When Hackers Rewrite History: the Lost Machine of Pisa

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Hacking the Smaller Machine
(Hackerando la Macchina Ridotta)

Department of Computer Science
University of Pisa

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- # Hacker, the Jargon definition
  - ## A person who **enjoys exploring the details** of programmable systems and how to stretch their capabilities, as opposed to most users, who prefer to learn only the minimum necessary

- # Computer history, hacker style
  - ## Recover technical documentation
  - ## Study and deeply understand old technologies
  - ## Check with contemporary knowledge

- **Calcolatrice Elettronica Pisana (CEP)**
  - **Pisa Electronic Computer, ~ May 1961**
  - **The known outcome of a project started in 1955**
  - **By University of Pisa with Olivetti as partner**
  - **So far considered the first Italian computer**

- **Macchina Ridotta (MR)**
  - **Smaller Machine, July 1957**
  - **First computer built by the same project**
  - **A fully functional machine**
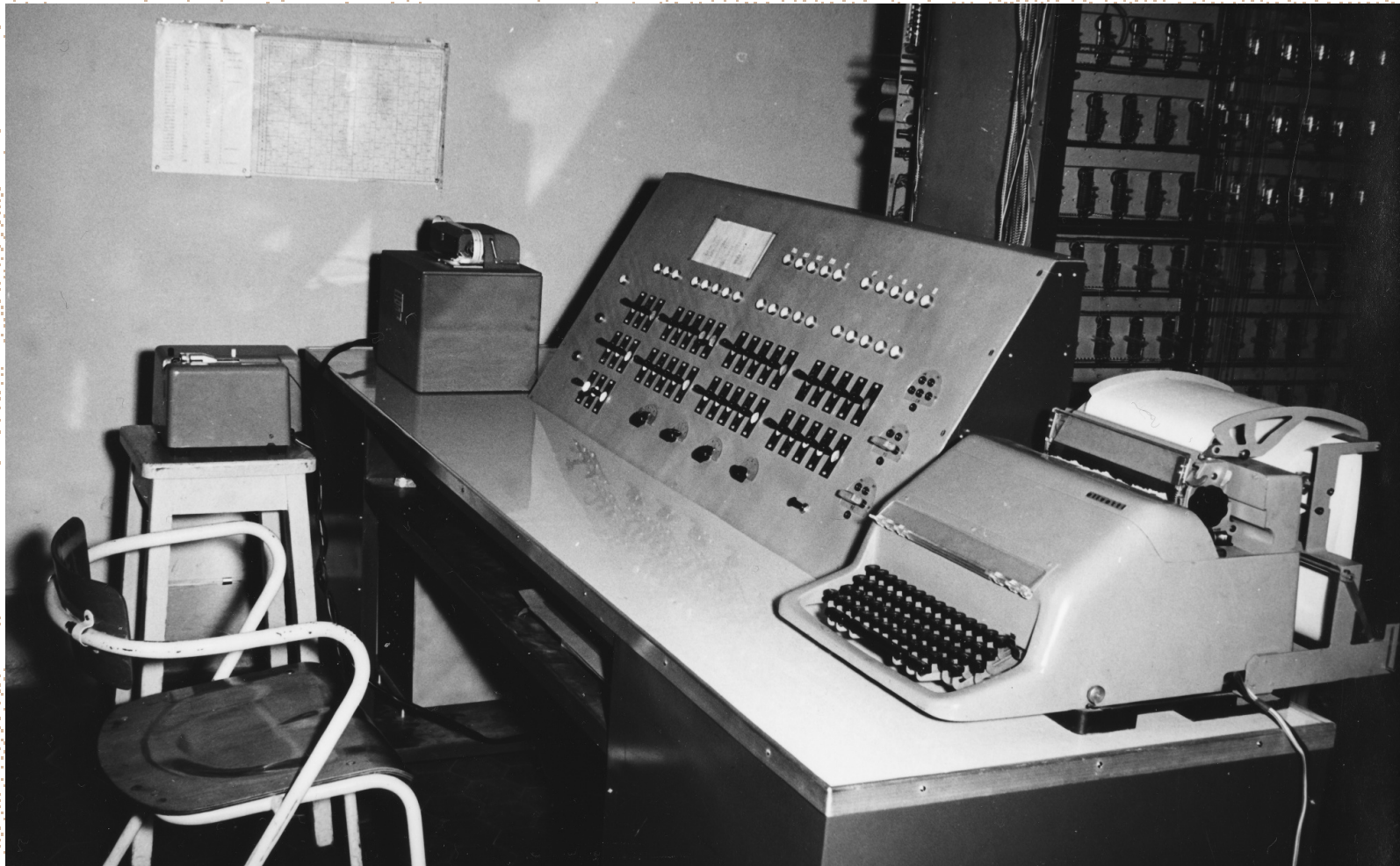 - **Used in 1958 for computing services**

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The lost machine
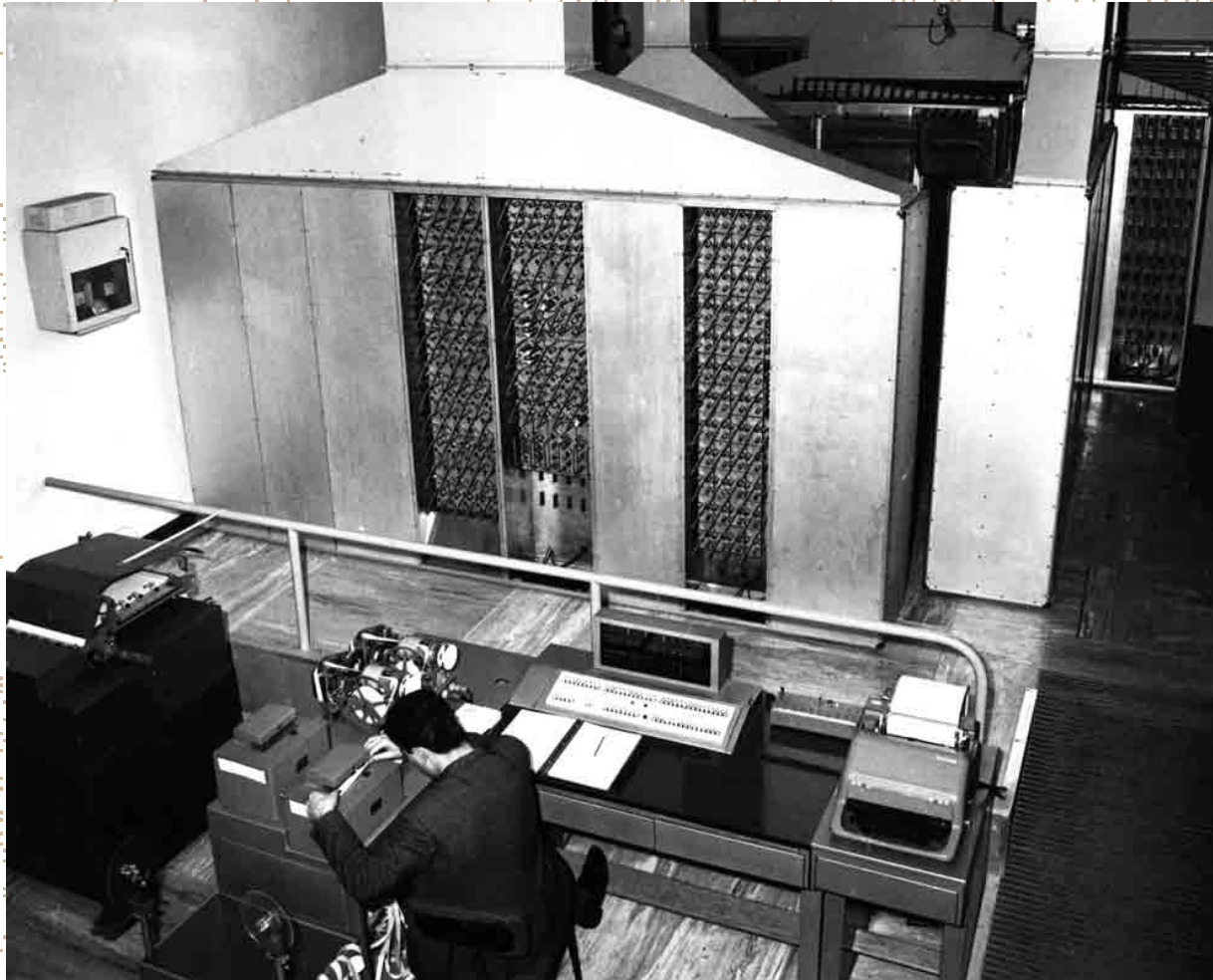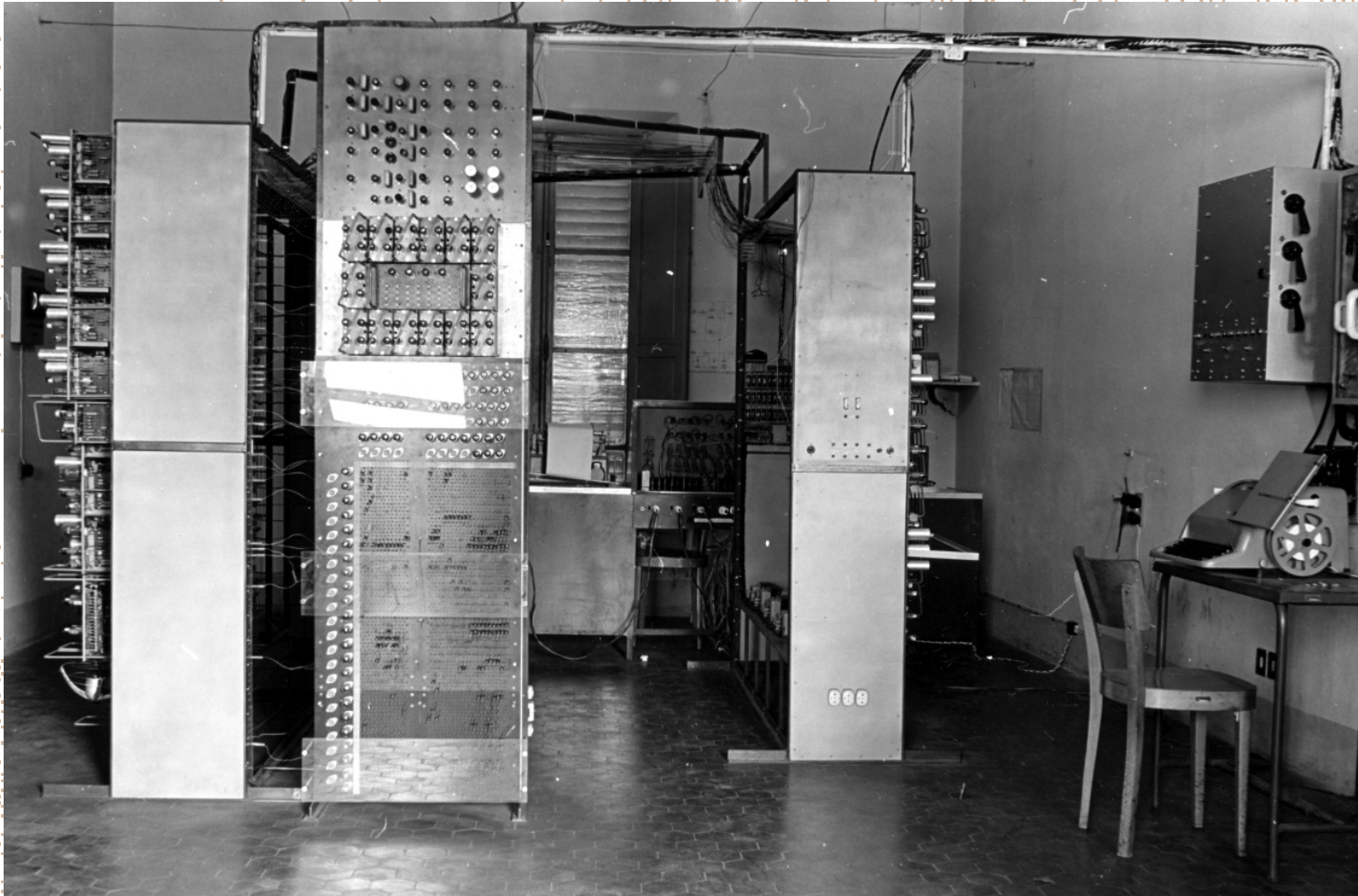
- **The MR has been so far underestimated**
  - Indeed, often plainly ignored
  - Previous research did not study MR technology
  - Focused mainly on administrative documents
  - Generally adopting a self-referential approach

- **Few facts may explain the MR oblivion**
  - People changed, memories vanished
  - The MR was dismantled, no physical relics
  - No inauguration ceremony, no media coverage
  - Misleading official plan (no prototype needed)

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Rediscovering the MR

- **Digging the archives**
  - **A long treasure hunt started in 2006**
  - **Incomplete documentation**
  - **Tech reports, blueprints, admin stuff, notes…**
  - **All wildly shuffled**

- **Two versions of the MR**
  - **First design, July '56, probably only on paper**
  - **The actual MR, implemented one year later**
  - **Lot of rethinking, reworking and learning**
 - **A truly well thought-out design**

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- **Very first Italian build computer in 1957**
  - **Third to run, after CRC102A and Ferranti Mk1**
  - **1958 Olivetti "Macchina Zero" (in Pisa too)**
  - **1959 Olivetti ELEA 9002, Padova Booth APE**
  - **1960 First production ELEA 9003s**

- **MR characteristics**
  - **1024 x 18 bits words**
  - **4-8 mms variable clock (125-250 KHz)**
  - **2 punched tape readers**
  - **2 teletypes, keyboard in and paper/tape out**

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State of the art solutions

- **Parallel architecture**
    - Many early 1950s machine processed word bits sequentially, MR used the parallel solution

- **Ferrite core memory**
    - Wrt. other choices the MR was an early adopter of this soon to be standard solution

- **Microprogrammed control**
    - Adopting a MIT technology, the MR first implemented the idea proposed by EDSAC2

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Other relevant features

- **Very high raw performance**
  - Compared to the Paris IBM 704, the MR had better KIPS (71.4, the 704 had Fortran, however)

- **Bootstrap in Direct Memory Access**
  - To boot the "MR OS" a memory image is read from punched tape in "DMA mode"

- **Hot breakpoints**
  - Programmers can set breakpoints which are activated by Control Panel keys

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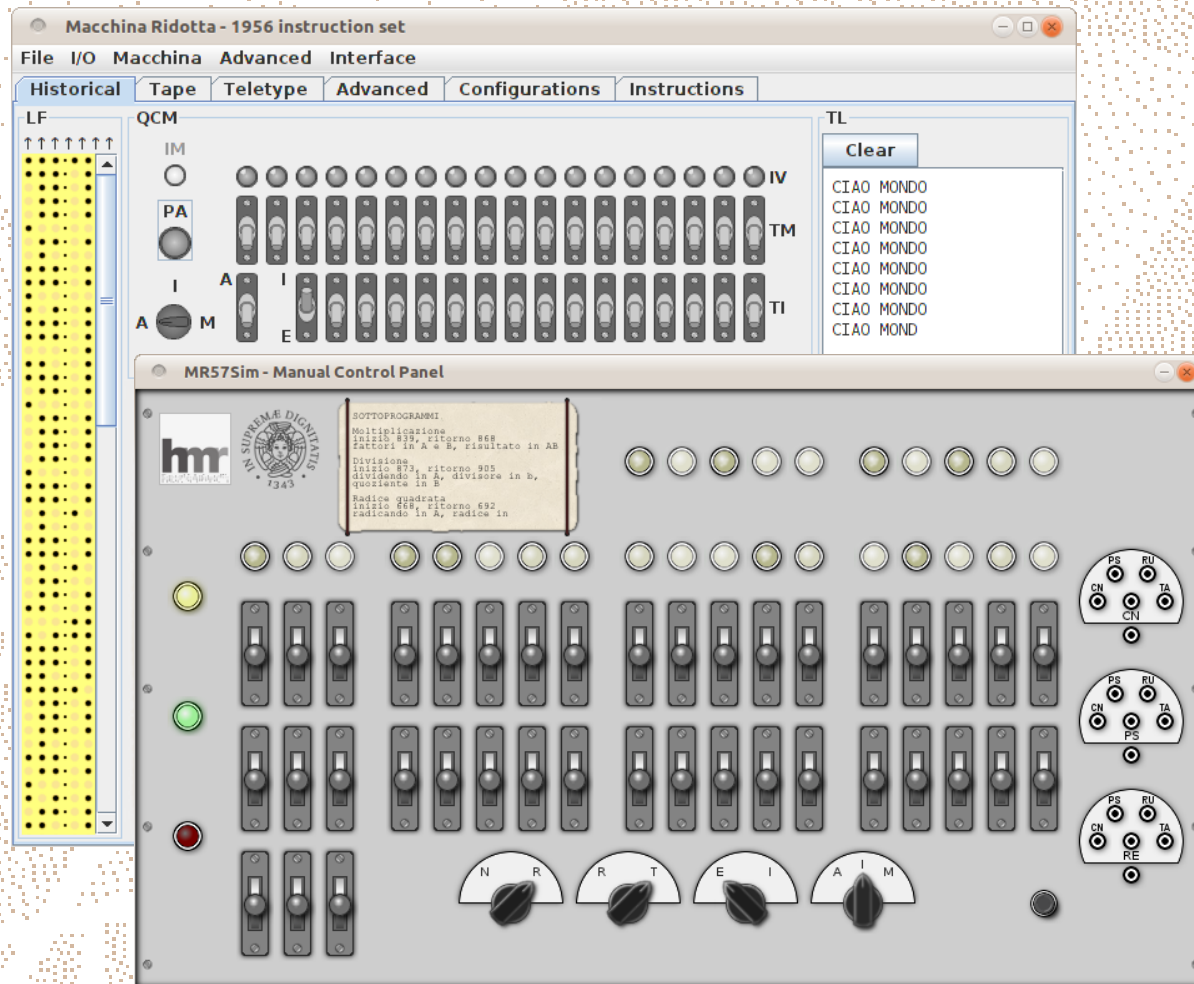
Rebuilding the MR: hw

- **6 bits full adder, early 1956**
  - **The very first piece of the very first computer :)**
  - **1/3 of the MR adder, part of the machine ALU**
  - **Additions and subtractions in 2's complement**
  - **Rebuilt from original blueprints**
  - **Very close to IBM 701 adder**

- **A fine cooperation**
  - **Computer Museum of Novara**
  - **National Institute for Nuclear Physics – Pisa**

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- **Museums must exhibit alive machines**
  - **Computer are made to run**
  - **A half of Computer Science is software**
  - **Young people has no memories (nor nostalgia)**

- **Goals**
  - **Better understanding of how computers work**
  - **Re-enact the experiences of pioneers**
  - **Feel the progress of technologies**
  - **Challenge kids with demanding tasks**

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- **A little game to present the MR 57**
  - **Actually a pseudo RNG**
  - **Using an algorithm not yet invented in 1957**
  - **A curious time paradox**
  - **A sort of tribute to Alan Turing (1912-1954)**

- **Useful to see**
  - **How to start a program**
  - **A simple usage of the control interface**
  - **The basic operating modes of the MR57**
  - **An example of the hot breakpoint feature**

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... the MR Slot Machine!

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