Case study in restoring software: IBM 704/709/7090/7094

Paul McJones

May 5, 2006

Static displays are nice

http://www.computerhistory.org/virtualvisiblestorage/

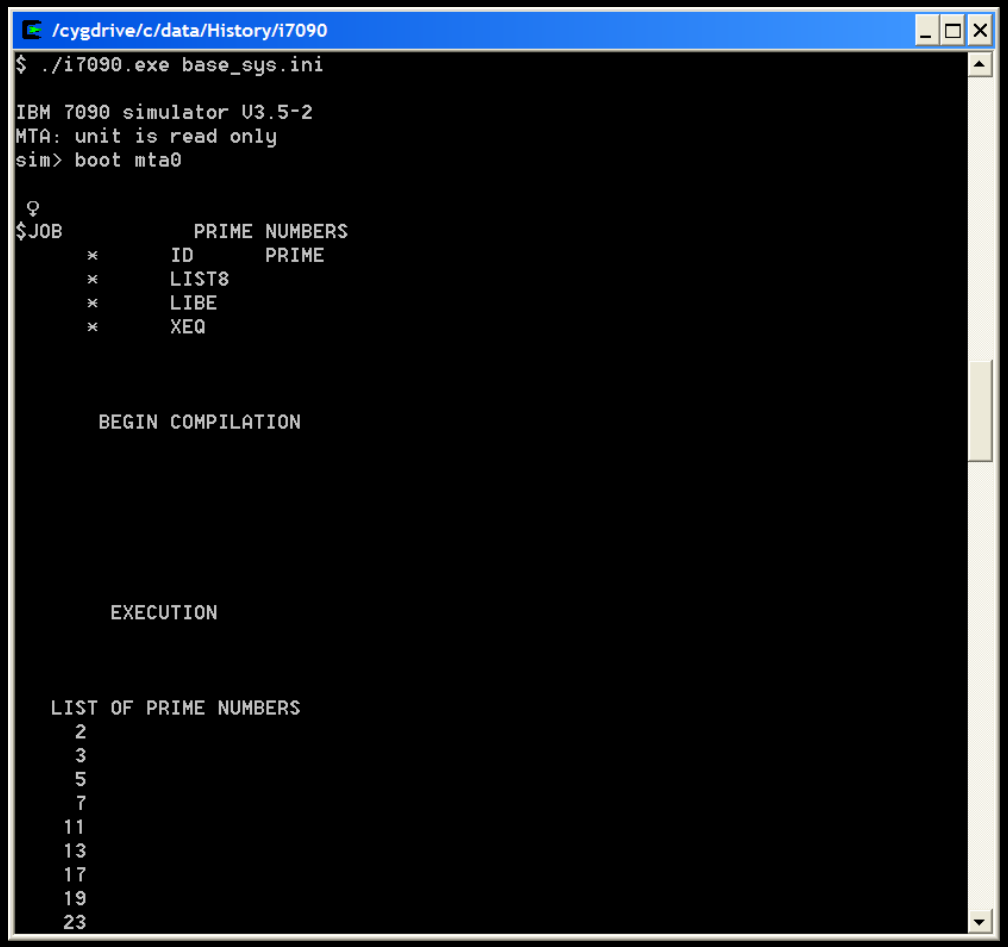
So are working machines!

http://pdp-1.org/Photos/Meetings/meeting-20040504/

Collecting software is nice

http://www.piercefuller.com/library/cdc-tss3.html

So is working software!



i7090 by Rich Cornwell

Why the IBM 704/709/7090/7094?

- Spanned from Von Neumann to System/360
- Hosted original programming languages:
  - FORTRAN, LISP, COBOL, MAD, SNOBOL, …
- Hosted earliest operating systems
  - GM/NAA I/O, SOS, IBSYS, CTSS, …
- Workhorse of scientific and engineering computing

What's involved

- Physical media: tapes, listings, etc.
- Transcription to modern media
- Manuals
- Processors, real or simulated
- Reacquiring expertise (reverse engineering)

Physical media: tapes, listings, etc.

- Paul Pierce
  - Diagnostics (necessary for debugging simulators!)
  - SHARE library (e.g., SAP assembler)
  - IBSYS (including many compilers!)
  - System/360 emulator (executable only)
  - CTSS
- P.Z. Ingerman/Smithsonian
  - IBM 704 Fortran II (located by Paul McJones)
- Tim Hart/MIT Library
  - Lisp 1.5 (located by Jack Harper; scanned by Olin Sibert)
- Robert R. Fenichel
  - CTSS Lisp 1.5

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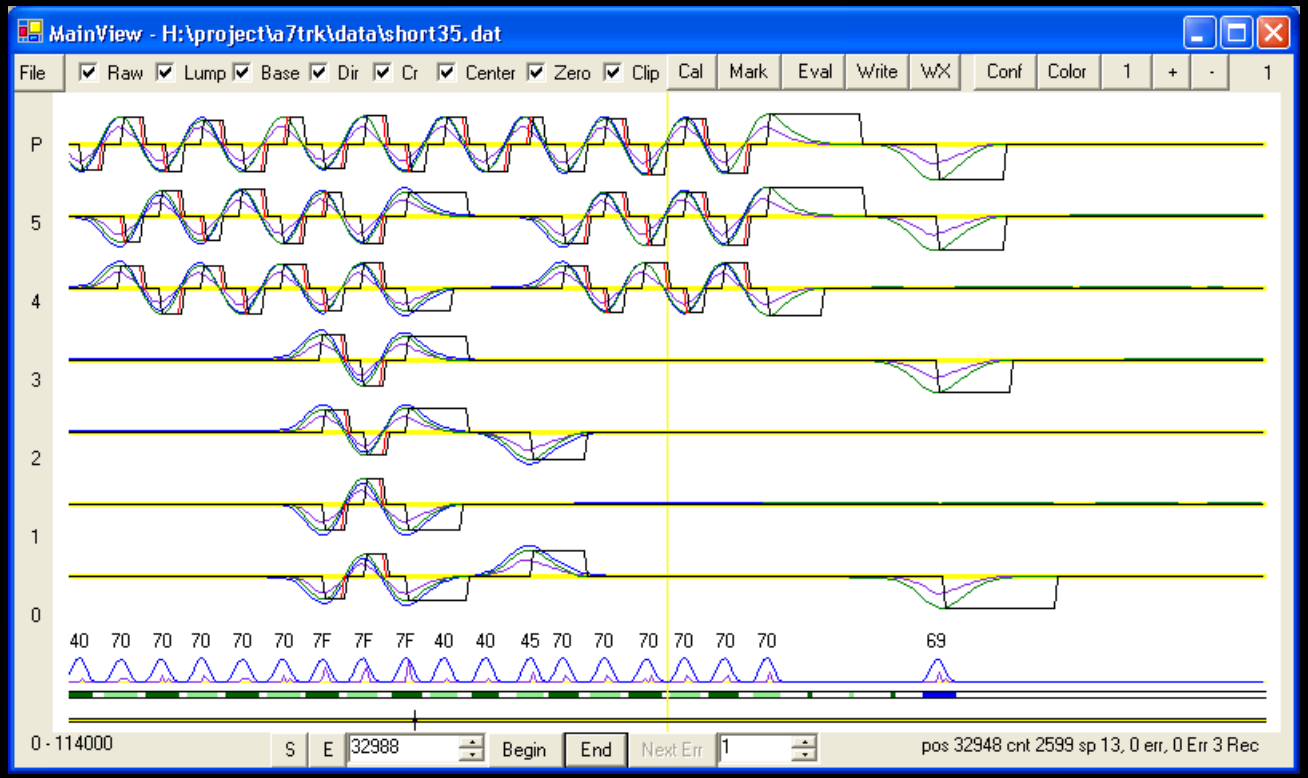
Transcription to modern media

- Paul Pierce



http://www.piercefuller.com/collect/a7tv.html

Transcription to modern media

- Manual transcription
  - Rich Cornwell: diagnostics, 704 Fortran II, etc.
  - Pascal Bourguignon: Lisp 1.5
- Line-printer tuned OCR
  - James Markevitch

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Manuals

- Al Kossow
  - Bitsavers.org
- Paul Pierce
  - Manuals, logic diagrams, etc.

- Basements and attics all over the world

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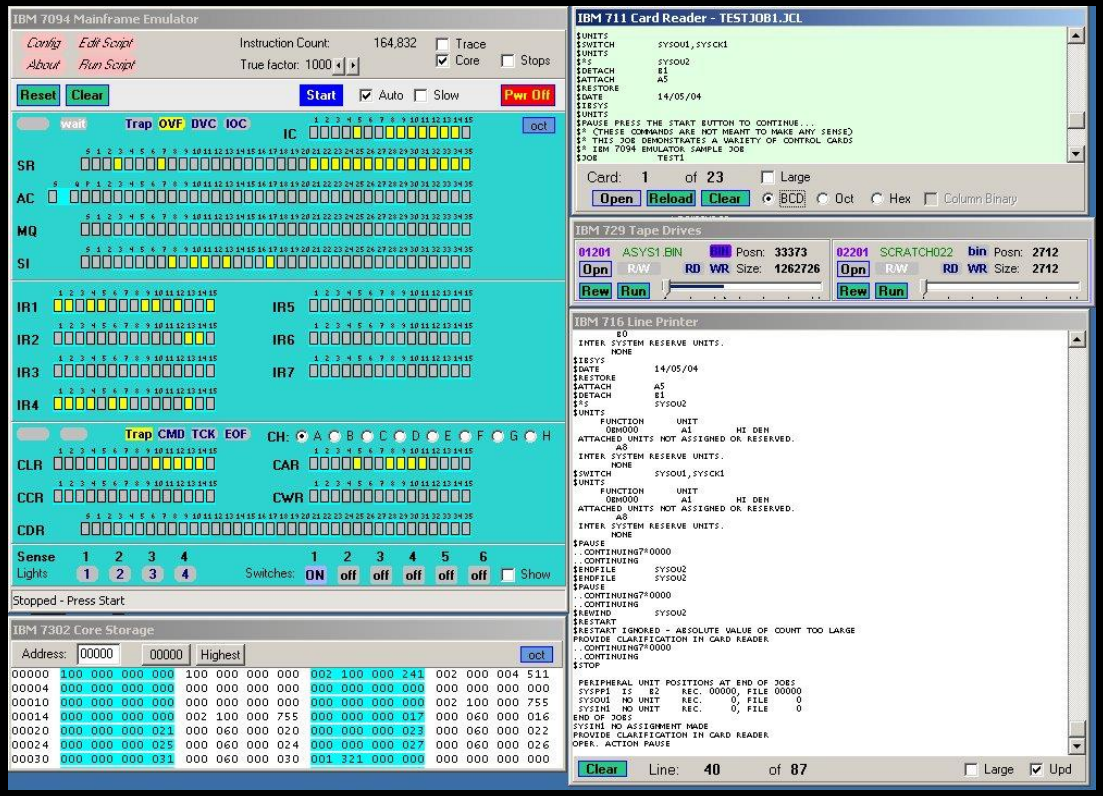
Processors, real or simulated

- Paul Pierce
  - Real: two IBM 709s, IBM 7094
  - Simulated: s709

Processors, real or simulated

- Rob Storey (Borland Delphi)



http://members.optushome.com.au/intaemul/EmuI7094.htm

Processors, real or simulated

- Dave Pitts
  - s709 extends Pierce's version to 7090/7094
  - asm7090
  - lnk7090

Processors, real or simulated

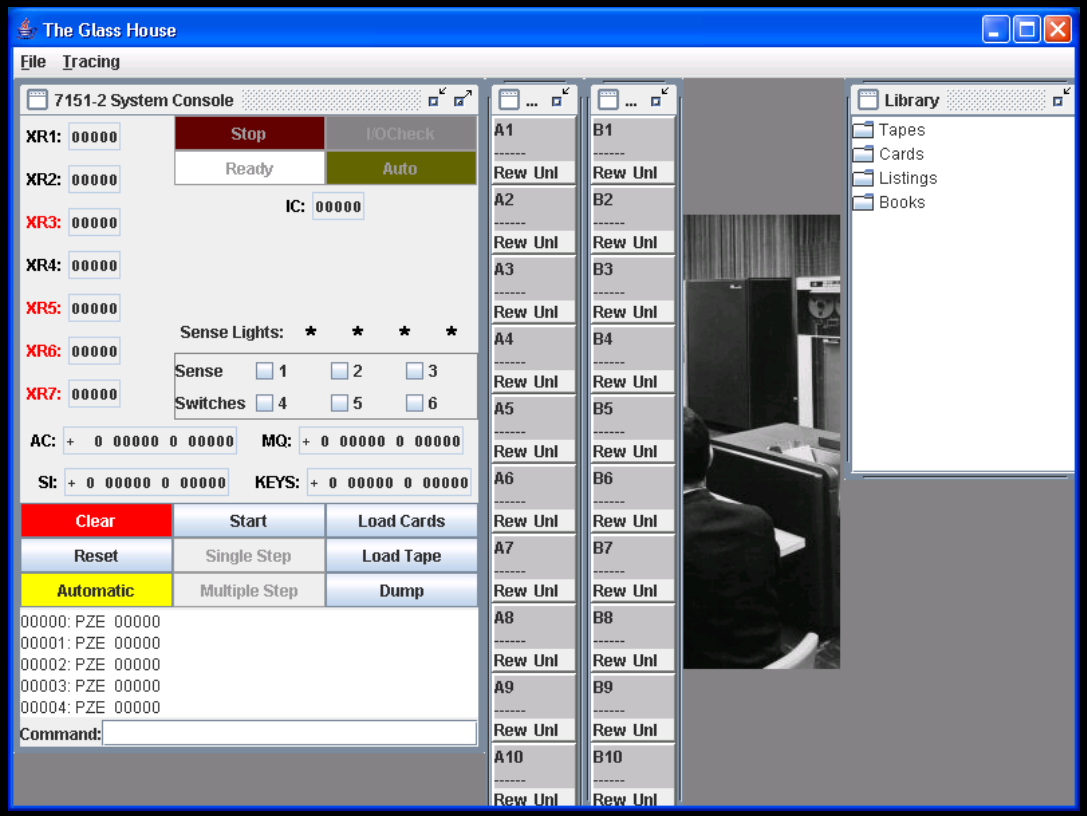
- Bob Supnik
  - Adding 709x to SIMH (focus on CTSS)

Processors, real or simulated

- Rich Cornwell
  - SIMH-based but independently developed
  - Used original diagnostics to develop simulator
  - Focus on IBSYS and older 704/709 software

Processors, real or simulated

- Fritz Schneider (Java)



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Reacquiring expertise

- Rob Storey and James Fehlinger first to boot IBSYS?
- Dave Pitts rebuilt IBSYS from source
- Rich Cornwell
  - first to boot IBSYS from disk?
  - rebuilt IBSYS from source *on IBSYS*
  - got Fortran II running
  - deciphered SAP library tapes
  - working on getting Lisp 1.5 to run
- Bob Supnik is reverse engineering CTSS hardware

Some lessons via Rich Cornwell

- Reference manuals don't always tell the truth
- Diagnostics are invaluable for writing simulators
  - 704: missing index register bits (<32K memory)
  - 7094 double precision
  - "Dangling tape writes" (no tape mark)
- "I have found so many neat tricks and learned so much about programming computers from examining old code, where 32K of memory was considered a huge amount of memory (more then could be used :-)."

How are these projects organized?

- A multidisciplinary team is required
- It is often a labor of love
- It is often a distributed effort
- A variety of web sites contribute:
  - Theme-oriented, e.g., multicians.org
  - Blogs, e.g. Dusty Decks
  - Slashdot
  - Google

How can institutions help?

- Encourage/coordinate restoration projects
  - Provide services such as media conversion
  - Host online services such as forums
- Provide long-term stability
  - Archive the software, manuals, simulators
- Provide visibility to the public
  - Physical exhibits (simulators, etc.)
  - Web site

For more

- http://www.piercefuller.com/collect/index.html
- http://www.bitsavers.org/pdf/ibm/
  - 704/, 709/, 7090/, 7094/, fortran/
- http://simh.trailing-edge.com/
  - http://simh.trailing-edge.com/docs/ctss_hardware.pdf
- http://members.optushome.com.au/intaemul/Emul7094.htm
- http://www.cozx.com/~dpitts/ibm7090.html
- http://www.mcjones.org/dustydecks/
- http://community.computerhistory.org/scc/projects/FORTRAN/
- http://community.computerhistory.org/scc/projects/LISP/

The end