Ada Lovelace

The first computer programmer

1815 - 1852

Biography

- Born on December 10th, 1815 in London as Augusta Ada Byron
- Parents separated when she was a baby
- Father Lord Byron was a poet and died when she was 8 years old
- Mother Lady Wentworth was a social reformer
- Descended from a wealthy family
- Early interest in mathematics and science, encouraged by her mother
- Obtained private classes and got in touch with intellectuals, e.g. Mary Sommerville who tutored her and later introduced Lovelace to Charles Babbage at the age of 17
- Married in 1835 William King at the age of 19, shortly after becoming the Countess of Lovelace
- By 1839, she had given birth to 3 children
- Continued studying maths, supported among others by Augustus De Morgan, a math professor in London who taught her via correspondence
- In 1843, she published a translation of an Italian academic paper about Babbage's Analytical Engine and added her famous note section (see *Contributions*)
- Died on November 27th, 1852 at the age of 36

Contributions

- First computer programmer, roughly a century before the electronic computer
- A two decade lasting correspondence with Babbage about his idea of an *Analytical Engine*
- Developed an algorithm that would enable the *Analytical Engine* to calculate a sequence of Bernoulli numbers, unfortunately, the machine was never built
- First person to realize the power of computer programs: Not only used for calculations with numbers
- Combined arts and logic, calling it *poetical science*
- First reflections about artificial intelligence, but she rejected the idea

Quotes

- *[The Analytical Engine] might act upon other things besides number, were objects found whose mutual fundamental relations could be expressed by those of the abstract science of operations, and which should be also susceptible of adaptations to the action of the operating notation and mechanism of the engine.*
- *The engine might compose elaborate and scientific pieces of music of any degree of complexity or extent.*
- *A new, a vast and a powerful language is developed for the future use of analysis, in which to wield its truths so that these may become of more speedy and accurate practical application for the purpose of mankind.*
- *I now read Mathematics every day and am occupied in Trigonometry and in preliminaries to Cubic and Biquadratic Equations. So you see that matrimony has by no means lessened my taste for these pursuits, no my determination to carry them on.*

Babbage's Analytical Engine

- Predecessor: Difference Engine, to solve polynomial equations
- The Analytical Engine should be able to solving a wider range of problems
- Whereas Babbage saw the machine purely as a tool for mathematical calculations, Lovelace realized its vaster range of applications

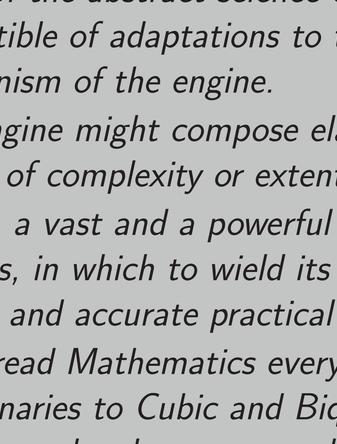

Figure 1:Charles Babbage

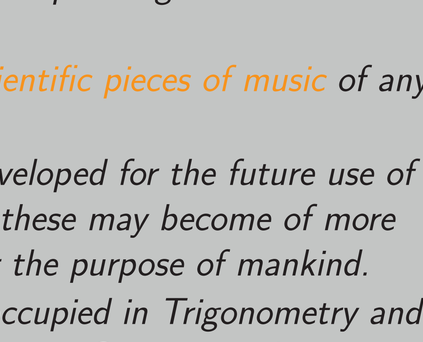

Figure 2:Trial of the Analytical Engine

Ada Lovelace Day

Each second Tuesday in October is *Ada Lovelace Day*. A day to raise the profile of women in science, technology, engineering, and maths to create new role models for girls and women in these fields. During this day the accomplishments of those women are celebrated.

Portrait

Figure 3:Ada Lovelace

Bernoulli Numbers

- Play an important role in several domains of mathematics, e.g. expressions for certain values of the Riemann zeta function
- Can be defined by the power series

$$\frac{t}{e^t - 1} = \sum_{n \geq 0} B_n \frac{t^n}{n!} \quad (|t| < 2\pi)$$

- For $n > 1$ odd, all B_n are zero
- For n even, the B_n alternate in sign

Ada Programming Language

- Created in 1980 on behalf of the United States Department of Defense
- For example, the Airplane Information Management System in the Boeing 777 was written in Ada
- Also used in the French TGV high-speed rail system, and the metro suburban trains in Paris, London, Hong Kong and New York City

```
with Ada.Text_IO; use Ada.Text_IO;
procedure Hello is
begin
   Put_Line ("Hello WORLD!");
end Hello;
```

hello.adb

References

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3. https://de.wikipedia.org/wiki/Analytical_Engine
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