

# Interaction Design & Physical Computing for interior design

Michelangelo Guarise

# Interaction design

*Interaction designers strive to create useful and usable products and services. Following the fundamental tenets of user-centered design, the practice of interaction design is grounded in an understanding of real users—their goals, tasks, experiences, needs, and wants. Approaching design from a user-centered perspective, while endeavoring to balance users' needs with business goals and technological capabilities, interaction designers provide solutions to complex design challenges, and define new and evolving interactive products and services.*

Interaction Design Association (IxDA)

# Interaction Design

- User Centered Design: design pursues users need, abilities and expectancies
- Simplify the interaction with complex environments
- The value of a product is measurable by user's satisfaction

# Interaction Design: simple facts

- It's all about creating experiences
- Designer is the first user
- Goal Driven

# Interaction Design: principles

- Simplicity:

The design should make simple, common tasks easy, communicating clearly and simply in the user's own language

# Interaction Design: principles



# Interaction Design: principles

- Visibility:

The design should make all needed options and materials for a given task visible without distracting the user with extraneous or redundant information

# Interaction Design: principles





# Interaction Design: principles

- Feedback

The design should keep users informed of actions or interpretations, changes of state or condition, and errors or exceptions that are relevant and of interest to the user through clear, concise, and unambiguous language familiar to users.

# Interaction Design: principles

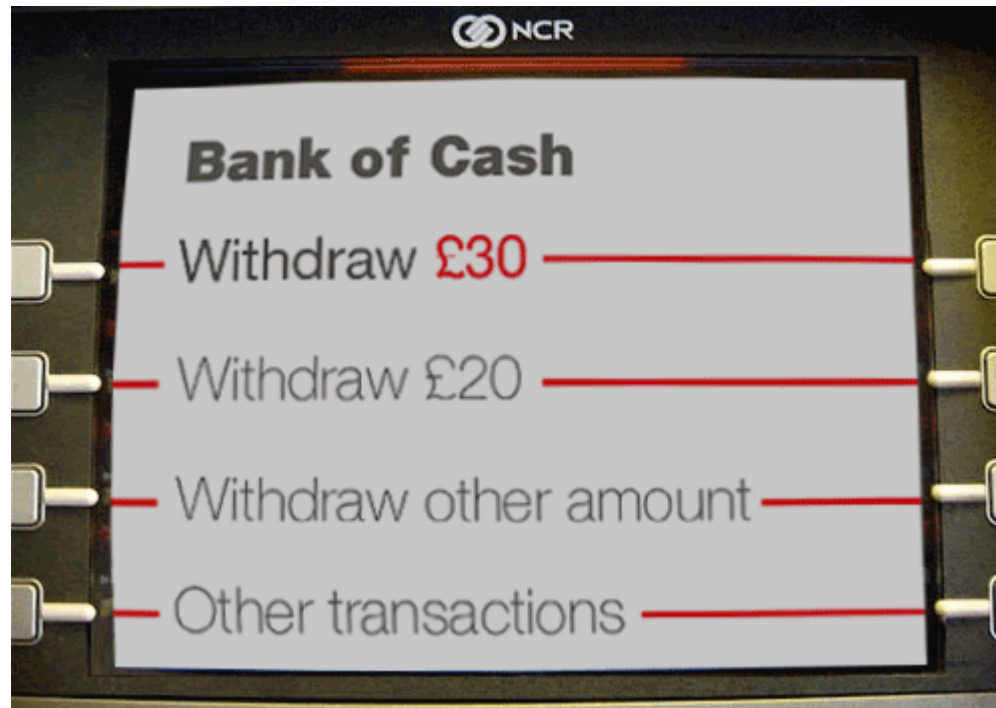


# Interaction Design: principles

- Tolerance

The design should be flexible and tolerant, reducing the cost of mistakes and misuse by allowing undoing and redoing, while also preventing errors wherever possible by tolerating varied inputs and sequences and by interpreting all reasonable actions.

# Interaction Design: principles

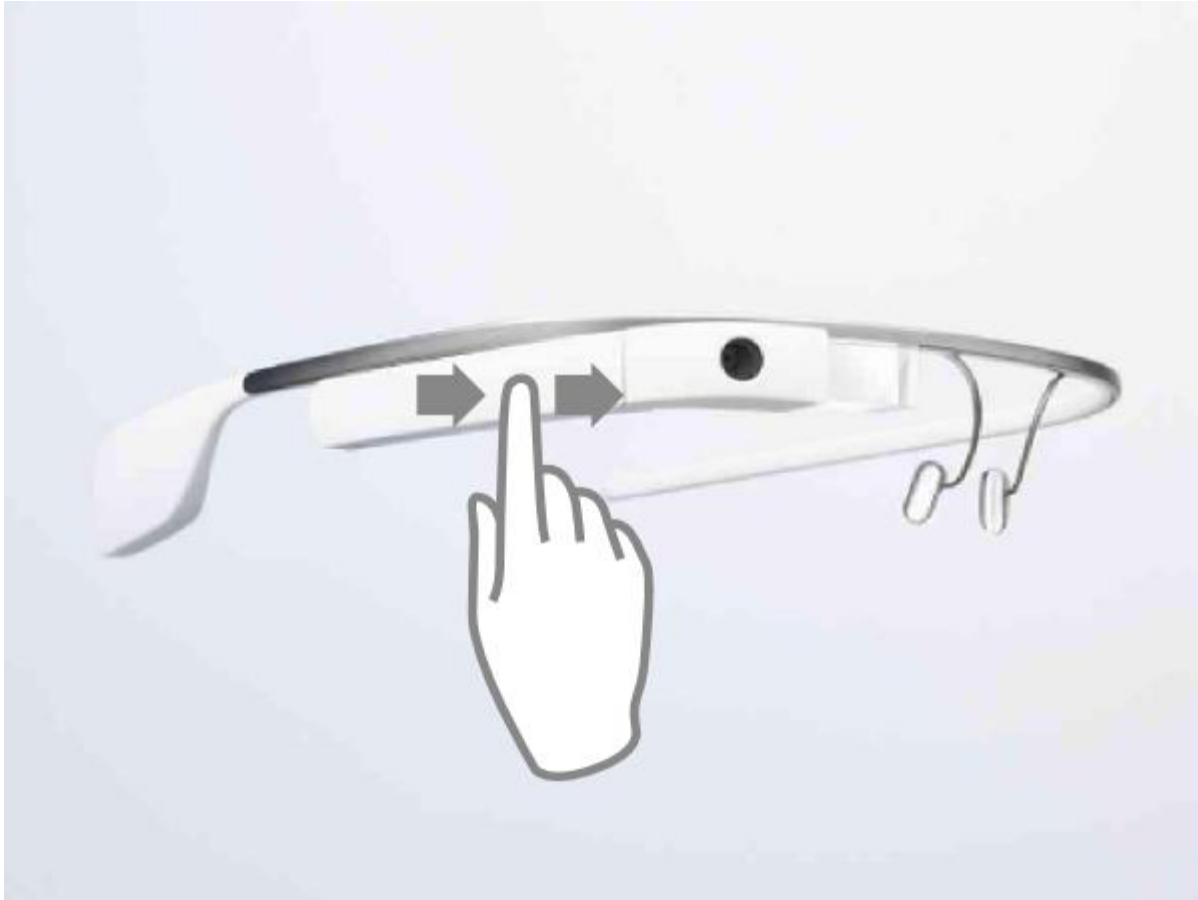


# Interaction Design: principles

- Reuse

The design should reuse internal and external components and behaviors, maintaining consistency with purpose rather than merely arbitrary consistency, thus reducing the need for users to rethink and remember.

# Interaction Design: principles



# User centered design

- It is more important to define usage scenarios than concentrating on technical aspects
- Solve problems before user has to face them
- Make novice experts

# Interaction Design

Interaction Design is the design of any interactive experience

In Today's world, interaction design is concerned with the creation of meaningful experiences between us (humans and objects).

Interaction design encourages design through an iterative process based on prototypes of ever increasing fidelity .

*Massimo Banzi*



# From IxD to Physical Computing



# Physical Computing

Physical computing uses electronics to prototype new materials for designers and artists

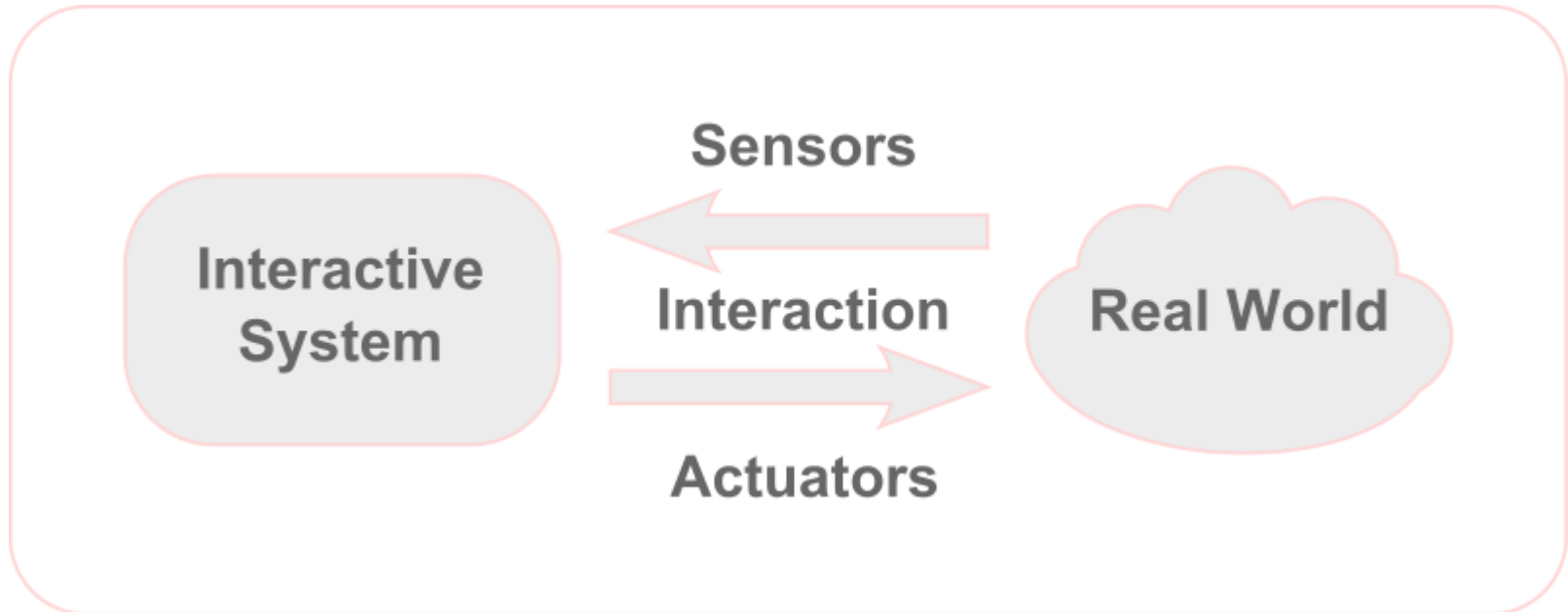
It involves the design of interactive objects that can communicate with humans using sensors and actuators controlled by a behaviour implemented as software running inside a microcontroller.

*Massimo Banzi*

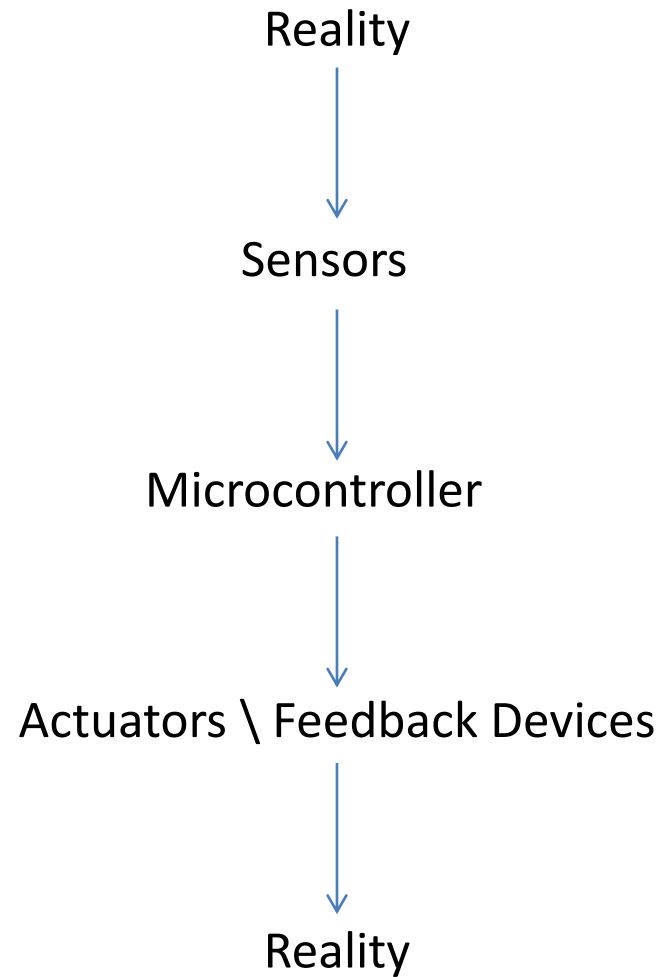
# Physical Computing

- Interactions in physical computing are made possible mainly by sensors
- They translate human natural body movements and environmental changes into machine readable values
- Using appropriate libraries, softwares and tools they can be translated into feedbacks and interaction triggers
- Feedbacks can also be delivered through actuators
- In the physical computing domain interactions are meant to be analog

# Physical Computing



# Physical Computing



# Sensors

- Sensors in Physical Computing are devices which translates changes in physical world and translates them into machine-readable data
- They can work in two domains:
  - Digital (on \ off)
  - Analog (Continuum)

# Sensors



- Light Dependant Resistor
- Detects Lightning conditions
- Analog

# Sensors



- Button
- Detects pressure
- Digital



# Sensors



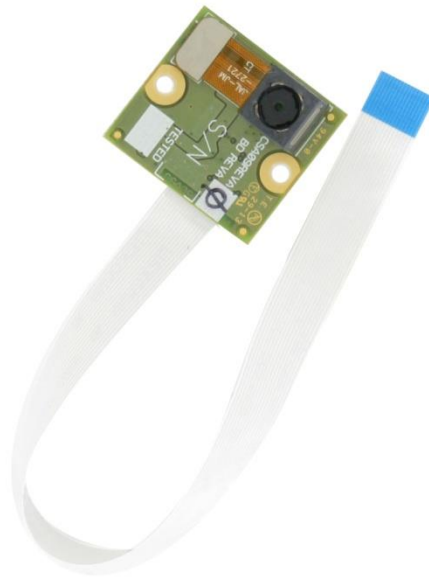
- Ultrasonic PING
- Detects distance of obstacles and objects
- Analog

# Sensors



- Potentiometer
- Used to Trim
- Analog

# Sensors



- Camera
- Can Record Video and still images
- Analog - Digital

# Sensors



- Air Quality Sensor
- Detects air pollution and balance
- Analog - Digital

# Actuators \ Feedback Devices

- Actuators and Feedback Devices in physical design are the actual medium in which the effect of the interaction consists
- They directly modify the physical and tangible reality
- They are directly responsible on the Interaction quality

# Actuators \ Feedback Devices



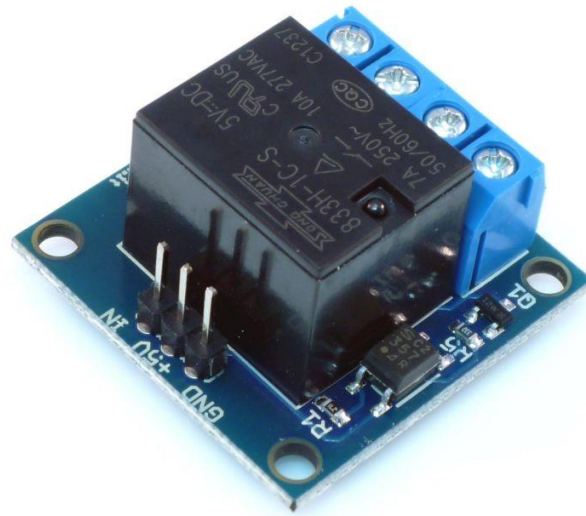
- LEDs
- Turn on \ Off – Change color if RGBY
- Analog - Digital

# Actuators \ Feedback Devices



- Servo-motor
- Change Physical Position
- Analog

# Actuators \ Feedback Devices



- Relais
- Open \ Closes a circuit
- Digital



# Actuators \ Feedback Devices



- Loudspeakers
- Emits Sounds
- Analog



# Physical Computing in Interior Design

- Smart Home
- Smart Grid
- Smart TV
- Smart Air-con
- Smartphones

# Physical Computing in Interior Design

- What makes such devices SMART?
- They can dynamically assess the physical world
- They can dynamically react to such changes
- They can exchange data with each other
- They extend our means of perceptions

# Physical Computing in Interior Design



# Physical Computing in Interior Design

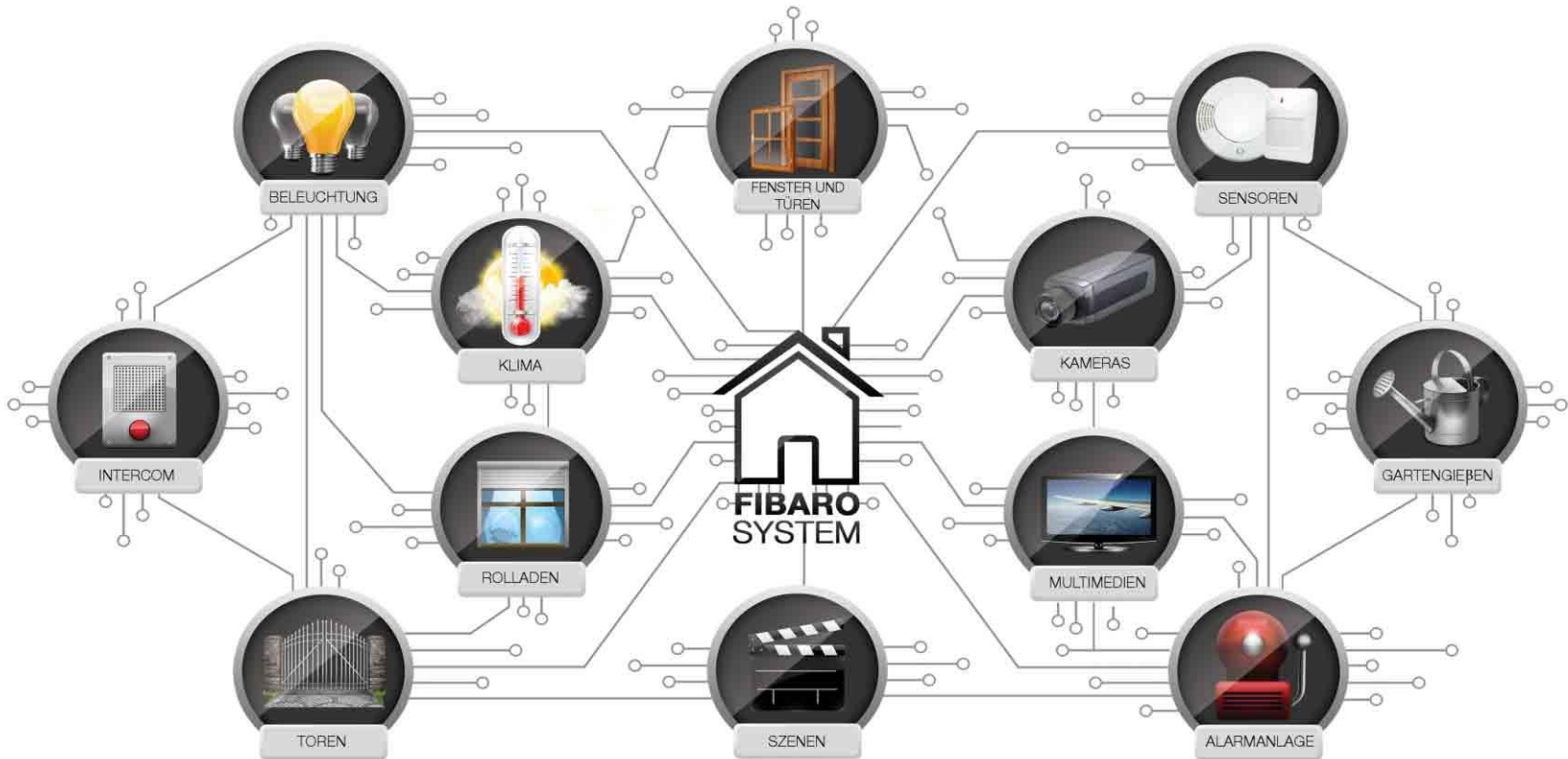
- My Phone knows its colder today (Google API)
- My Home Router gets the data from my Phone
- My Home Gateway connects my Aircon to other services
- My Aircon reacts, warming my house

# Physical Computing in Interior Design

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# Case Histories

- Fibaro Smart Home System





# Case Histories

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# Case Histories

- LG Smart Fridge



# Case Histories

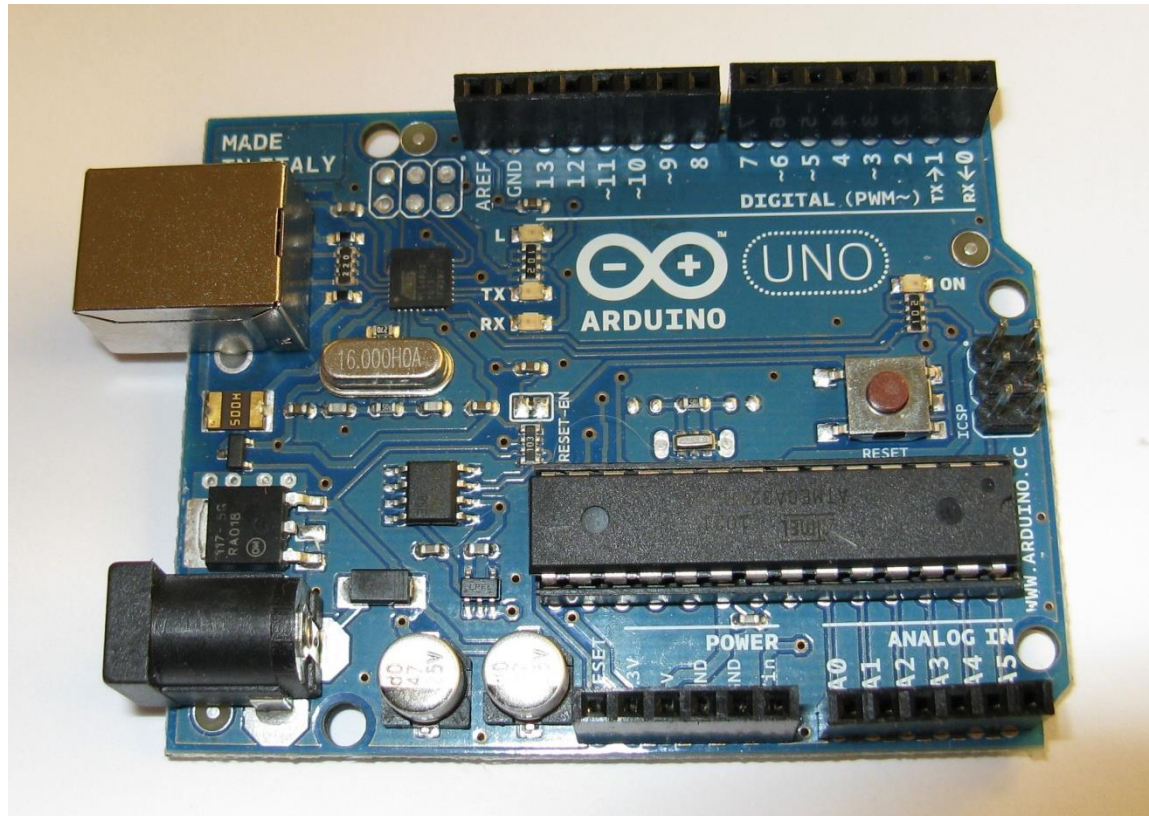
- Iseelite



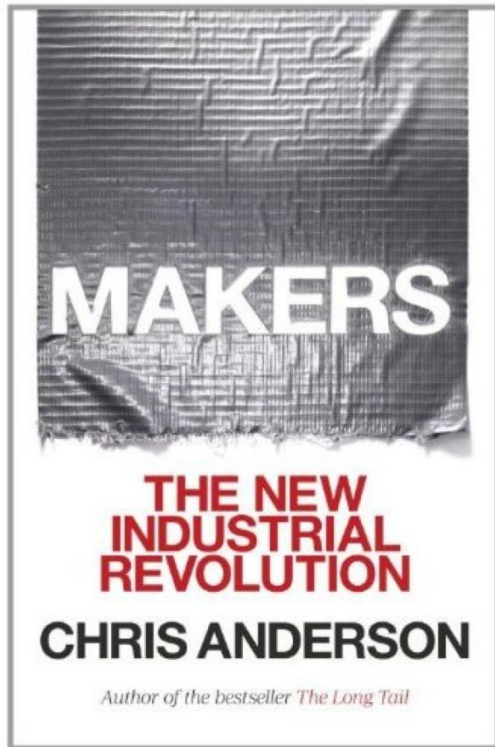
# Interactions

- Voice Control
- Biological Datas
- Time schedules
- Random events

# The Makers Revolution



# The Makers Revolution



**The  
Maker  
Movement**

**ROME**

**Maker Faire®**  
**THE EUROPEAN EDITION**

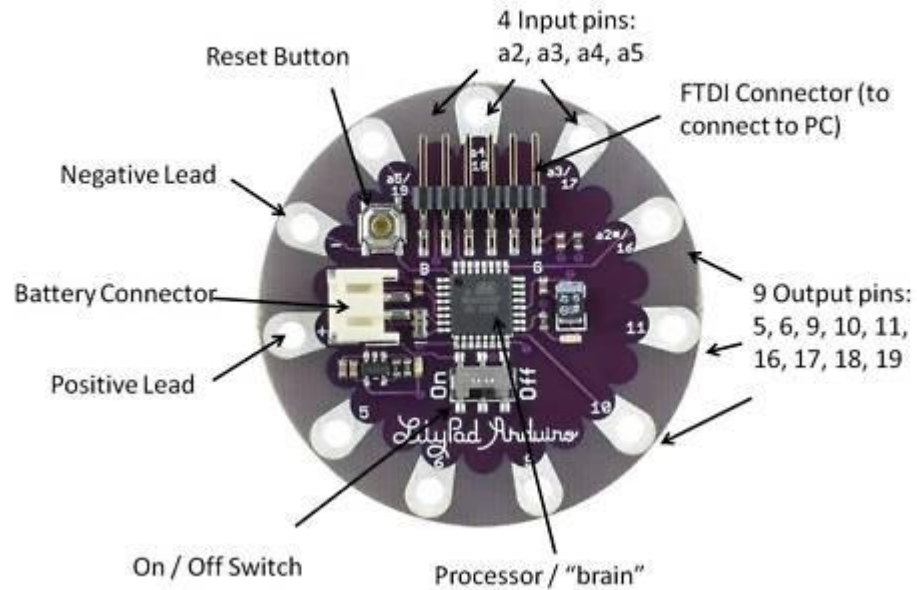
# Makers

The maker subculture is a contemporary subculture, representing a technology-based extension of DIY culture. Typical interests enjoyed by the maker subculture include engineering-oriented pursuits such as electronics, robotics, 3-D printing, and the use of CNC tools, as well as more traditional activities such as metalworking, woodworking, and traditional arts and crafts.

Maker culture' emphasizes learning-through-doing (constructivism) in a social environment. Maker culture emphasizes informal, networked, peer-led, and shared learning motivated by fun and self-fulfillment

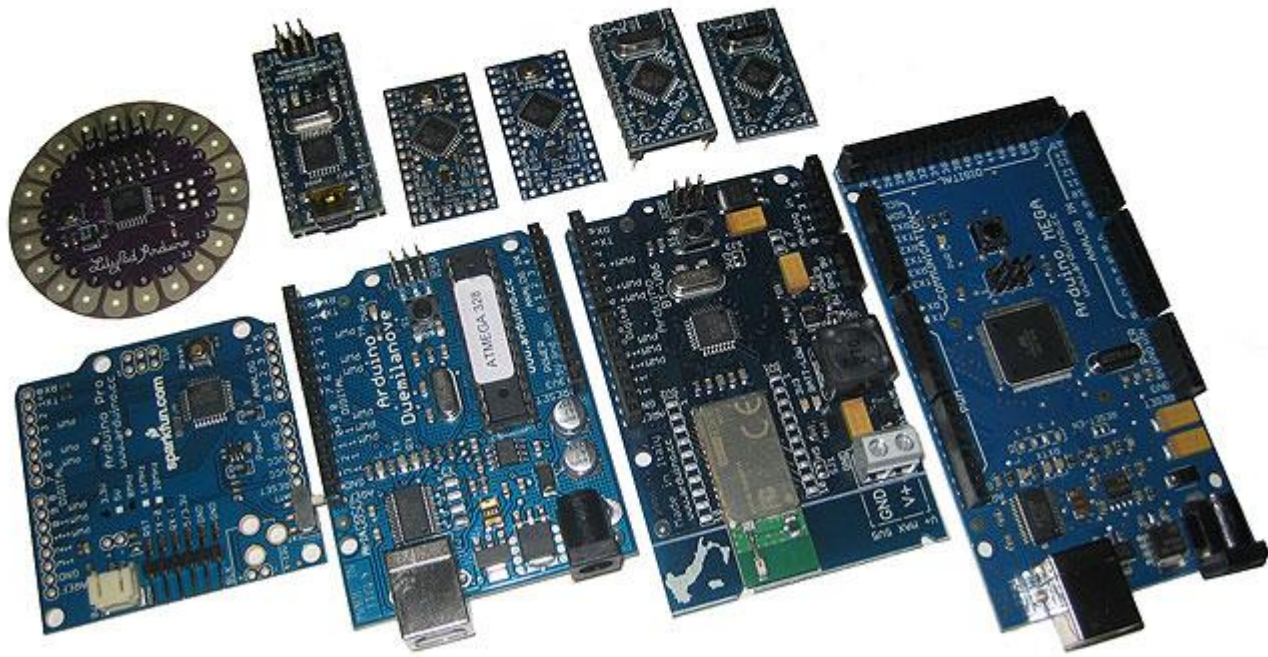
# Arduino

## The LilyPad Arduino "Simple" Board

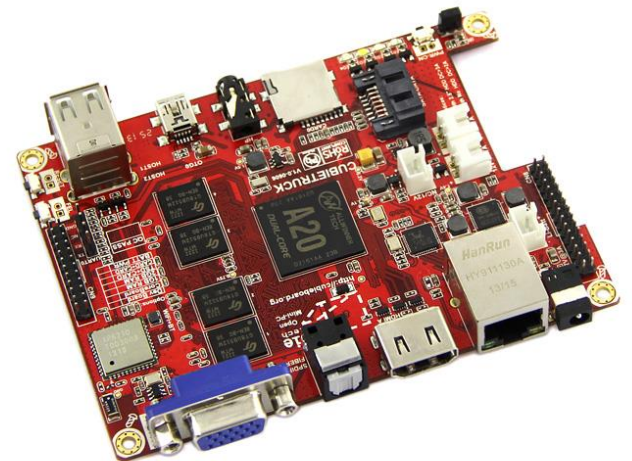
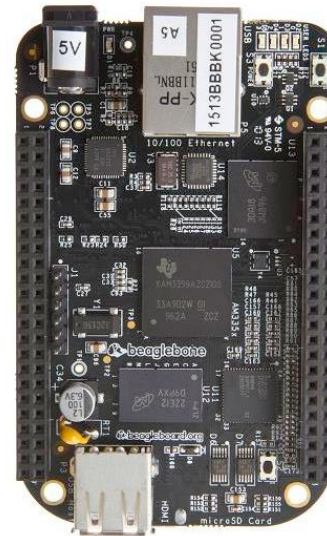




# Arduino



# And its legacy



# Third Industrial Revolution

## THIRD INDUSTRIAL REVOLUTION

Chris Anderson, considered to be an authoritative source on the maker movement, recently came out with the first trade book covering this market. In it, he rightly points out that the economy of hard goods still dwarfs that of digital, with the latter receiving the lion's share of media attention. It is not just the U.S. economy that is dependent on making stuff – it is also true for the global economy, much of which has benefited from being the source of cheap labor for producing goods under a 'second industrial revolution' model. With the advent of the maker-lead industrial revolution the manufacturing landscape will be forever changed.

Mass production, which is predicated on the economies of scale, will still have a place. Who needs a custom manufactured refrigerator or washing machine? But when a component wears out, you will be able to print one at home, or send the 3D model to the local service bureau, rather than pay a princely sum for a piece of plastic or metal that has traveled half way around the world. Understanding that this change is inevitable, the forward-looking manufacturer may sell their unit with a set number of licenses for downloading and printing replacement parts.

**“Yet as big as the economy of bits may be, that dematerialized world of information trade is less than one fifth of the U.S. GDP. The rest, including the biggest service sector of all, consumer retail, is mostly about making, moving and selling stuff.”**

**– CHRIS ANDERSON, *MAKERS: THE NEW INDUSTRIAL REVOLUTION*<sup>34</sup>**

# Rapid Prototyping

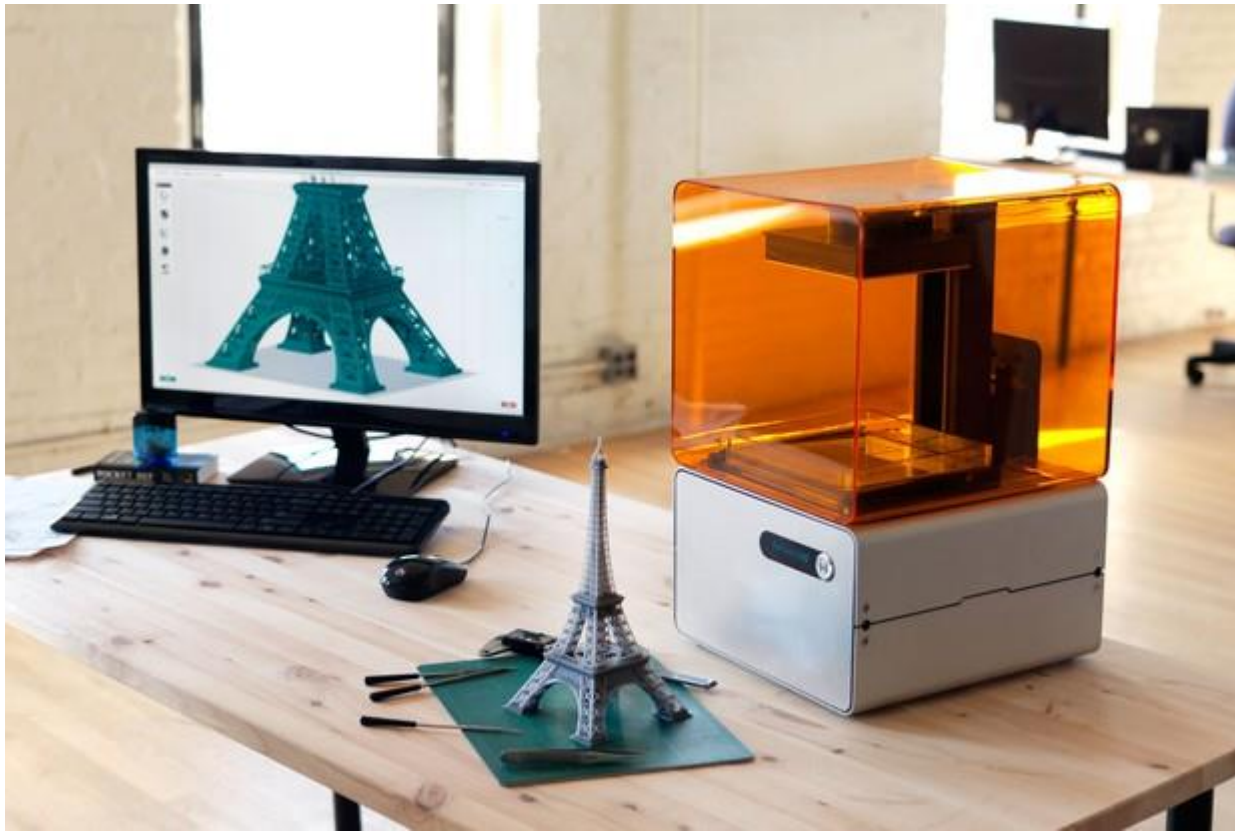
- Rapid Prototyping is the Procedure which allows to obtain a full working and resemplant prototype of the designed product
- Physical computing helps designers and artists to quickly prototype their interactive concepts.

# Rapid Prototyping

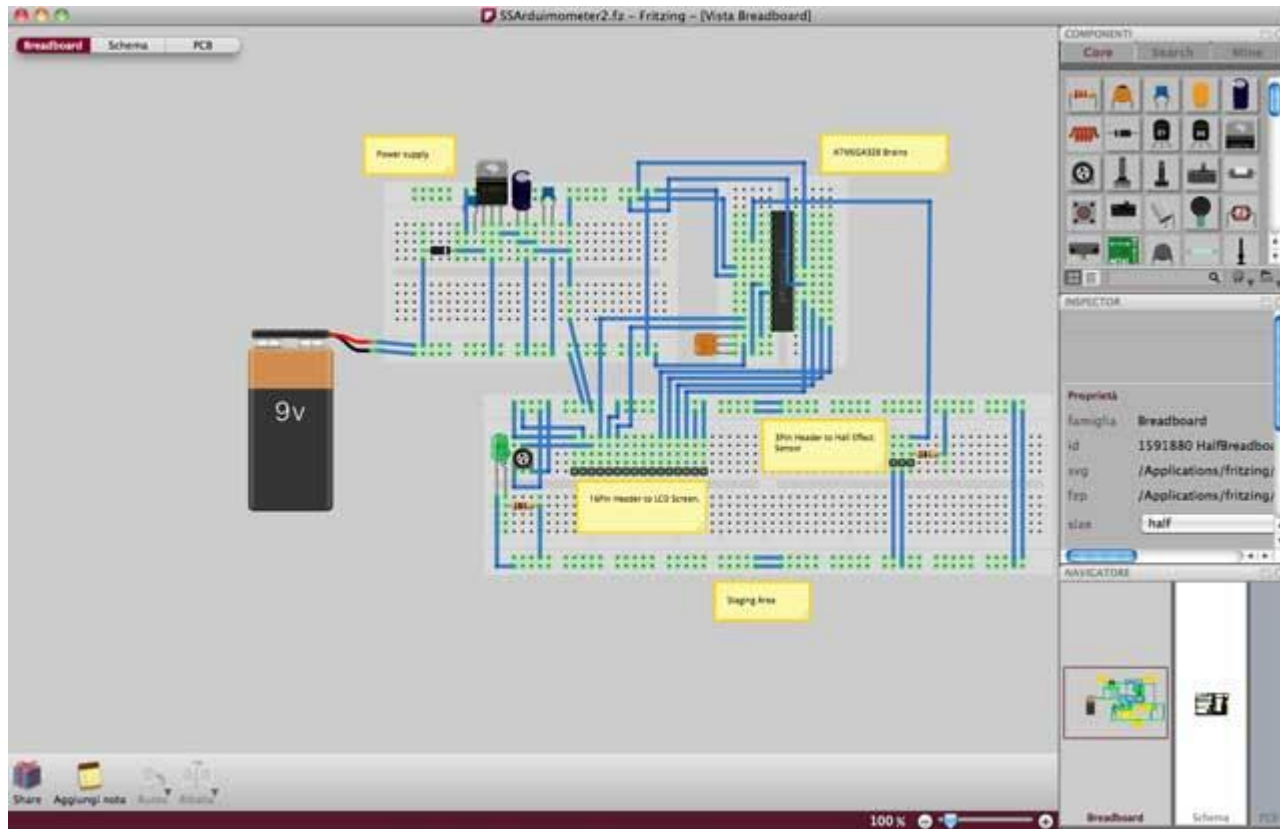
- Fast and effective communication of design ideas
- Effective validation of design fit, form, and function
- Greater design flexibility, with the ability to run quickly through multiple design iterations
- Fewer production design flaws and better end-products



# Rapid Prototyping



# Rapid Prototyping



# Rapid Prototyping

