SqueakBot: a pedagogical platform for educational robotics

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Outline

- Planète Sciences
- Pedagogy
- SqueakBot
  - Electronic interfaces
  - Software
- Application examples

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Planète Sciences

- Since 1962, proposes scientific and technical activities to young people.
- Several sectors including a sector dedicated to robotics and IT.
- Each year, 50000 children discover scientific and technical culture by practice while having fun thanks to 1000 organizers and trainers.

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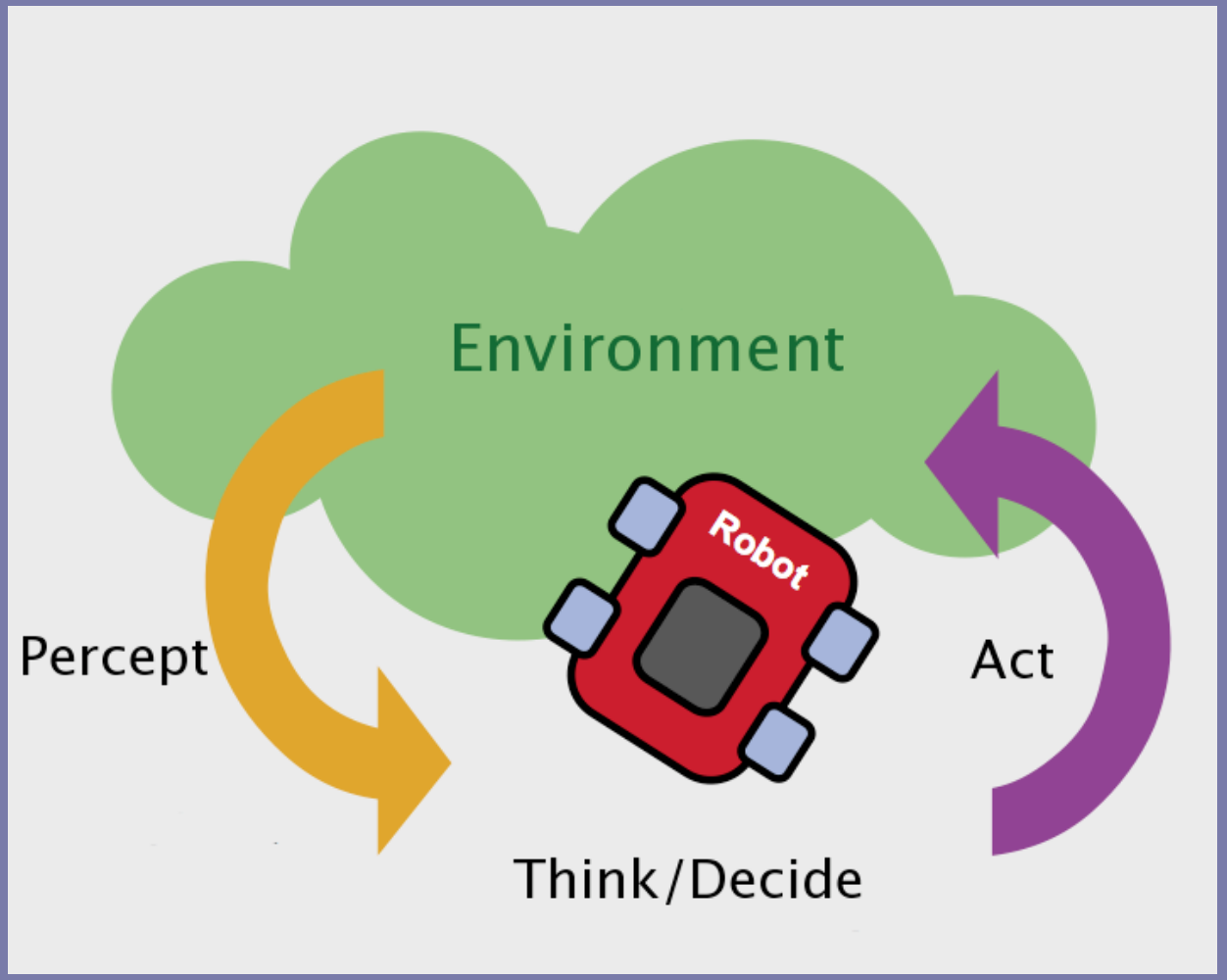
What is a robot?



Specificities for children (1)

- Fast learning curve.
  - No complicated language to learn.
- Must use their native language.
  - Interface in French.
- Must have **FUN** while making robots.

Specificities for children (2)

- Usually do not have a technical background.
- Problem: building robots involve a lot of tedious electronics and programming added to sometimes not straightforward mechanics.
- Short period of time (2 weeks summer camp with 4 hours of science a day).

Pedagogical robotics

- Build ready-to-use electronic modules which can be programmed easily.
- BUT must not restrain the creativity of children. Let the children experiment. We do not make them assemble kits.
- Several modules which could be interfaced with LOGO have been developed.

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SqueakBot

- Drawbacks of LOGO:
  - Our version works only on Windows.
  - Necessity to learn a syntax.
  - OO approaches more natural to modelise robots.
- Open source Squeak/EToys approach developed in partnership with the University of Caen for several years.

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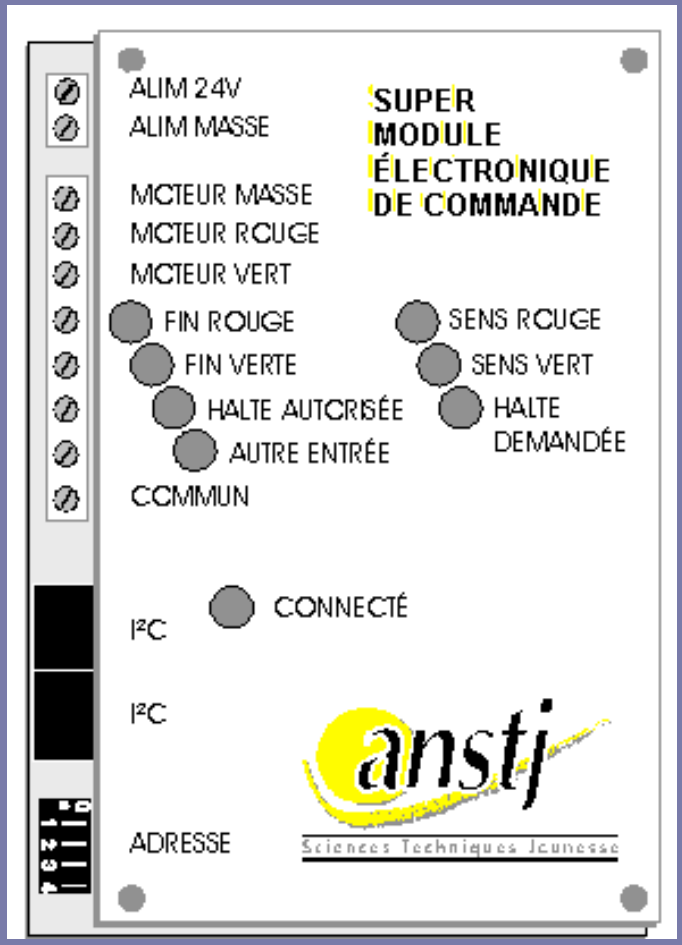
SMEC

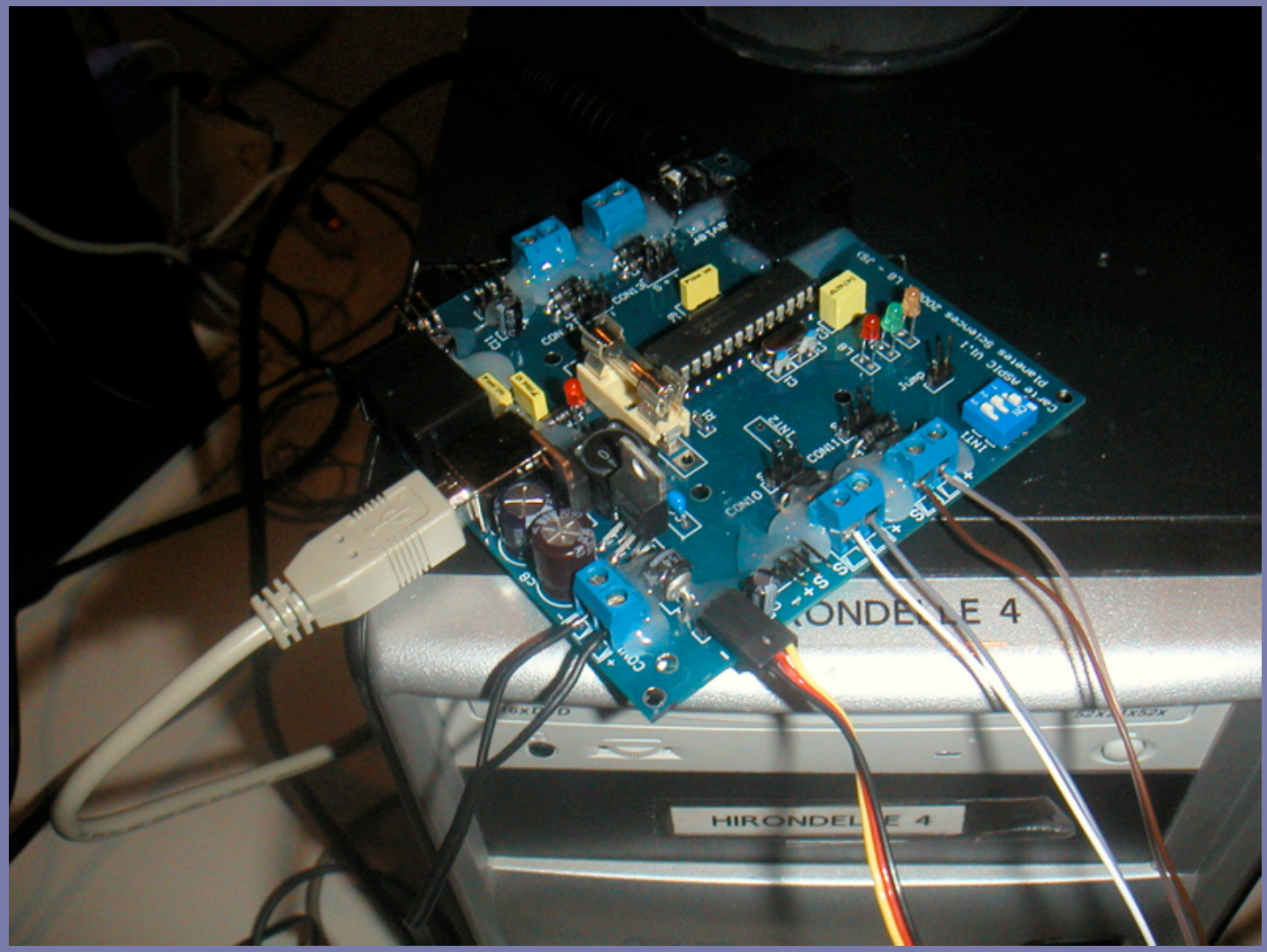
- Super Module électronique de commande.
- Controls 1 or 2 DC motors + 5 binary inputs.
- Can be interconnected thanks to an I2C bus.



ASPIC

- Analogical & Servomotors by PIC.
- 4 analogical inputs.
- 4 servomotors.
- Connection via USB port.
- Can be connected to I2C bus.
- Card program can be modified.
- Remote control for debug.

ASPIC



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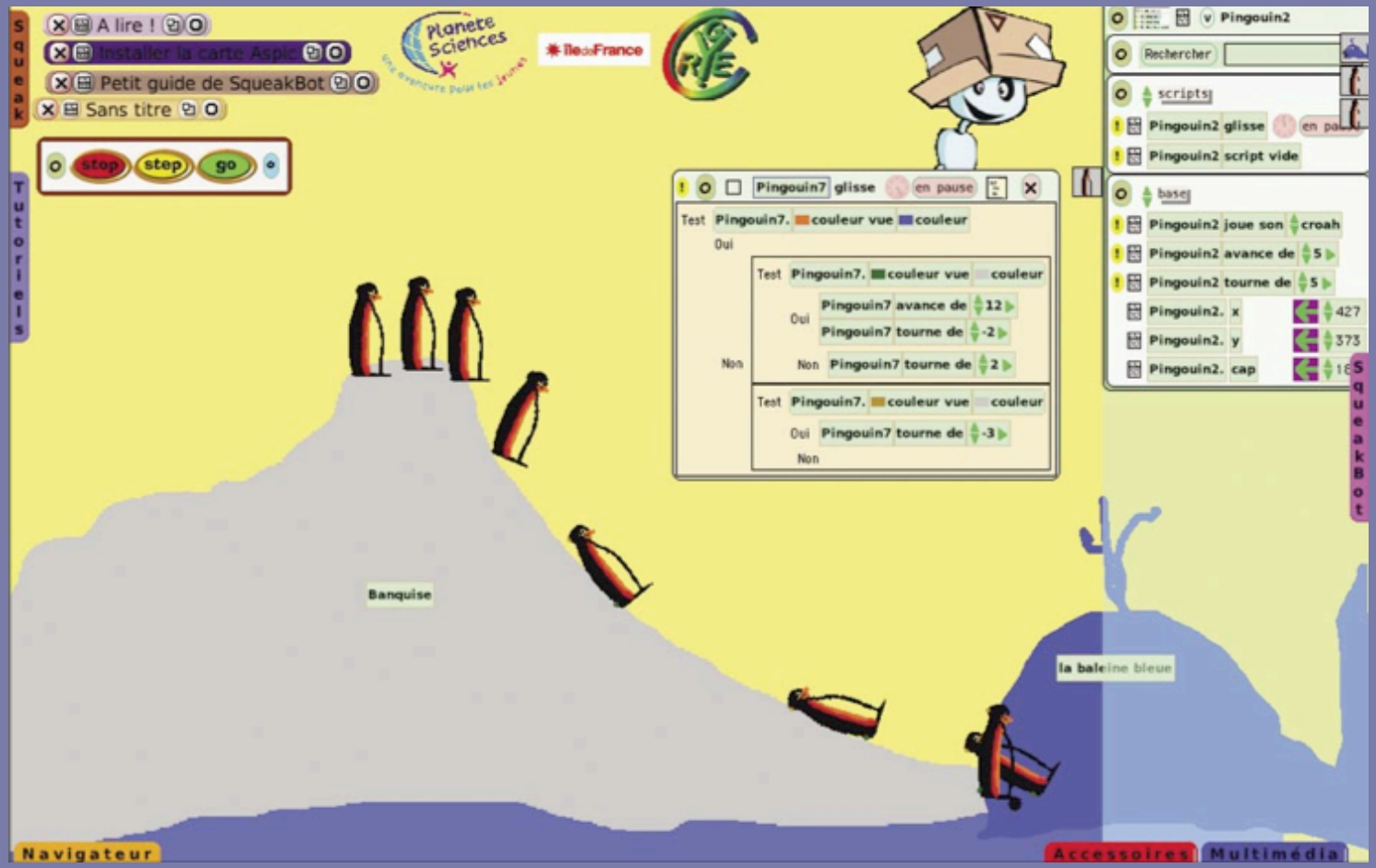
EToys


A lire !
Installer la carte Aspic
Petit guide de SqueakBot
Sans titre
stop
step
go
Planete Sciences
Ile de France
Pingouin7 glisse
en pause
Test Pingouin7. couleur vue couleur
Oui
Pingouin7 avance de 12
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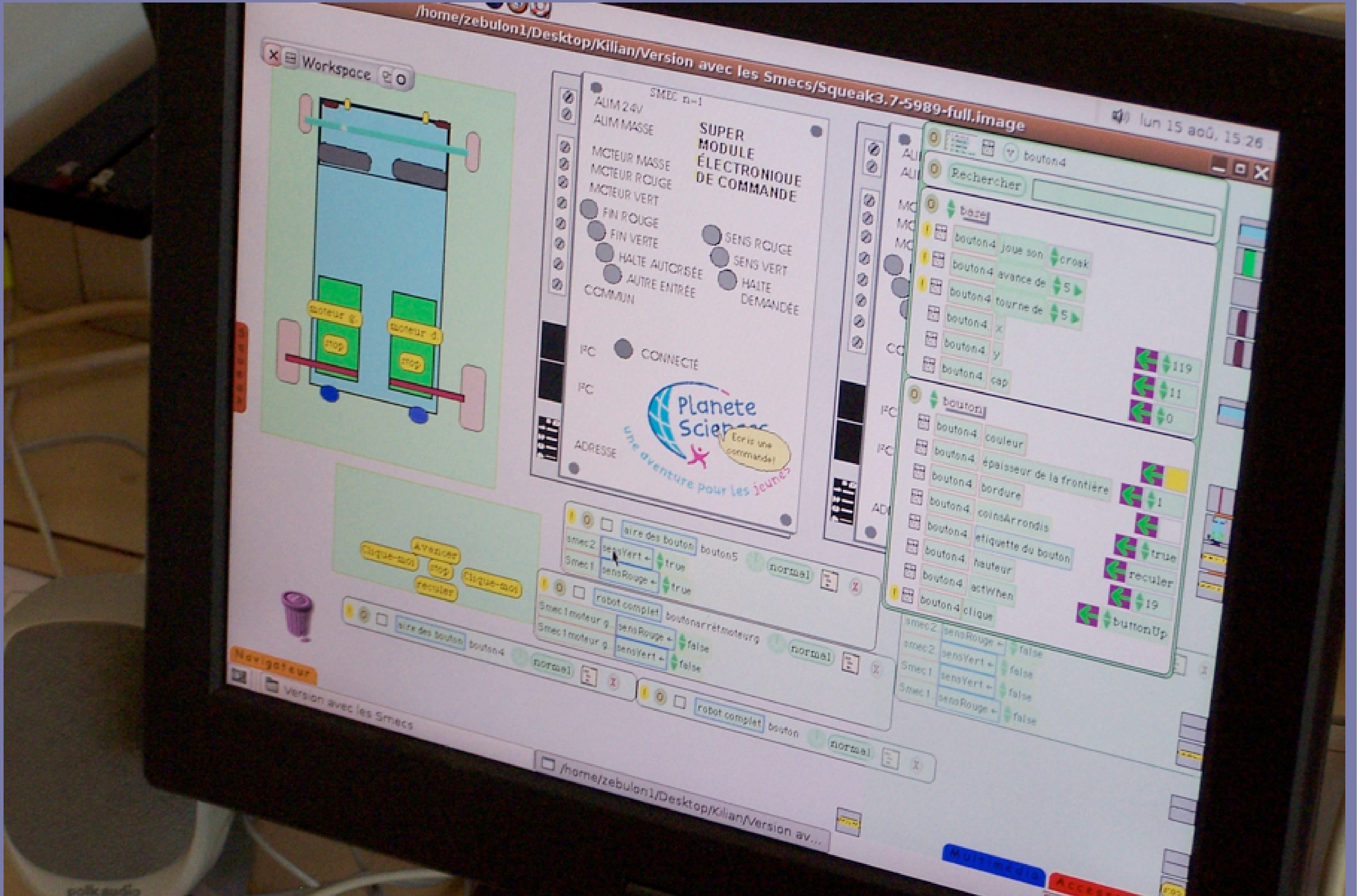
Pingouin2
Rechercher
scripts
Pingouin2 glisse
Pingouin2 script vide
base
Pingouin2 joue son croah
Pingouin2 avance de 5
Pingouin2 tourne de 5
Pingouin2. x 427
Pingouin2. y 373
Pingouin2. cap
Banquise
la baleine bleue
Navigateur
Accessoires
Multimédia

EToys

- Programming by dragging & dropping tiles into scripts.
- Very intuitive. Accessible to children with no prior knowledge of programmation.
- Possibility to switch to Smalltalk syntax.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Workspace
SUPER
MODULE
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MOTEUR VERT
FIN ROUGE
FIN VERTE
HALTE AUTORISÉE
AUTRE ENTRÉE
COMMUN
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Planète Sciences
une aventure pour les jeunes
Rechercher
bouton4
Navigateur
Version avec les Smecs
/home/zebulon1/Desktop/Kilian/Version av...

Implementation

- Plugin written in C using FFI.
- Classes handling the I2C protocol.
- Classes representing the real devices.

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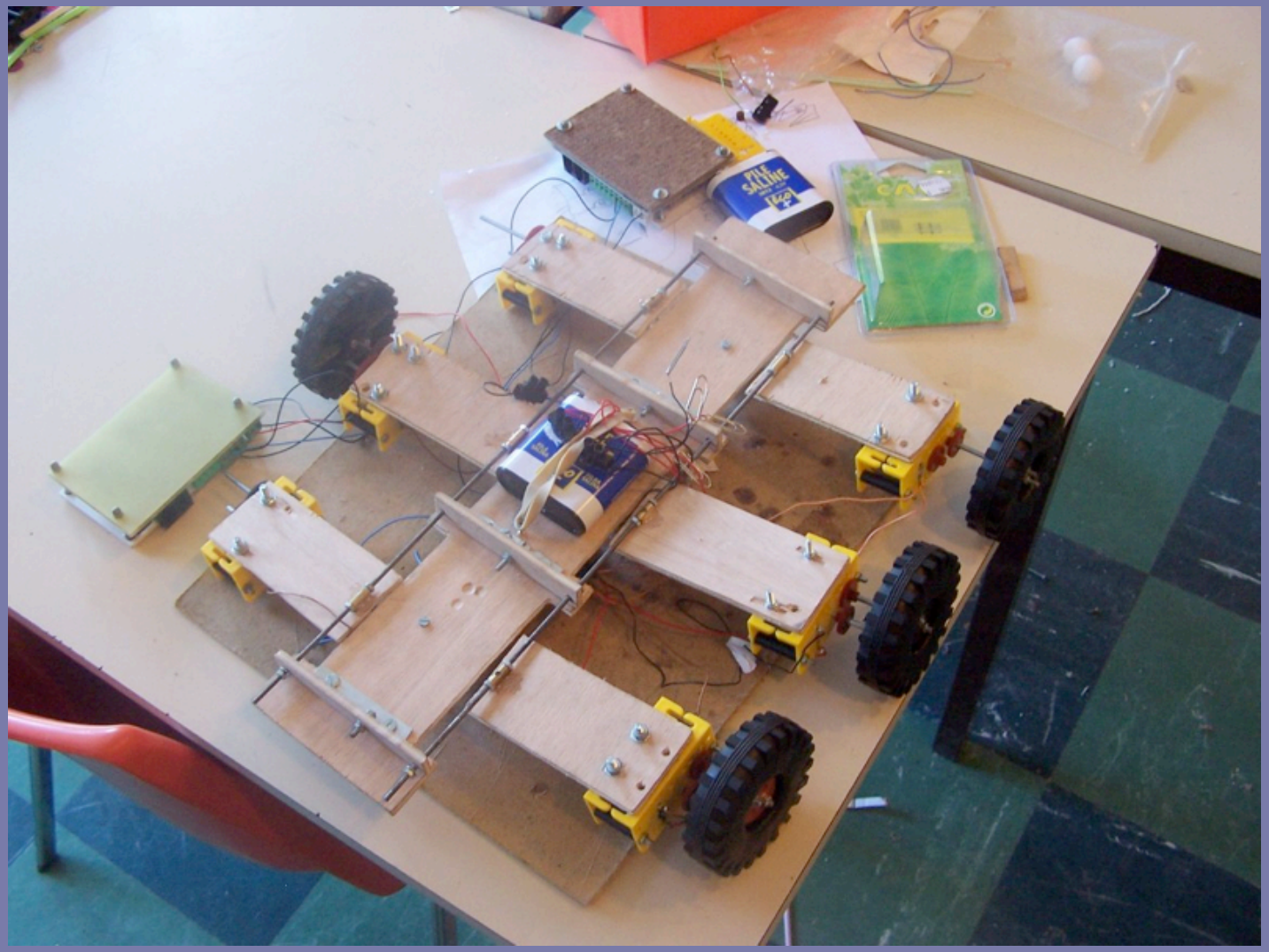
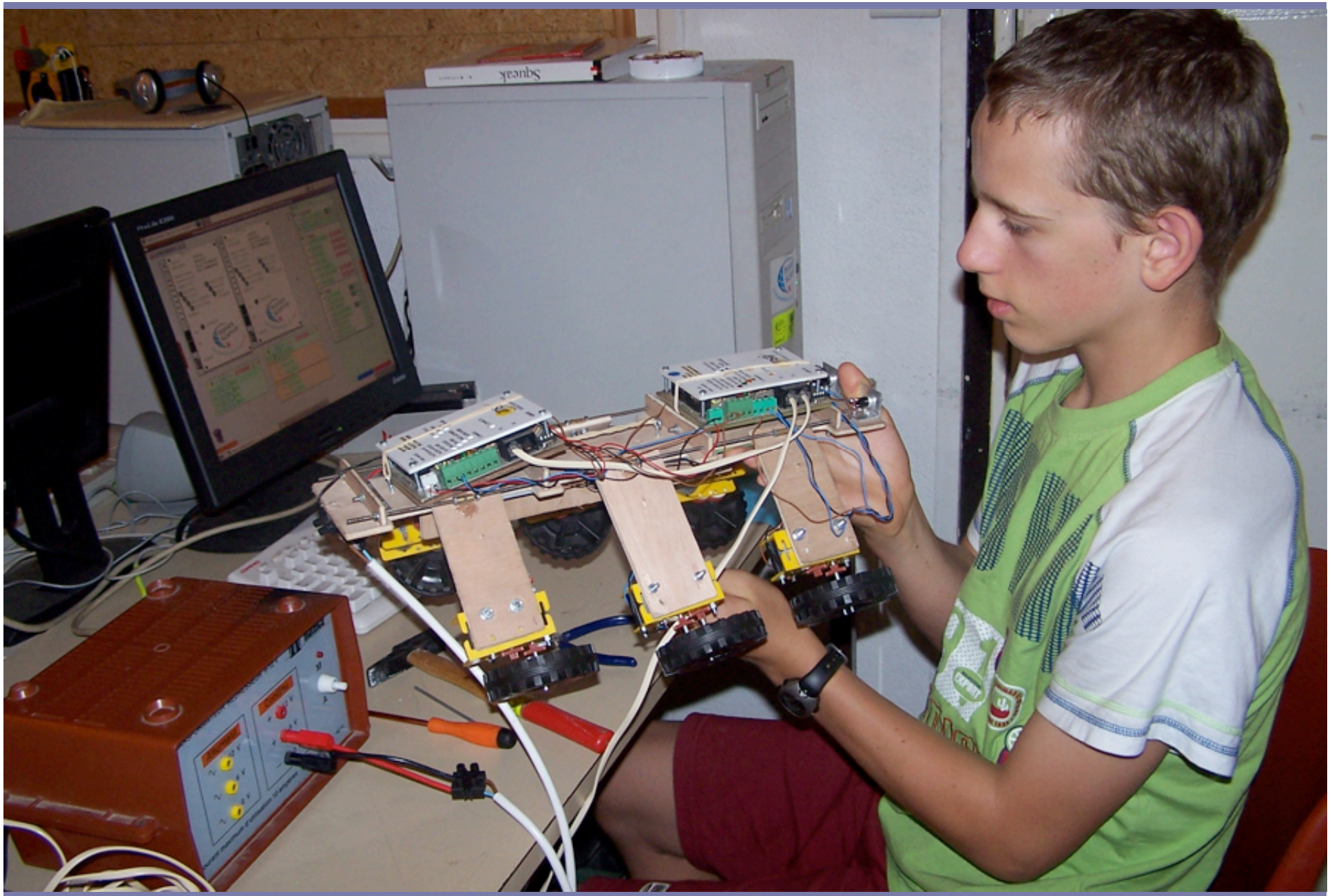
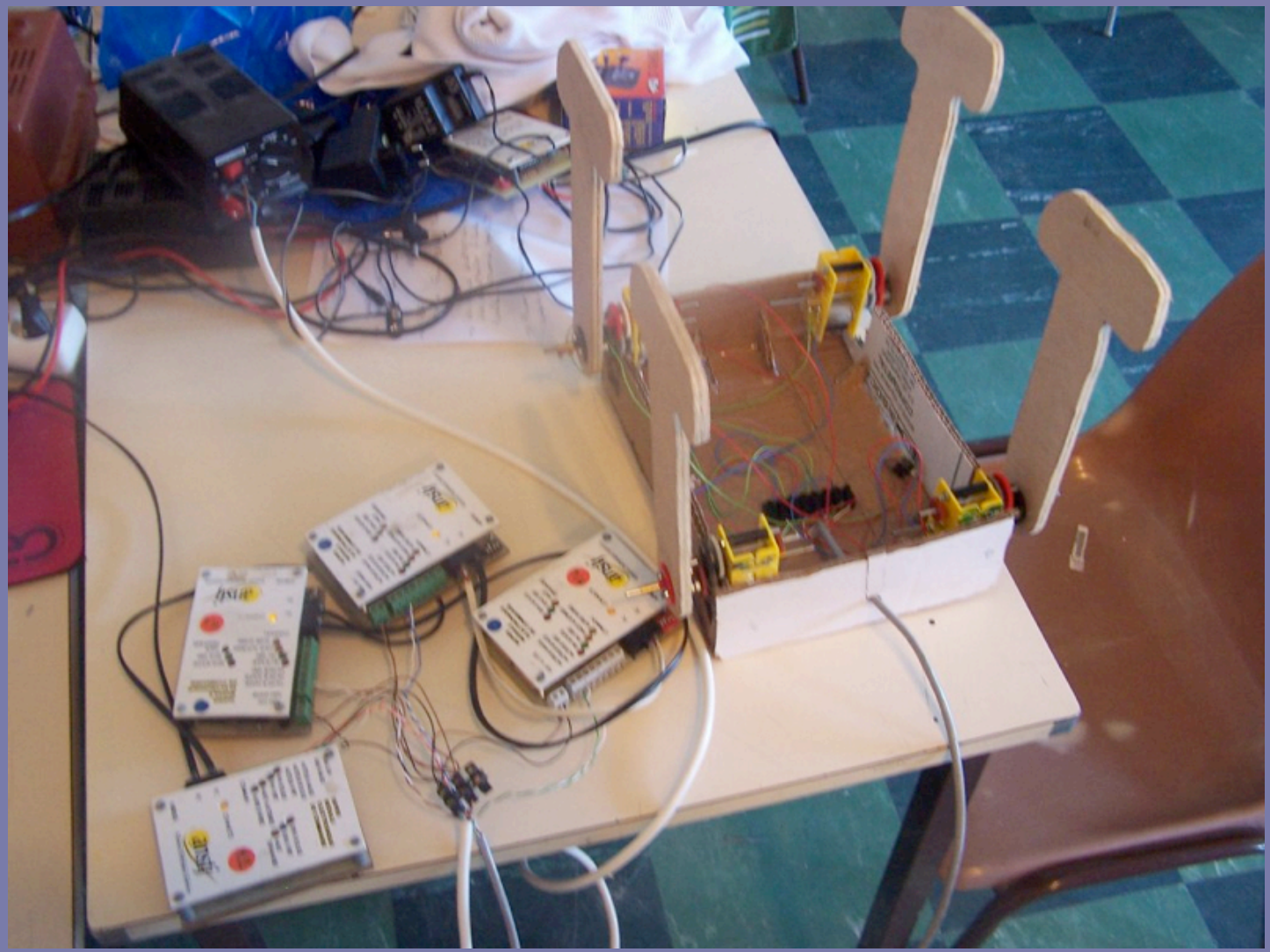
Mars rover

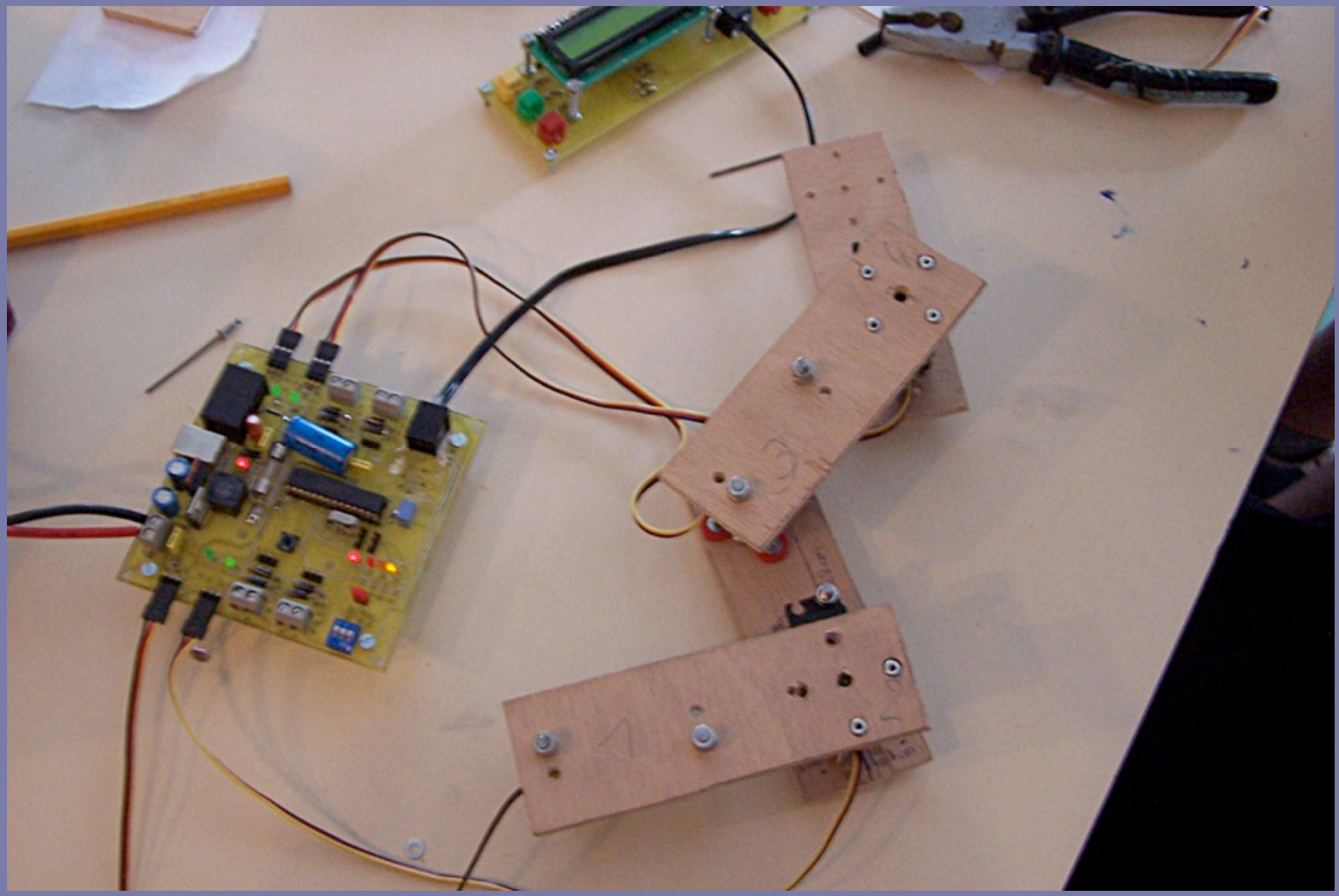



Squeak

Walker

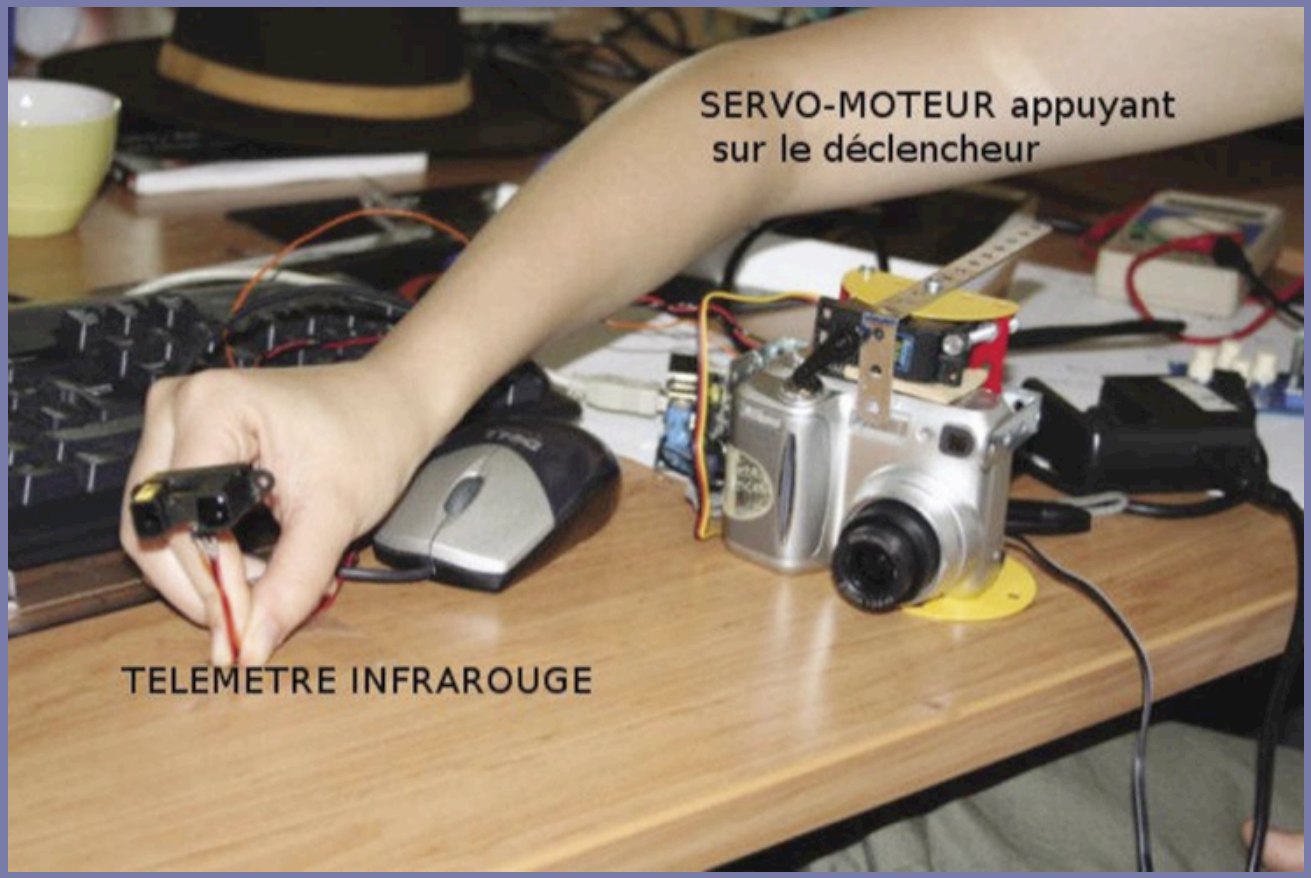


Caterpillar

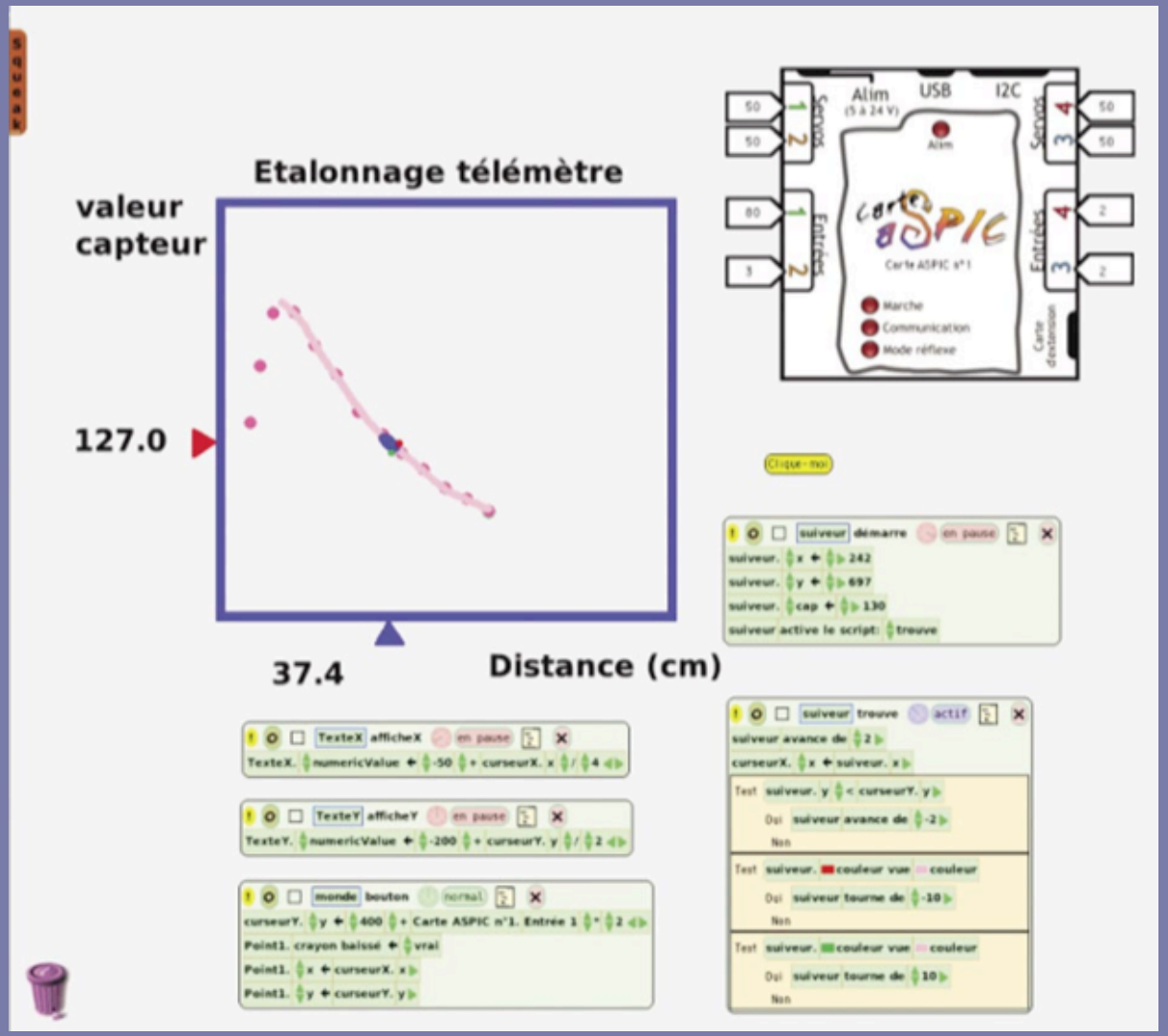


Video

Intruder detector



Intruder detector



Conclusion

- Allows children with no technical knowledge to develop robots.
- Fast results keep the motivation high.
- Tested in a summer camp.
- Part of a larger project called “Boîte à Bots” containing everything needed to build robots with children.

Perspectives

- Make it work with Linux and Mac (problems with USB port handling).
- Test with a wider audience (e.g. at school)

Why so much energy spent in such a project?


Planète Sciences

Links

- http://www.planete-sciences.org: the association website. (French)
- http://www.squeaksource.com/SqueakBot.html: project source code.
- http://www.planete-sciences.org/robot/boiteabots/: the bot box website. (French)