# Exploring science with low cost social robots

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#### Social robots for education

Learning programming with robots

Learning science with robots

Exploring science with robots

Social robots for education: The road ahead

Other issues

#### Social robots for education: Context

- Education: 19th century system, 20th century teachers, 21st century children
- New educational needs: More creative, critical minds for a digital world
- Multiple intelligences
- Learn through playing, be surprised, feel emotions
- Less interest in science and engineering
- High demand in science and engineering jobs
- ICT advances
  - Robotics
  - Analytics
  - Artificial Intelligence
  - Cheap(er) hardware

#### Social robots for education: Context

#### Structure

- Sensors: USB Camera, Microphone, Touch, Accelerometer
- Actuators: Wheels, Moves parts of body, Voice, Screen, Chest with colours
- Communication: HDMI, 3USB, Ethernet, WiFi
- Raspberry Pi

#### Actions

- Listen and speak (SP,FR,EN,CAT), Converse
- Makes decisions, learns
- Emotional touch!!!
- Move
- Vision, Recognition (Face, QRs,...)

#### Programmable

- Scratch, Blockly
- SDK in Python
- Low cost





#### Social robots for education: Context

Product	Robotics	AI/ Emotional Intelligence	Magical/ lmaginative	Natural Language Interaction	Personalise d learning strategy	Connected School- Home	Content Library	Access- ories
EMOBOT	1	1	1	1	✓	1	1	1
LEGO	✓	×	×	×	×	×	<b>V</b>	✓
MakeWonder	✓	×	✓	Only Speaking	×	×	✓	✓
Little Bits	×	×	✓	×	×	×	×	✓
Orbotix	✓	×	✓	×	×	×	×	×

Social robots for education

## **Learning Programming with robots**

Learning science with robots

Exploring science with robots

Social robots for education: vision

Other issues

# Programming with robots

Aisov Scratch ▼ [D] connect bot1 to ip aisoy1.local Scratch [D] disconnect bot1 bot1 set all language to E bot1 grammar = list Blockly ASR recognition bot1 start connect botl to ip 192.168.1.110 disconnect bot1 bot1 state is Normal set bot1 grammar to list set bot1 todos | language to English | with Male | voice | set | bot1 to Normal | state | block bot1 says text to say moving botl say text to say moving mouth block botl say text to say without moving mouth block bot1 says one of the list wit botl say one of the list with with moving mouth block bot1 moves head horizontal move eyebrows of botl to 0.5 in 1 seconds no block move head horizontal of bot1 to 0.5 in 1 seconds no block move head vertical of bot1 to 0.5 in 1 seconds no block bot1 moves head vertical to move eyes of bot1 to 0.5 in 1 seconds no block bot1 moves eyebrows to 0.5 change hearth color of bot1 to: red 255 green 255 blue 255 in 1 secs no block bot1 moves eyes to 0.5 med bot1 heart light to: red 255 write in mouth of botl text text to write no block write in mouth of botl text text to write no block bot1 writes text to write in mo when bot botl is touched at head when bot botl is in position 0 when bot botl hears sentence [E] when bot1 is touched at head SDK [E] when bot1 is in position stand [E] when bot1 hears sentence [E] when bot1 detects 1 faces

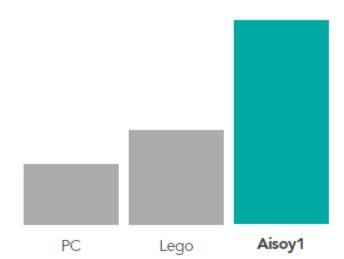
# Programming with robots

Program your play



The robot as domotic hub

Results of improvement of the capacity of understanding, reasoning and problem solving



Social robots for education Programming with robots

## Learning science with robots

Exploring science with robots

Social robots for education: vision

Other issues

# Learning science with robots

(Affective) Math Academy



Social robots for education

Programming with robots

Learning science with robots

## **Exploring science with robots**

Social robots for education: vision

Other issues

# Exploring science with robots





Game of colours

Game of geometry

- Educational stage, Objectives, Competences, Learning standards, Didactical resources, Timing, Suggestions, Evaluation
- 30+ Game activities

# Exploring science with robots

- Understanding the concept of velocity
- Geometry concepts
- Probability concepts
- Newton laws
- Game theoretic concepts
- •

Social robots for education

Programming with robots

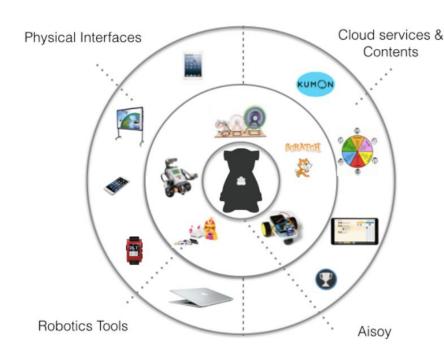
Learning science with robots

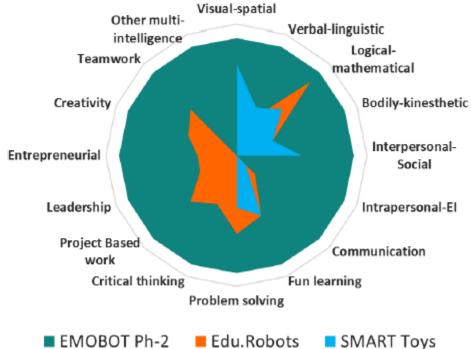
Exploring science with robots

Social robots for education: vision

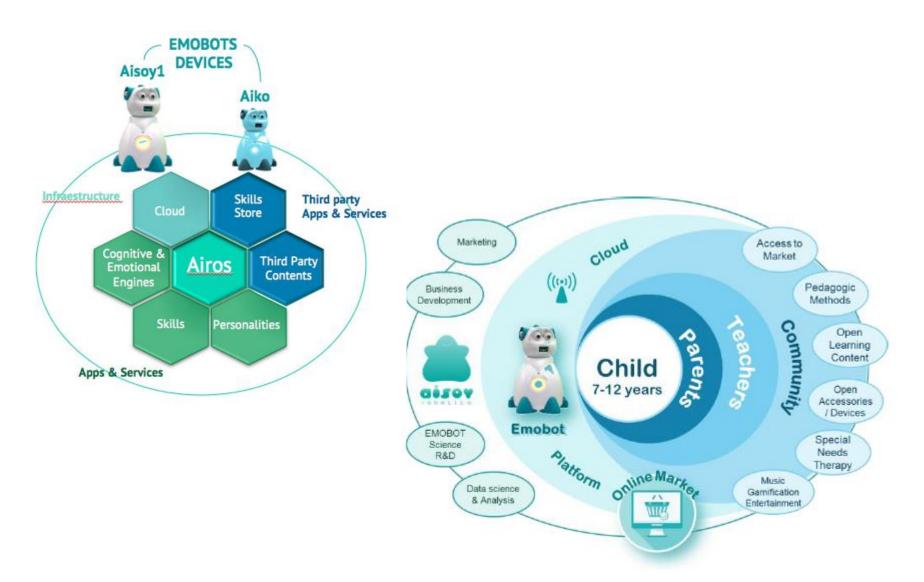
Other issues

#### Social robots for education: Vision





#### Social robots for education: Vision



## Social robots for education: Vision

Low cost. Important for CESAME centers!!!

```
350 € --→ 250€ School version
150 € Family version
```

Social robots for education

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#### Other issues

#### Other issues

- The gender issue
  - Our experience



- Children with special needs
  - ASD. Our hypothesis



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Other issues

- Social robotics and Al
- Not just to learn technology, but to learn and explore science (and other subjects) in a fun way
- The affective bond
- Teaching assistants
- Mentor at home
- Low cost

#### Thanks!!

Collaborations welcome!!!

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