Computer Science, Software Engineering & Robotics: Education for the Future

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Talk Outline

• Why Education for the Future? 2
• Relationship between the Disciplines *
• The Future is Now 5
• What Education for the Future? 4
• Discussion ??? *
Scientists from the RAND Corporation have created this model to illustrate how a "home computer" could look like in the year 2004. However, the needed technology will not be economically feasible for the average home. Also, the scientists readily admit that the computer will require yet-invented technology to actually work, and 50 years from now, scientific progress is expected to solve these problems. With teletype interface and the Fortran language, the computer will be easy to use.
Why Education for the Future?

SSC Data Acquisition Group

- Early 1990s
- Ring 87.1 km circumference
- Particle collisions every 10 ns
- Generated 1 MB of data per collision
- Capture 100 TB per second
How Do We Know a Computer?
Computing Cones

Tangible... ...Intangible

I/O Devices

Applications

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Computing Cones

Tangible...

...Intangible

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Computing Cones

- Tangible...
- ...Intangible

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Computing Cones

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...Intangible

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Computing Cones

Tangible...

...Intangible

CPU
RAM
ROM
Bus
Interfaces
I/O Devices
Applications
Computing Cones

Tangible...

...Intangible

Programming Language

Applications

CPU

RAM

ROM

Bus

Interfaces

I/O Devices
Computing Cones

Tangible...

Intangible
Computing Cones

Tangible...

Intangible

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Computing Cones

Tangible...

Intangible
Computing Cones

Tangible...

...Intangible

Computer Engineering
Computing Cones

Tangible...

...Intangible

Computer Engineering  Software Engineering
Computing Cones

Tangible...

...Intangible

Computer Engineering  Software Engineering

←  Computer Science  →

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Computing Cones

Tangible...

...Intangible

ROBOTICS

CIT CIS

Computer Engineering Software Engineering

← Computer Science →

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Computer Science –

discovery of computer algorithms
Computer Science – *discovery* of computer algorithms

Computer Engineering – *construction* of hardware
Computer Science –
*discovery* of computer algorithms

Computer Engineering –
*construction* of hardware

Software Engineering –
*construction* of software

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Computer Science – discovery of computer algorithms
Computer Engineering – construction of hardware
Software Engineering – construction of software
Robotics – utilization of the results of all three
Computer Science –
*discovery* of computer algorithms

Computer Engineering –
*construction* of hardware

Software Engineering –
*construction* of software

Robotics –
*utilization* of the results of all three

Computer Information Systems – ??
Top Tech 2012 Special Report
IEEE Spectrum, January 2012

• Bye, Wheelchair, Hello Exoskeleton
• 3-D Chips Grow up
• Birth of the Bionic Eye
• China’s Homegrown Supercomputers
• Plug-in Vehicles Proliferate
• 3-D Printing Takes Shape
• 4G LTE (Long Term Evolution) networks
What is the role of algorithms in the search industry?

At Yahoo, we view search systems first and foremost as vehicles for delivering the results of algorithms: discovery, content analysis, machine learning, indexing, query analysis, and ranking.
Flying robots build a tower near Paris

• 20 foot tower built
• no people involved
• took a few days
• 1st installation built by flying machines
• designed by Swiss architects Fabio Gramazio and Matthias Kohler
THE FUTURE IS NOW!!!

Harold Tepper, IEEE’s Computing Now

The Smart Grid: The smart grid will affect virtually every aspect of human life and environment.

D.A. Reed et al., Computer, Jan. 2012

Imagining the Future (cloud services)

The cloud can store data that need to be always accessible to a large number of separate devices, and provides resources for multiple agents.
THE FUTURE IS NOW!!!

T. Berners-Lee, R. Cailliau,
World Wide Web:
Proposal for a Hypertext Project

• Nov. 12, 1990, CERN, Geneva, CH
• Operation: “A link is specified as an ASCII string from which the browser can deduce a suitable method of contacting an appropriate server. When a link is followed, the browser addresses the request for the node to the server.”
What Education for the Future?

Trivial Example - Quadratic Function

Math: \( f(x) = ax^2 + bx + c = 0 \)

Analytical Solution (theory):
\( x_1 = \frac{-b - \sqrt{b^2 - 4ac}}{2a} \)
\( x_2 = \frac{-b + \sqrt{b^2 - 4ac}}{2a} \)
What Education for the Future?

Trivial Example - Quadratic Function
Engineering: \( f(x) = 0 \) (incl. \( ax^2 + bx + c \))

Numerical Solution (computations): bisection method - repeatedly divide the interval and compare signs
What Education for the Future?

Trivial Example - Quadratic Function

Science: \( s(t) = s_0 + vt + at^2 \)

Experiments (measurements):
\( s \) - distance, \( v \) - velocity, \( a \) - acceleration
What Education for the Future?

Math

Engineering

technology

Science

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