialists recognize the archetype of Logo), we'll proceed this way: `1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1` (go forward one step, turn right 90°, etc) or this way `R4 (1 1 1 1)`, other forms being possible. In the second case, we use the repeat control (R) to do 4 times the same set of instructions.

If we want to compare Roamer and its French predecessor, the Jeulin turtle, we see many differences, more or less important, such as its price (around 370€) a lot cheaper than the turtle. But, whatever the differences, there is an obvious fact: the Roamer has the advantage to exist, to be produced, when the other one has not been manufactured for years. It is even, to our knowledge, the only pedagogic robot of this type currently available on the national and international markets. Another asset is the dynamism of the English team at Valiant Technology (see website: [www.valiant-technology.com](http://www.valiant-technology.com) and diverse suggestions for use), its will to see this creation evolve especially towards audiences with specific needs: the work started in partnership with CNEFEI is a sign.

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We can essentially consider Roamer as a computerised aid to solve problems and develop procedural reasoning, a concrete support for abstract learning. Its objectives and fields of application are therefore the structuring of thought, representation, symbolisation (coding-decoding), analysis, anticipation and planning of actions (simulation). It can be used for notions linked to time and space, numbering, but also contribute to the development and expression of the child's creativity. The context or scenario of the actions of Roamer, tour by school bus, a hero pursuing his quest, pet or artist, there are many opportunities for the imagination to express itself in a structured activity. This approach, associating emotional and affective aspects to cognitive ones, is a powerful inductor of motivation and concept memorisation.

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Roamer wasn't designed for an audience with specific needs; we wanted to know if it could become an object generating relevant pedagogic and rehabilitation activities for different professionals, teachers, educators, rehabilitators (psycho-motor, occupational therapists) in different contexts with children and young disabled. For two years, some of them have agreed to play a game of exploration work with the Roamer. The children participating in these experiments were mentally handicapped (trisomic children mainly) or motor-deficient with associated problems (IMC children, cranial-traumatised adolescents) and sense impaired (blind children).

Pretending to give an account of the different works, even schematically, would be an illusion. An illustration in context with detailed analysis is given in following pages. Let's just note that first, adults were reserved about the relevant character of this tool for young people. The diverse worries expressed in the first place were about:



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- The possible in adaptation of the robot to the abilities of some young people (mentally handicapped particularly) because of the complex controls and the level of abstraction required.
- The foreseeing of a quick boredom because of difficulty to renew motivating situations with a robot, which only moves around.
- A comparison done by the children which would be to the disadvantage of Roamer with respect to the multi-media computer already used in class or at home, more attractive or offering varied activities: children being used to these multi-functional systems could be put off by an object with few abilities and hard to manipulate.
- Inter-face elements not very convenient (no saving possibilities of the programs without a PC, problematic keyboarding with visual or sound returns) or clearly in-adapted ergonomics (membrane keyboard for motor-deficient or blind children).

But, the results to keep in mind after several months of regular experiments show that for children of different groups, they have tackled the robot without problems, with curiosity never denied. To our surprise, the enthusiasm at the beginning continued over the months, the majority of the children accepting with interest to be confronted by an object or situation requiring rigour, thinking instead of acting immediately, the necessity to face difficulty in the elaboration of a project. For the professionals, the activities built with Roamer (space exploration, distance appreciation, circuit project, problem solutions) led them more than once to review their evaluation of the pupils, allowing them to know more precisely the competencies, lacks and functioning for each one. In some cases, we notice real school unblocking, the robot being a powerful object for learning poorly invested in until then. The situations created, leading to cooperation, verbal exchanges (hypothesis, analysis) favoured the groups dynamic.

Moreover, the symbolic value brought to the children using this object is undeniable; we can suspect that the novelty, rarity and originality of the object have a role. The real obstinacy, the renewed motivation to use, manipulate this machine despite the difficulties - cognitive, perceptive or motor sometimes underlined by the conception of the object itself- shown by the children surprised us, in their desire to experiment and understand, to control and their joy in success.

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For the future, there are two determining points to retain:

1. Valiant Technology, creator of the Roamer, who has partnership links with CNEFEI, is working on a new robot. Sensitive to the necessary adaptations and improvements to be integrated to better correspond to the specific educational needs for young handicapped, it plans to take them into account with the indications given by the diverse experiments. We suggest, for example, the integration of a vocal synthesis. This device, allowing the robot to say what it is doing when it is doing it, and also when inputting or editing a programme, gives in these cases a useful return, especially for visually and mentally impaired children, and allows the widening of the range of exercises, for example by changing the roles (the child does or represents graphically what the robot says). This additional competence, added to other functions and adaptations linked notably to ergonomic elements related to handicaps and specific difficulties would be an advantage for an adapted pedagogy. Concerning this, let's note that in a recent report (Information and Communication Technology in Special Needs Education, November 2001) by the European Agency for the development of education for children and teenagers



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with specific educational needs, the pedagogic Roamer is quoted among the material to be developed towards the education for public with special needs.

2. Finally, these pedagogic practices linked to procedural computing have to find a real place among all the activities using IT. Multi-media and more recently the Internet, being on the front stage, produced an effect of clouding, shadowing an uncommon object with a specific pedagogic vocation (which they are not)- we can only wish to have practices and reflection made and renewed around it. For this, the CNEFEI, organized a study day on the 4th of December 2002. But, we have to acknowledge a real difficulty to stand practices against a unique object, which has no other existence than in the pedagogic field and which doesn't rely on the support of a flourishing market which stimulates the economy and the fantasies of modernity, unlike computers or digital audio-visual equipment. Therefore, the teacher, educator and rehabilitator can be led to choose to integrate the pedagogic robot among his tools, away from fashion, a thoughtful choice of conviction, founded on the interest of the learners.

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Christian Sarralié Professor at the CNEFEI

These lines are written because of observations made with adolescents with cranial trauma and with the practicalities of the Roamer. It is no more than a first approach, which gives glimpses of the possibilities, the particularities and questions relative to the utilisation of the Roamer with these people.

Characterising an adolescent with a serious cranial trauma leads us to meet with the complexity and diversity. Physical, intellectual, emotional, scholar, family and social, all areas of the person are concerned by the consequences of a trauma. Apart from etiology, a hit on the head, the clinical facts of our subjects are very different one from the other; problems are intricate and often difficult to discriminate. The lesions can affect all the upper body functions and provoke, directly or indirectly, personality problems and problems of relationship with others, as well as an incapacity of the subject to be conscious of or to understand his problems.

Accident, coma, awakening, rehabilitation, readaptation and reinsertion are, from a chronological point of view, the main phases of the itinerary of a person with cranial trauma. After rehabilitation, re adaptation is a first change of perspective. The action of the different professionals is no longer only centred on the diverse functions of the person but also on his social functioning. For the teacher, it means to (re) position the teenager as a pupil. Re adaptation is a process which must allow: to live globally, in a schooling as rich as possible; to offer the experience of confronting the school reality to get the bases of a real project; to explore the breaks and continuities in the person's individuality, especially his cognitive functioning. For our subjects, the school re adaptation takes place in small groups where they are taught for a few hours different subjects.





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The greatness of intellectual dis-functioning and the loss of knowledge increase the selection criteria of the tasks offered. For the teacher, the range of choice is reduced and it is more difficult to choose. The use of Roamer makes possible a not too abrupt entrance to activities requiring little school knowledge and we can easily grade the difficulty and complexity. The accessibility also concerns the teacher. On the one hand, the Roamer's approach is simple. On the other hand, a minimum of instruction is needed to quickly conceive some exercises (even if we have to keep the illusion that it is enough to trace any sort of figures).

For 5 sessions of forty minutes with a dozen teenagers, we have essentially worked on three tasks:

- Observation and restitution (oral, graphic or procedural) of the demonstration programme the Roamer has in memory and we can activate as soon as it is on: the course of an equilateral triangle, stopping at each summit; giving a short piece of music at the second summit; stopping when tracing the last side.
- Covering a square by the Roamer.
- Covering a double square (two squares with one shared side).

The gap between the former school level of our subjects and their real abilities when they have a serious schooling is big. But this gap might not be detected because of cognitive problems or can be rejected to escape from an unacceptable state. This leads the teenagers to claim a similar level of work to the one they had before the accident or to desire to be at a higher level or to be as before. Without direct references to the school curriculum, Roamer presents a certain neutrality and a way to answer these too precise claims, inaccessible at the moment of returning to school.

Jeremy demands maths exercises of 10th grade, rejecting quickly anything that is far from that. But he is far from being able to solve questions of this level considering his problems. His school files show that he didn't have such a level before his accident. The proposition of activities with the Roamer puts his opposition to one side and leads to sessions taught until the end. And this despite the huge difficulties met by Jeremy because of his problems affecting all his intellectual dimensions: step by step, with the help of a transcription on the board, after forty minutes, he can reproduce the presentation programme but we're not sure that he has got an overall view of it.

The Roamer lends itself to group activities, allowing naturally to differentiate them and individualise them. Its accessibility and neutrality are useful with groups of extreme heterogeneity concerned at the same time the nature of the problem and the school functioning. It is also user-friendly for the dimension of (re) socialisation of re adaptation. Introversion, centring on rehabilitation activities, marks the repair desire characterising these teenagers. But, it also gives the advantage of individual work, that we consider as unavoidable when in rehabilitation with the subjects. The most precise observation, which is required to understand the manifestations of the problems. The dual situation favours confidences and framing of behavioural problems.

Nicholas has a frontal syndrome, which manifests itself through a lack of control of his thought and behaviour. Easily distracted, undisciplined and rebellious, he doesn't respect the rules of group life, is not in a hurry to start a task and stick to it. Roamer presents enough attraction to settle him in a task and to remain with it, it gives the teacher a less direct aspect, with an adequate climate to tie a quality pedagogic relationship, even if this stays difficult and fragile.



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In re-adaptation phase taking on a child is multi- dimensional and in collaboration with many professionals. The activities around Roamer can make this collaboration operational. First because they lead to observations on easily communicable behaviour and around activities understandable by all the members of the team, Roamer activities calling on or interesting for diverse professions. We consider the Roamer generates common tasks, as a common denominator of a synergy for re-adaptation actions.

In re-adaptation, in an ecologic situation, the subject has to do a task proposed in an autonomous way; it is an opportunity to do, to put to the test his functioning and the means acquired to overcome these difficulties. And this know how becomes efficient when the Roamer leaves room for initiative to be used and requires work to be proposed with visible effects.

But realising is also to be aware. The teenagers with cranial trauma must be conscious of his problems and, in all the senses of the word, recognise them to overcome them. He must have the Roamer made actions, the objective being to have the robot execute something, placing him symbolically on the controls, allows him a certain distance favourable to be conscious.

Roamer allows calculation activities. It is taken here, not in the sense of operating but by borrowing from Vergnaud, with the inference meaning; an inference which can be qualitative. In the organisation of the behaviour of the subject, these calculations are about goals and sub- goals possibly formed, the rules of actions, the information uptake and the control allowing to read them. These different aspects are often lacking in a teenager with cranial trauma and give the whole of the symptoms gathered under the expression: problems of execution functions.

To work on the characteristics of the thought, we take advantage of two components of the activity with the Roamer: algorithmic and heuristic. The first allows us to put a structured framework, to work on planning and do the actions and their relevance to the goal; to practice repetition. The second one avoids the risk of chronic repetitive tasks and leads to needs identification, to goal formulation and thinking on the activity itself.

If the relation of help is each time or at the same time for the different functions or modalities usually given, it is characterised first of all, by the fact that it must be measured, that is moderated and estimated. Using the Roamer allows us to observe, therefore to study the changes to organise a situation. It gives the teacher, during the activity, a widespread range of possibilities to intervene and means to carry them out.

The mistake is in the procedure and from this localisation, we get double profit. On the one hand, it gives a less direct aspect to the teacher's interventions relieving the teenagers from rehabilitation situations centred on himself. On the other hand, it allows a de- dramatization of the mistake too often experienced as a painful memory of the consequences of the accident.

Micheal shows us that the Roamer is drawing an M in his demonstration programme. Being hemiplegic, he must redirected on the left; he suffers from Visio- spatial problems. almost on his own, trying with the Roamer, he manages to correct himself and to give the exact shape of the movement,



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the use of the machine limiting the interventions of the teacher. A welcome limitation because direct interventions are badly experienced by Michael who then accuses the teacher of undermining him, of thinking of him as no good. Looking at the problems, we note here that the Roamer is, indirectly, an extension to rehabilitation.

Different check ups, medical or neuro- psychological, give information on the problems of the subjects. The school situation shows more or less obviously their signs and how the subject deals with them. The movements of the Roamer can, during perception attacks, bring to the fore the difficulties to take the objects when moving or of visual exploration. Schooling also reveals sometimes behaviour disruptions not noticed beforehand.

Audrey has been mute since coming out of a coma. When she comes to us, it is the only visible problem and in her file, only problems linked to speech are stressed. We communicate with her properly since she understands what we say to her and all reading. We notice, however, she doesn't understand some words orally or when reading, sometimes being unable to produce one in writing. It is the case for the word 'music', necessary to put on the board the Roamer's demonstration programme; she can't find it, despite the clues given.

When we make a square, the value of the rotation angle is the problem.

Audrey doesn't resort to geometrical analysis but to eye estimation. After a few failed tries, she puts herself next to the machine to feel the measure of the angle. But she only proceeds by trial and error and the corrections are always of small values (3 or 4 degrees). This type of behaviour has been noted by many researchers for children learning the notion of angles with the Logo turtle. What surprises us, is the time she spends in this task and this solving behaviour, considering the fact that Audrey was in the 12th grade at the time of the accident.

The elaboration of the programme for the realisation of a square is as long and laborious. we find the signs of perseverance effects when many times Audrey writes:  $4 \times 4$ . The value of the step (4) is given to the angle despite the earlier and correct demonstration of its value (90). Audrey writes the instructions side after side, tries mistakenly with, it seems, a lot of difficulties to put together what she sees and the objective she is aiming at. It is the same to link the instructions and to produce the global procedure. She then writes on the board:  $16 \times 270$ , multiplying by four the measures (as she explains to us without noticing her mistake), instead of repeating 4 times the instructions. These observations show characteristic signs of the problems of execution functions, which are not mentioned in any different check ups given to us.

we are saying first that the activity led with the Roamer is an activity in itself. we mean here that we don't want it to link to a particular field of a school subject nor to connect it to the field of cognitive ability to educate. Roamer allows the reference to S. Papert (1981) and its use to the Logo language in its turtle geometry. If it comes close to turtle geometry for differential geometries it is specific in its style by qualifying IT geometry, which is based on calculations. But his model of thought, modular and procedural, is not ours, which gives calculation the highest definite sense and which is linked more to the conceptual aspect implemented in the behaviours of the subject.

Roamer is a tool, which enables the working of different mathematical notions, such as number, measures or figures. But many works have shown that articulation, generalisation and school



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mathematics transfer phenomena were far from being discovered. Let's remember that Papert himself wrote that the effects of the work in geometry turtle are essentially relational and affective. The Roamer gives the activity a first and essential quality in re-adaptation: it is stimulating.

We link our thoughts on Roamer to the work of S. Papert. Writing a procedure borrows from natural language and its realisation by Roamer presents with the writer, a corporal link, which is relevant with what he feels in his own body. We join D. Barataud (1990) who warns against the idea of a perfect isomorphism between the movements and the language translation in geometry turtle and the mother-tongue and corporal real life experience. It is the same if we compare how to trace a figure with a pencil and the Roamer's realisation. The French language has semantics far larger and more blurred than the programming language used. Contrary to Roamer, a person can turn while going forward; tracing a square with a pencil is rarely continuous and not always the same. These differences get worse when a comparison is done with subjects who don't have the integrity of controls and the perception of their body, and have phasique and praxic problems.

If we can straight away think of adaptations aiming at the handiness of the instrument for people with motor, sensorial or physical deficiencies and of the improvement of its reliability to trace figures with large dimensions, it is above all the support of the programming, which calls for discussion. In fact, on the machine we can't see the typed procedure and the correction of a mistake is limited to the last instruction. Without tackling the question of adaptation on the Roamer itself, pairing it with a computer and programming software is essential to start with more difficult programmes with pupils with brain deficiencies.

Roamer means wanderer. This meaning is more relevant for our subjects forced to go here and there in the mysteries of the cognitive functioning to discover the characteristics of relative novelty given by cerebral deficiencies. The Roamer, project manager of this exploration, is also an investigation instrument. A real instrument if we go back to the Latin etymology of this word, meaning tool and resource.

These few resources lead us to put forward the hypothesis that Roamer is a judicious tool to lead re-adaptation work and to make the process dynamic. Just like Papert made of his turtle an object-to-think-with, we make Roamer an object-to-adapt-with.

Thanks to Christophe Noel, specialised teacher at CMPA in Neufmoutiers-en-Brice, who took part in this project.

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