First Draft of a Report on the EDVAC

John von Neumann

presented by Debra Goldberg

John von Neumann, 1903-1957

- Born December 28, 1903
  Margittai Neumann Janos Lajos in Budapest
- 1925: Simultaneous degrees from U Zurich,
  U Budapest; student of Hilbert, Weyl, Pólya
- 1930: came to US
- Died of pancreatic cancer

Career highlights

- 1927 became Privatdozent at U Berlin
- 1933: Institute for Advanced Study
  (with Oswald Veblen, James Alexander, Albert Einstein, Marston Morse, Hermann Weyl)
- top-level consultant to government, industry
- 1955: Atomic energy commissioner

Honors and positions

- 1933 on: co-editor Annals of Mathematics
- 1935 on: co-editor Compositio Mathematica
- 1938: AMS Bôcher Prize
- 1951-53: president of the AMS
- 1956: first Enrico Fermi award
- 1956: Albert Einstein Commemorative Award
- 1956: Presidential Freedom Medal

Contributions to applied math

- 20th century universalist
- checklist
- Nobel Prize work

Contributions before 30

- Hilbert's 5th problem for compact groups
- Proved the mean ergodic theorem
- Laid mathematical foundation for quantum theory
- Proved the minimax theory of games theory
- Basic work in foundations of mathematics

Later contributions

- Classic treatise on games theory
- Rings of operators
- Lattice theory
- Shock waves
- Hydrodynamics
- Astrodynamics
- Meteorology

Later contributions (page 2)

- Manhattan project
- Atomic energy
- Computer technology
- Governmental policy
  - Mutually assured destruction
- Automata theory
- Promoted scientific computing

Impact of this paper

- computer architecture
- stored program concept
- binary
- error detection and recovery

Excerpts of this paper

- Defines automatic computing system
- Defines components
- Elements (especially vacuum tubes)
- Neuron analogy
- Arithmetic operation of CA

Components

- CA: central arithmetical
- CC: central control
- M: memory
- I: input
- O: output

Elements

- Variety of possible types
- Have discrete equilibria
- gate vs. trigger

Arithmetic operation of CA

- Binary
- Precision
- Telescoping operations

Selected points discussed

- error detection and recovery

- cache

- timing (synchronous or asynchronous)

- user-friendly I/O (decimal)

- primitive version of Amdahl's law

Overview of remainder of paper

- E-elements (an abstraction of vacuum tube)
- Circuits for arithmetic operations
- Binary system
- Moving data between M and CA, within M
- Capacity and organization of M
- CC and its interaction with M
- Formulation of programming code

Whose work was it?

- EDVAC team included
  - J. Presper Eckert, chief engineer
  - John w. Mauchly, mathematical advisor
- Paper may have been intended as team report
- Eckert and Mauchly left, filed for patents
- JvN disputed

JvN anecdotes

- speed of his thinking
- analytical and numerical ability
- parties
- could relate to children

- It would appear that we have reached the limits of what it is possible to achieve with computer technology, although one should be careful with such statements, as they tend to sound pretty silly in 5 years. (1949)

Quotes

- In mathematics you don't understand things. You just get used to them.

- If people do not believe that mathematics is simple, it is only because they do not realize how complicated life is.

Discussion questions

- Why did JvN challenge patents?
- Why was only his name on this paper?
- Did he spread himself too thin?