DIDATTICA DELL'INFORMATICA

Da Computational Thinking a Computational Action

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Computational Thinking

- Nel libro Mindstorms, Papert sostiene che la programmazione facilita il ragionamento procedurale, in quanto insegna a dividere il problema principale in problemi più semplici da risolvere, e a fare debug su di essi.
- Questo modo di approcciarsi ai problemi e alla loro risoluzione è efficace non solo nell'ambito della programmazione, ma se interiorizzato può essere applicato nella vita di tutti i giorni.

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Computational Thinking - Wing

- Nel 2006 è la scienziata americana Jeanette Wing, direttrice del Dipartimento di Informatica della Carnegie Mellon University, a diffondere il concetto di Pensiero Computazionale, infatti nell'articolo su Communication of ACM intitolato "Computational Thinking", sostiene che il Pensiero Computazionale contiene concetti che possono essere utili a tutti e non solo agli informatici.

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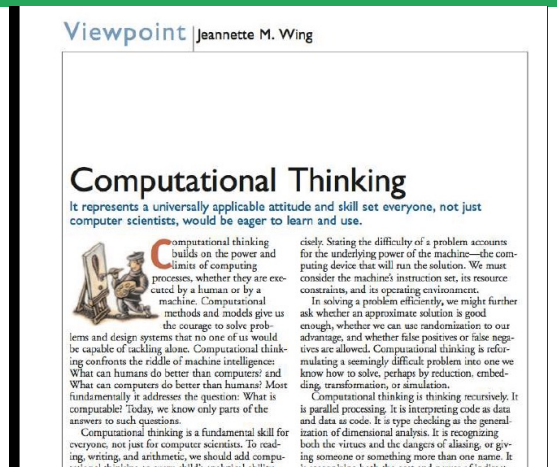

Viewpoint | Jeannette M. Wing

Computational Thinking

It represents a universally applicable attitude and skill set everyone, not just computer scientists, would be eager to learn and use.

Computational thinking builds on the power and limits of computing processes, whether they are executed by a human or by a machine. Computational methods and models give us the courage to solve problems and design systems that no one of us would be capable of tackling alone. Computational thinking confronts the riddle of machine intelligence: What can humans do better than computers? and What can computers do better than humans? Most fundamentally it addresses the question: What is computable? Today, we know only parts of the answers to such questions.

Computational thinking is a fundamental skill for everyone, not just for computer scientists. To reading, writing, and arithmetic, we should add compu-

cisely. Stating the difficulty of a problem accounts for the underlying power of the machine—the computing device that will run the solution. We must consider the machine's instruction set, its resource constraints, and its operating environment.

In solving a problem efficiently, we might further ask whether an approximate solution is good enough, whether we can use randomization to our advantage, and whether false positives or false negatives are allowed. Computational thinking is reformulating a seemingly difficult problem into one we know how to solve, perhaps by reduction, embedding, transformation, or simulation.

Computational thinking is thinking recursively. It is parallel processing. It is interpreting code as data and data as code. It is type checking as the generalization of dimensional analysis. It is recognizing both the virtues and the dangers of aliasing, or giving someone or something more than one name. It

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Computational thinking

- computational thinking: “being able to think like a computer scientist and being able to apply this competence to every field of human endeavor”
- it supports the goal of teaching scientific and cultural aspects of computing in schools, focusing on principles and methods more than on systems and tools.
- This is required since informatics is the science underlying the digital technology pervading all aspects of contemporary society.

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computational thinking

- More and more people are now considering CT a new subject, somehow different or distinct from computer science (“computing” in UK, “informatics” in Europe).
- this approach is misleading: in the long run it will do more harm than benefit to informatics.
  - in schools they do not teach “linguistic thinking” or “mathematical thinking”, with specific “body of knowledge” or “assessment methods”.

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Shift: Da Computational Thinking a Computational Action

https://cacm.acm.org/magazines/2019/3/234922-from-computational-thinking-to-computational-action/fulltext

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Computational Action

- Mentre apprendono l'informatica, i giovani dovrebbero anche avere opportunità di creare elaborazioni che abbiano un impatto diretto sulla loro vita e sulle loro comunità
- Gli studenti hanno la capacità di sviluppare prodotti che possono avere un impatto autentico nella loro vita dal momento in cui iniziano a imparare a programmare, tutto ciò di cui hanno bisogno è di trovarsi in contesti che gli consentano di farlo.

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Computational Action

- 2 dimensioni chiave dell'azione computazionale
  1. identità computazionale
  2. Digital Empowerment
- 1
  - Students must feel they are responsible for articulating and designing their solutions, rather than working toward predetermined "right" answers.
  - Students need to feel their work is authentic to the practices and products of broader computing and engineering communities.
- 2
  - A significant number of activities and development should be situated in contexts that are authentic and personally relevant.
  - Students need to feel their work has the potential to make an impact in their own lives or their community.
  - Students should feel they are capable of pursuing new computational opportunities as a result of their current work.

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Computational Action

- concentrandoci sull'azione computazionale (oltre che sul pensiero computazionale), possiamo rendere l'educazione informatica più inclusiva, motivante ed "empower" per i giovani studenti.
- Troppo spesso, l'educazione informatica è stata guidata dall'enfasi sui bambini che imparano i "fondamenti" della programmazione, come variabili, loop, condizioni, parallelismo, operatori e gestione dei dati…
- Questa attenzione iniziale sui concetti e i processi di elaborazione, lasciando le applicazioni del mondo reale per "dopo" corre il rischio di far sentire agli studenti che non è importante per loro imparare.
- Sorge la domanda che troppi studenti di matematica o fisica hanno posto: "Quando lo useremo nella nostra vita?"

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Computational Action

- **Situando** l'educazione informatica in contesti del mondo reale che contano per gli studenti, possiamo coinvolgere più persone nell'informatica, con tutti i benefici che ne derivano per i giovani e la società.
- Non solo programmatori (tanto necessari) ma anche cittadini alfabetizzati computazionalmente (in grado di risolvere problemi).
- C'è la necessità di piattaforme che eliminano le barriere e consentano una veloce progettazione e sviluppo di soluzioni (App Inventor…) e comunità a cui rivolgersi

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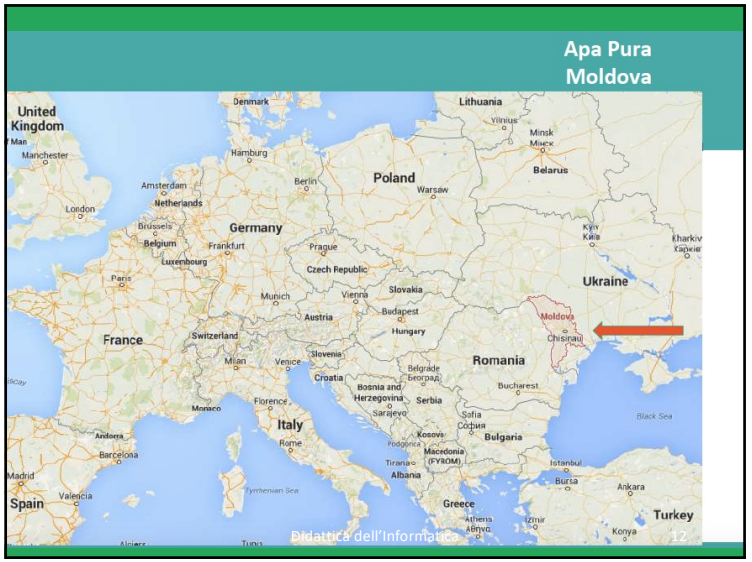

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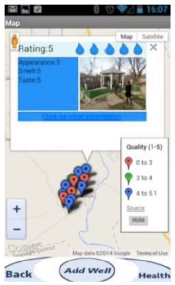
An app to help people find pure sources of water

Apa Pura
Moldova



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Apa Pura as Computational Action

Apa Pura demonstrates:

- Even children can create valuable resources that have nationwide scope

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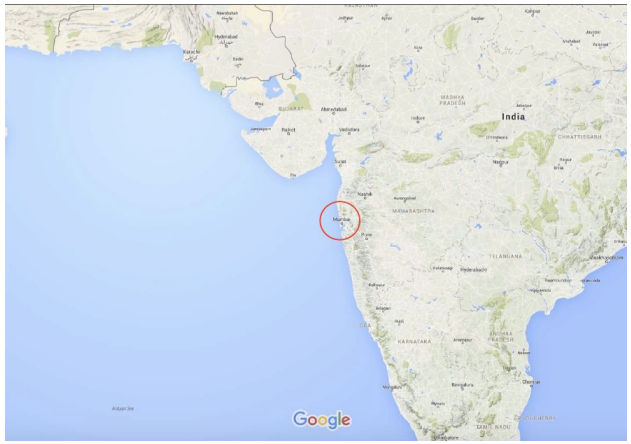

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THE HINDU

Tech girls and the making of the Dharavi code

MUMBAI » MUMBAI LOCAL

MUMBAI, April 10, 2016

Updated: April 10, 2016 01:53 IST

Nawneet Ranjan helps girls of Nayabasti learn computers at the Dharavi Diary school in Mahim, Mumbai. Photo: Arunangsu Roy Chowdhury.

The Hindu

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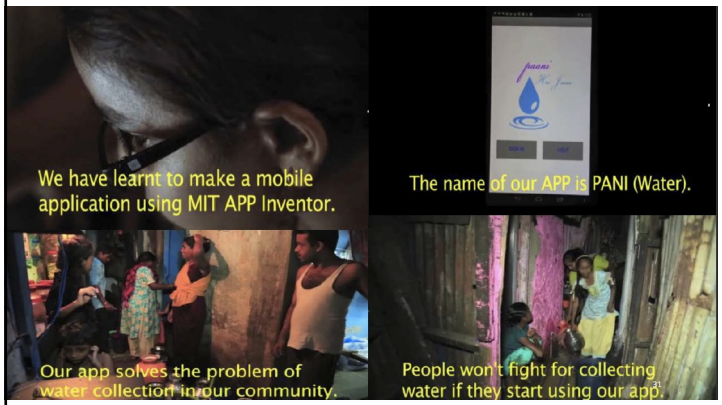

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Pani as Computational Action

Pani demonstrates:

- Even children in the poorest communities can create tools to improve life in their community

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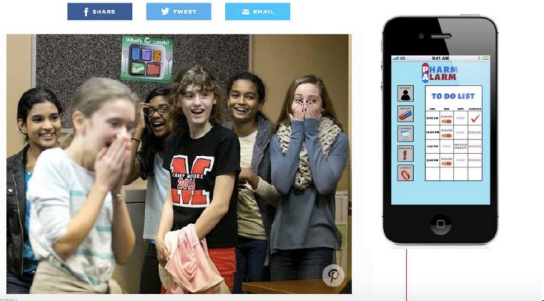
Kentucky Middle School Girls Develop App to Assist Alzheimer's and Dementia Patients: 'This Is a Tribute to My Grandfather'

BY ROSE MINUTAGLIO · @ROSEMINUTAGLIO



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Pharm Alarm as Computational Action

- Pharm Alarm demonstrates:
- Even children can draw on their personal experience as inspiration to make life better for others

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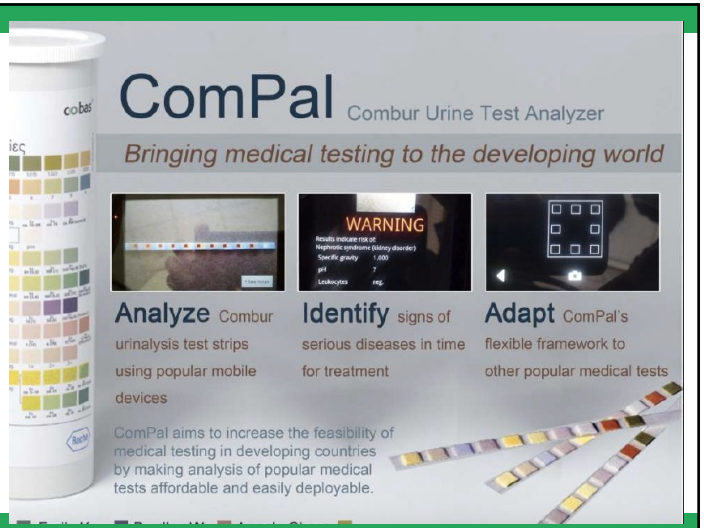

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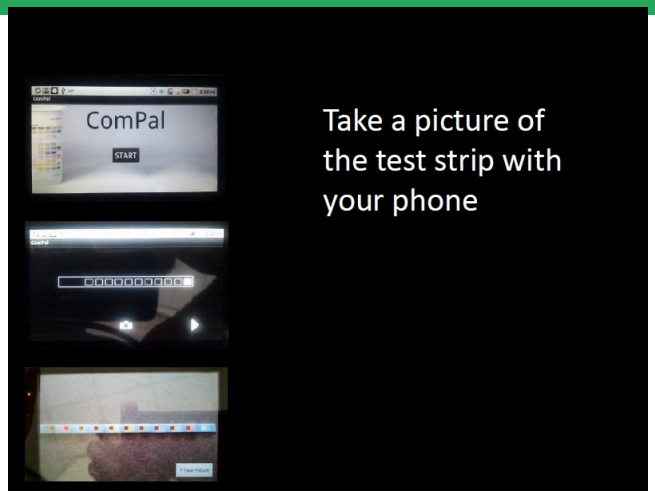

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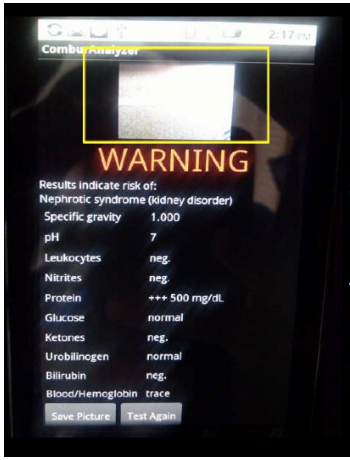

See an automatically generated diagnosis.

The photo and the diagnosis can be send to a clinic.

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ComPal being tested in a village clinic in Nicaragua

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ComPal as Computational Action

ComPal demonstrates:

- Even students can create breakthrough applications to for medical care worldwide

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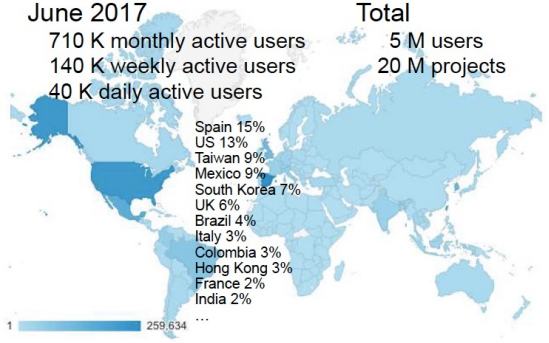
Activity on MIT App Inventor Server

June 2017
710 K monthly active users
140 K weekly active users
40 K daily active users

Total
5 M users
20 M projects



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YOUTH RADIO
Who We Are
How We Work
Press Room
Newsroom
Classroom
Creative Studio
DONATE
CONTACT
Cultivating Media and Minds
Producing top level media is what we do. Providing education and career opportunities for diverse youth is how we do it. Youth Radio merges professional training in media arts and technology with health and academic support, while providing a platform for youth participation in the national dialogue.
MORE
YOUTH RADIO
Newsroom Classroom Creative Studio
Delivering youth perspectives to massive audiences through outlets like NPR, Marketplace, The Huffington Post, and National Geographic.
NEWS RSS
PODCAST
learn how you can support youth radio
ANNOUNCEMENTS:

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Youth mobile power
• A collaborative project of Youth Radio and MIT App Inventor
• Produce national radio broadcasts about youth-related issues where mobile computing can play a role
• Publish apps that relate to those issues
• Publish App Inventor toolkits that let young people create their own original related apps
Newsroom Classroom Creative Studio

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Mood Ring App for Mental Health
Google Play
Mood Ring
Mood Ring
Hello Jane

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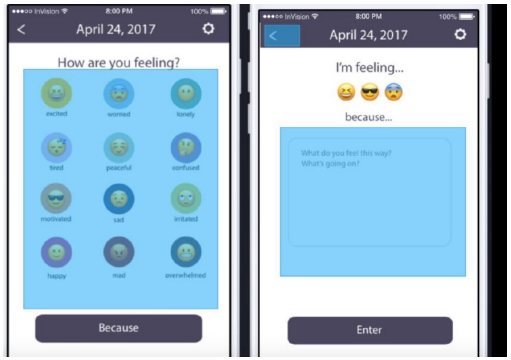
April 24, 2017
How are you feeling?
excited
worried
lonely
tired
peaceful
confused
motivated
sad
irritated
happy
mad
overwhelmed
Because
April 24, 2017
I'm feeling...
because...
What do you feel this way? What's going on?
Enter

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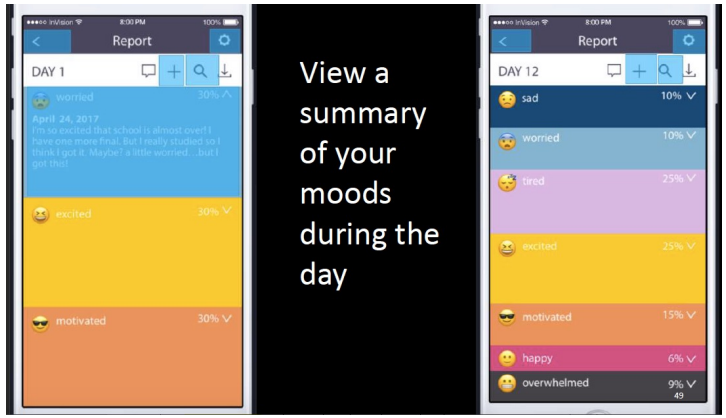

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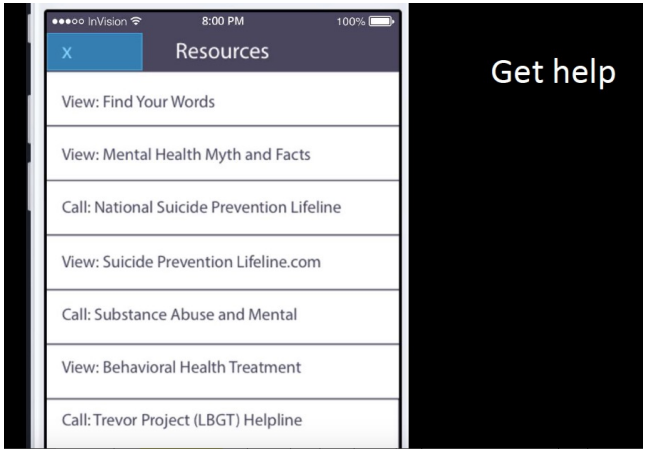

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Mood ring as computational action

- A real application to address an important global issue.
- Designed by the young people at Youth Radio to address mental health issues as they see them.

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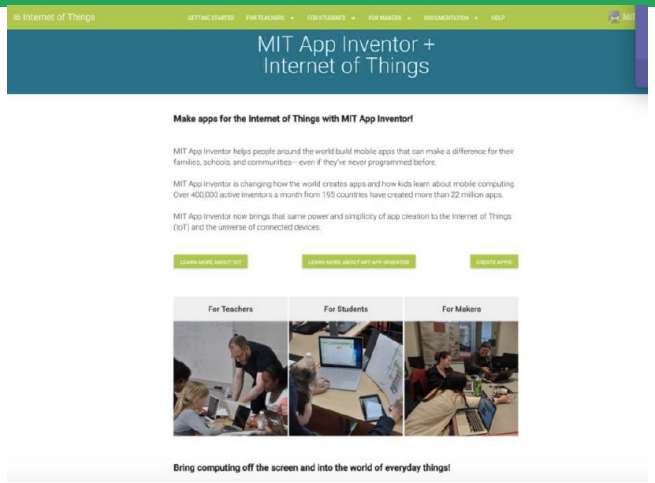

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Texas middle schoolers win national contest for app inspired by their blind classmate

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No matter how old you are, or what gender you are, as long as you have the imagination and the will to do it, anything is possible. -- Helo Navi team member

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Discussione

- Che strategia utilizzare per appassionare gli studenti all'informatica?
- Computational action può far parte di tale strategia? In che modo?
- Come conciliare l'esigenza di appassionare con quella di assicurare che gli studenti acquisiscano le conoscenze/ i framework concettuali necessari per adeguare i saperi in altri contesti?
- Come questo si riflette nella progettazione disciplinare di un primo biennio di Informatica?

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Iniziative per diffusione informatica

- Programma il Futuro
https://programmailfuturo.it/
- Olimpiadi del Problem Solving
https://www.olimpiadiproblemsolving.it/web/index.php
- Gare Kangourou
http://www.kangourou.it/
- Olimpiadi dell'Informatica
https://www.olimpiadi-informatica.it/
- Cyberchallenge.IT
https://corsi.unisa.it/INFORMATICA/focus?id=766

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