

Computational thinking - unplugged

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With support from
Google



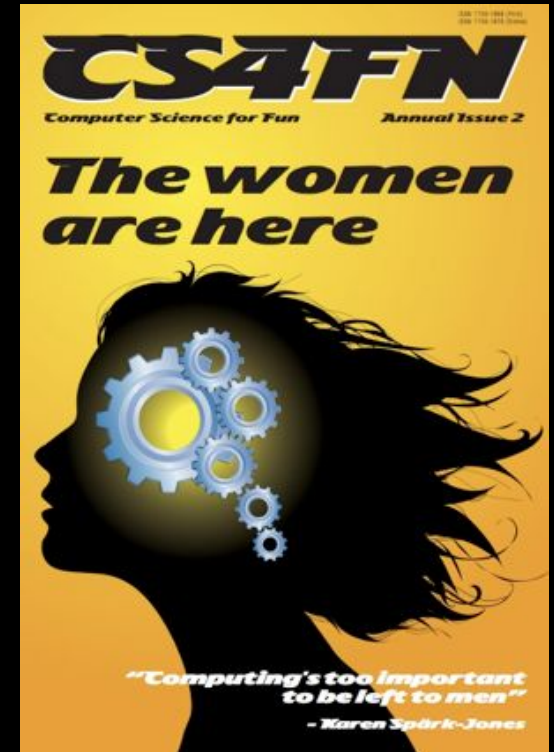
www.teachinglondoncomputing.org

www.cs4fn.org

Twitter: @TeachingLDNComp @cs4fn

Computer Science for Fun: cs4fn

- Inspire school students about computer science
- Rich context from fun research stories
- Answering “Why learn”



Teaching London Computing

www.teachinglondoncomputing.org

- cs4fn's sister project
- Aim to support teachers (in London and beyond)
- Plugged and Unplugged activity sheets
- Courses and Workshops
- Booklets and Magazines (see your pack)

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Aims:

Computational Thinking

- Give you deeper understanding of computational thinking
- Give you practical ways to teach computational thinking in a fun, thought provoking way
 - away from computers, focus on concepts
- Show how it can be embedded in contextually rich stories
- Showing **why** it is important

Activity sheets at
www.teachinglondoncomputing.org
Twitter: @TeachingLDNComp

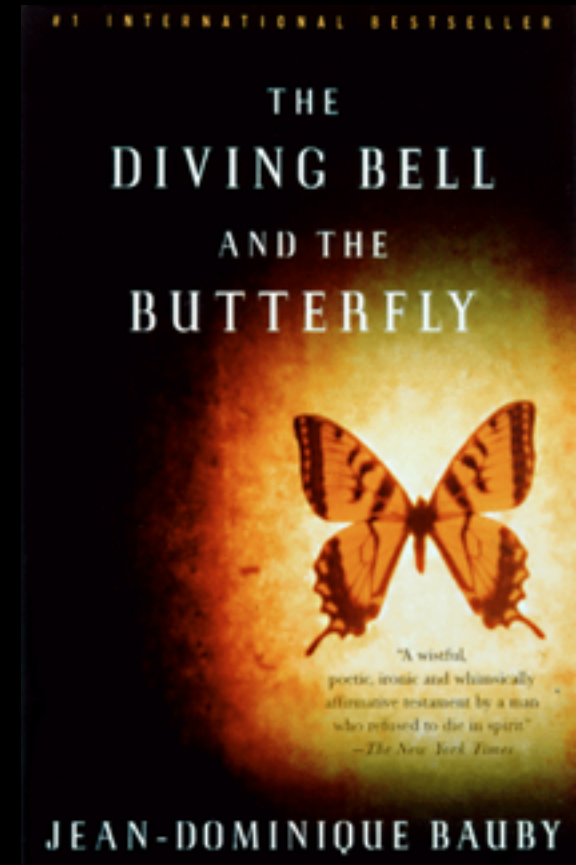
Locked-in Syndrome

- A person with locked-in syndrome is totally paralyzed except perhaps being able to move an eyelid.
- They can see, hear and think but they cannot communicate back.
- Their intelligent mind is trapped inside a useless body.



Could you write a book if you had locked-in syndrome?

- Jean-Dominique Bauby did...
 - “one of the greatest books of the century”.
- Describing his life with locked-in syndrome.
- How did he do it?
 - With a helper
 - No technology



Communicating with Locked-in Syndrome

- The helper reads the alphabet a letter at a time
 - Is it A?
 - Is it B?
 - Is it C? etc
- Blinking means yes, not blinking means no
- The helper writes the letter down.
- Then starts again with the next letter

How well does it work?

- Try it...
- What problems need to be solved?
 - to make it really work
- Can it be improved?
- How fast is it?
 - How long would it take to write a book?



How fast is it?

- It is very slow
- It takes on average 13 questions for *every* letter
- At worst it takes 26 questions
- In identifying problems, coming up with solutions and faster ways, you are doing computational thinking!

Computer Scientists do it better

- Any Computer Scientist knows it can be done in...

5 questions per letter at worst

How?

Let's play a game

- 20 Questions...
- I think of a famous person.
- You have to guess who I am thinking of by asking questions.
- I can only answer yes or no.



Winning at 20-Questions

- Do you ask questions like
 - Is it Adele?
 - Is it Gandhi?
 - Is it Usain Bolt?
- That takes millions of questions
 - you have only 20!
- Instead you try to ask halving questions...
 - Are they female?
- Apply that solution to Locked-in communication



Answer the Question.

Take the left branch if the answer is Yes.

Take the right branch if the answer is No.

Answer the Next Question on that branch and continue as above.

START HERE

Does it come before
N in the alphabet?

YES

NO

Before F?

Before T?

YES

NO

YES

NO

Before E?

Before J?

Before R?

Before W?

YES

NO

YES

NO

YES

NO

YES

NO

Before
C?

Before H?

Before L?

Before P?

Is it
T?

Before Y?

Is it A?

Is it C?

Is it F?

Is it H?

Is it J?

Is it L?

Is it N?

Is it P?

Is it R?

Is it U?

Is it W?

Is it Y?

A

B

C

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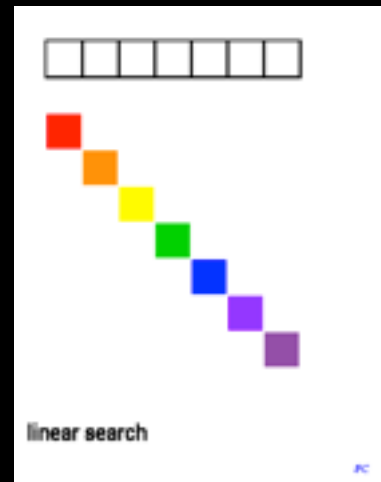
X

Y

Z

Search Algorithms

- We have looked at two different ways of searching for information
- Two different algorithms
 - Linear search
 - One by one
 - Binary search
 - Divide and conquer
 - Halving search



Does everyone agree we would have improved things for Bauby?

Did we get it right?

- Did we count the right thing?
- What if blinking is hard work for him?
 - We should have found out first.
- Have we made his life better or worse?

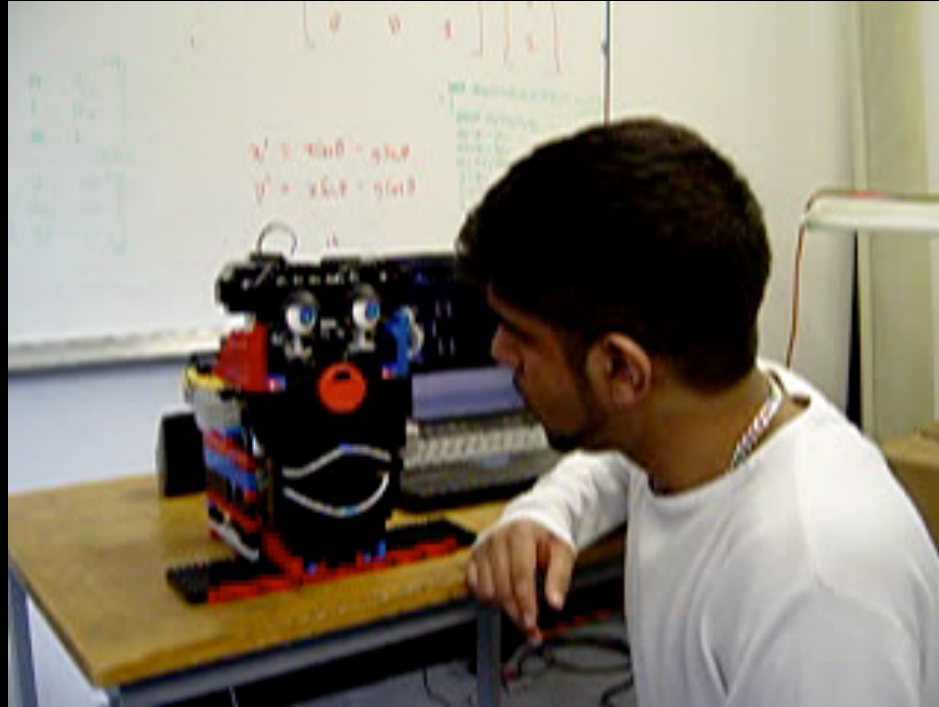
Computing is about understanding people
too.

What is computational thinking?

- It is about thinking skills
 - Algorithmic thinking
 - Abstraction
 - Generalisation
 - Pattern matching
 - Translating solutions
 - Evaluation
 - Analytical thinking
 - with people
- Not just about computers!
 - Solutions for people



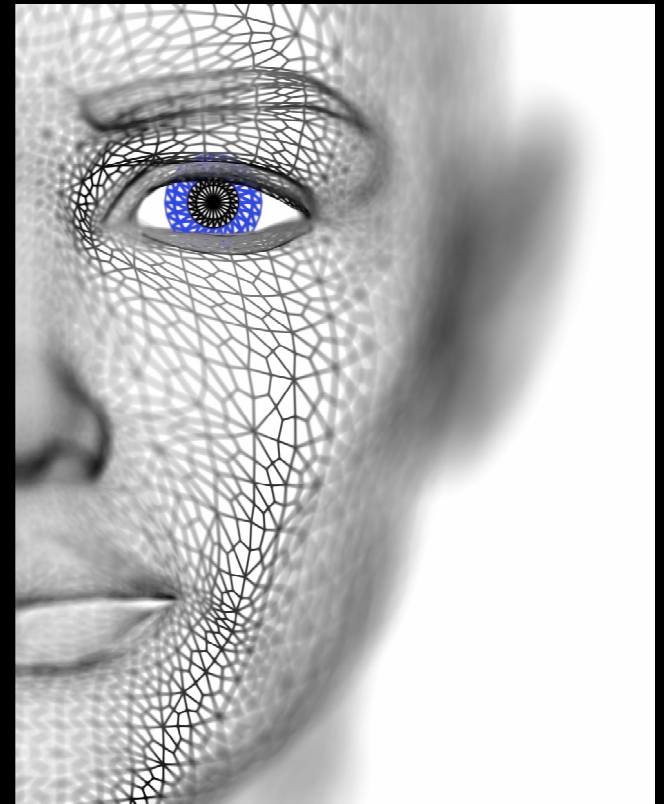
We use more than words to communicate...



Could a robot understand and show emotions?

Objects: Programming an eyebrow

If NICE SOUND
then DOWN
If NASTY SOUND
then DOWN
If SUDDEN SOUND
then UP



Computational Thinking Lessons

- Algorithmic thinking
- Abstraction
- Evaluation

It is also a fun
way to introduce
programming



More support

On our website to support this session:

- Activity sheets
- Story sheets
- Slides
- Videos

Details of more workshops/courses including free unplugged sessions

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Thank you!

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