



ALaDDIn

Monga,  
Morpurgo

Who we are

Activities

Popularization

Bebras  
(schools)

General  
audience

K-12

Algomotricity

Labs

Teacher  
training

## ALaDDIn @ Unimi

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Budapest, October 26, 2016



# ALaDDIn: Who we are

Since 2008 a **multi-brain** group... without any 'head': we like to see Aladdin as a true collective enterprise.

People involved in the labs with schools:

- Carlo Bellettini
- Violetta Lonati
- Dario Malchiodi
- Mattia Monga
- Anna Morpurgo
- Massimo Santini

But we are indeed a *galaxy* of people inside our Computer Science Department (one of the biggest in Italy). These deserve an explicit mention:

- Paolo Boldi
- Alfio Ferrara
- Mauro Torelli

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# So many friends to thank...



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- Angelo Lissoni, who set us off...
- Fabrizio Carimati, Lorenzo Repetto, Antonio Dini, our main “external” collaborators;
- the many Bachelor, Master, and PhD students participating to our projects;
- the Department of Computer Science, for its support;
- ...

# Once upon a time...



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Angelo Lissoni, Kangourou Italia: a contest to popularize math (started in 1991),  $\approx 50K$  participants in Italy, 6M in the world.

- In 2007 he started the Kangourou of English (as a second language)
- Proposed to our department to organize a Kangourou of... **ECDL!!!** (European Computer Driving Licence)
- In fact, in those years some departments (even in scientific areas) of our University wanted to quit informatics courses, substituting them with ECDL!
- An opportunity: Start a Kangourou of informatics to popularize that **informatics  $\neq$  ECDL**



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# ALADDIN

Aladdin laboratorio di divulgazione  
e didattica dell'informatica

*ALaDDIn: Laboratory for Dissemination and Didactics of  
INformatics*

- Popularization of informatics as a **science**
- Teaching of **informatics** (not computer skills!) in K-12





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- A radio broadcasting, with podcasts (still available)  
<http://digitoergosum.unimi.it/>
- “European Researchers’ Night”, Milano, 2013, 2015, 2016, previously “Avventura della Scienza”, Milano, 2010, 2012
- INFOCULT, a workshop aimed at gathering together researchers and teachers interested in changing the way informatics is presented in schools, Gargnano, 2011
- Lectures at the Museo Nazionale della Scienza e della Tecnologia, Milano, 2015, 2016
- A book on ‘Turing’ distributed with one of the major Italian newspapers (Corriere della Sera, in press)



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Soon our main effort shifted on **changing how informatics is presented in K-12 schools.**

- We didn't want to rely on traditional lectures: we started studying Papert, Ben-Ari, Computer Science Unplugged, ...  $\rightsquigarrow$  *Experiential Learning Theory* and *Problem based learning*
- Very important for us: **shift from a device/application centered computer literacy to "informatics as a science"**  $\rightsquigarrow$  *algomotricity*
- We started workshops for schools:  $\approx$  3000 pupils, 2011-2016

# Algomotricity



## Algomotricity

Pupils are exposed to an informatic concept/process by playful activities, which imply a mix of tangible and abstract object manipulations: they can investigate it firsthand, make hypotheses that can then be tested in a guided context during the activity, and eventually construct viable mental models.

## Role of computers and apps

The computer is never a starting point, but all activities end with a computer-based phase in which participants use specific software tools that we have developed.

## Context is key

Problem based learning: no aspirine without headache!

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# Informatics as 'Automated Processing of Information'



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Informatics as a **science**, focus on automated processing of information.

**information** What is information? How can symbols/numbers be used to represent it?

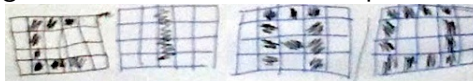
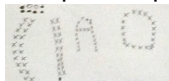
**processing** How can information be manipulated/changed in order to produce new knowledge?

**automation** Which manipulations can be performed by a *mechanical* interpreter? How can this be done?

## Information

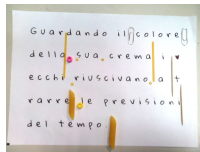
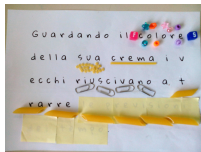


Bitmaps, sampling, resolution, information compression...



## (Meta)-Information

From marking text with objects to mark-up languages



**Esercizi**

- Testo 1
- Testo 2
- Testo 3
- Testo 4
- Testo 5
- Caratterizzazione libera

**Wikipasta - Aiuto**

Formato	Formattazione
Boldo	Grassetto
Italo	Corsivo
Sottolineato	Colorato
Strisciato	Colorato
Strisciato	Strisciato

**Testo Formattato:**

Nel mezzo del camino di fronte a un focolare che si  
brucia di un ardore. All'istante è di quel che si sono  
svolti e si sono a fare che nel mezzo della stanza.

**Identifica la codifica del testo formattato:**

...nel mezzo del camino di fronte a un focolare...

**Formato**

**Risultato della formattazione:**

...nel mezzo del camino di fronte a un focolare...

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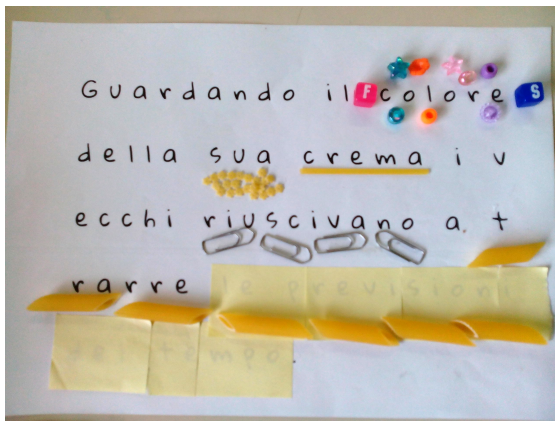
Algomotricity

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## (Meta)-Information

From marking text with objects to mark-up languages



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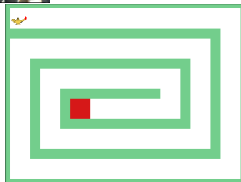
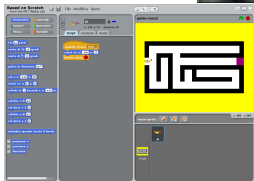
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## Automated processing (programming)

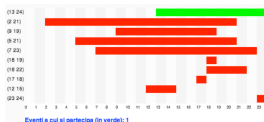
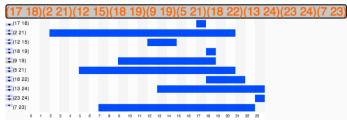
Introducing sequence, selection, and iteration:  
from guiding a blindfold classmate to programming with scratch



## Processing (algorithms)



What do the problem of giving change and that of scheduling events have in common?



## Recursion

Blind-delegation, self-similarity, base-case: it's recursion!



The Mysterious Computer

Choose or edit a phrase to be processed, start a game level, and find out what is going on by clicking on EXPLORE.



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Given the success of the workshops, we started to disseminate them to teachers.

- Workshops for teachers
- Formal pre-service training (known as TFA in Italy): three editions since 2012.
- Since 2014 we teach one of the few courses about “Teaching of informatics” in a university curriculum (master level)
- ‘#Digit-iscol@’ Sardinian project for training local teachers (all school levels) about extra-curricular programming activities

Thank you for your attention!



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