Hi Bill, Brian, David.

A few thoughts.

When Bell Labs folks joined the Multics project they were given accounts on
CTSS.
CTSS had online text editing and the RUNOFF command. (I used it to prepare a
multi-page Political Science dept memo in 1964.) The CTSS version of RUNOFF
worked on any terminal that CTSS supported, including IBM 2741 and 1050
terminals, and TTY 37s.

The Bell Labs folks used CTSS to write programs and compile them, to write
documents and memos, and to send MAIL among project members. Ken wrote a
slick editor for CTSS called QED and I had phone and mail discussions with
him about features and usage.

Versions of QED and RUNOFF were translated to the BCPL language by Bell Labs
devotees of BCPL, I think in 1967. Multics was not usable for terminal
session use at MIT until December 1968.. before that we edited on CTSS and
sent files to the 645 for compilation.

I only visited BTL a few times and I don't remember when they started running
Multics as a service on their 645, but I don't think it would have been until
1979. So, depending on the dates, it is possible that Dennis typed his
thesis on a terminal connected to CTSS, dialed into the Project Mac 7094.

If I were a graduate student writing a thesis in 1967, I would want to use a
computer to create my draft, rather than typing on paper, messing with
carbons, retyping pages, etc etc. When I got my draft right, I could then
either produce a final copy on a 2741 or 1050, or produce a final draft and
hire a professional typist to do the copy for submission.

Here are some things I would like to know.
- what are the dates we have for Dennis's thesis drafts?
- what kind of terminal did Dennis have at home? My recollection is that BTL
folks
  had TTY37s.
- if that is the case, was there some other kind of terminal available at BTL
for
  typing the draft? e.g. a Selectric.

Have you consulted other people who worked with Dennis in 1967?
Thompson, Neumann, McIlroy?

Hi Jerry,
You may have seen recent articles about Dennis Ritchie's Harvard PhD thesis.

Dennis's brother Bill asked me whether the thesis could have been computer typeset back in 1967, and if so, how. This has turned into an interesting exercise in recalling the dates when various technology became available.

Here is an article by Bill Brock of Computer History Museum in Mountain View.
https://computerhistory.org/blog/discovering-dennis-ritchies-lost-dissertation/#:~:text=Ritchie's%20loop%20program%20solution%20to,for%20programming%20loops%20in%20BASIC.

Look at all the subscripts and superscripts, Greek and curly fonts, wow.
Dennis was working on this in 1967, from a home terminal that had a spinning typeball.
He may have had an account on CTSS, perhaps Comp Center's machine via Harvard.
[I don't remember when we added CTSS accounts on the Project MAC machine for a whole bunch of Bell Labs users. (I can remember adding accounts for some BTL folks and assigning passwords using a random digraph based generator from Dan Edwards. But no names.)] But was Dennis using a typesetting program to produce his drafts?

So far, none of the folks we have asked remember how Dennis produced his thesis.
Brian Kernighan thinks that M37 TTYs were not in use in 1967. Anyway the sample in Brock's article doesn't seem to have M37 fonts. I remember that MEMO/MODIFY/DITTO had a CHANGE TYPE BALL command, but I don't think it would be up to the complex expressions on the sample pages. I'm hoping you remember what typeballs were available for the Selectric in the 67-68 time frame and whether there was one that could have produced the drafts in the article.

I looked up Selectric typeballs and found this reference. I was looking to see if any typeball had the ability to produce the characters in the drafts.

http://bitsavers.org/pdf/ibm/serviceForConsultants/Service_For_Consultants_198312_Complete/15_Type_Catalog.pdf
The "symbol" font doesn't seem to have some of the symbols like the curly L and D in the Brock sample.
(I think I remember "custom" third party non-IBM typeballs for the Selectric, but not the time frame.)

Looking at the PDFs of draft theses show other things that look like they were done by hand, such as a P-with-a-curly-underscore and the greater-than-or-equal-to symbol where the line underneath looks hand drawn.
Also, look at the capital T in Then and Theorem .. its baseline seems a little lower than the letters following.
Would this happen with a Selectric? I see this with a few other capital letters.

I suspect that Dennis wrote a draft using TYPSET and RUNOFF where he indicated math symbols with letter abbreviations, like "th" for theta, and

sub- and superscript indications; and then a professional math-symbol-thesis-typist created his drafts. Page 156 of a draft is included in Brock's article and has a "th" with a hand notation of "check?" .. maybe this was a theta?
Notice also the hyphenated word at the bottom of this page. I don't recall RUNOFF being able to do this.

So, do you remember any dates for the availability of RUNOFF features, or when TTY37s were added to CTSS, or interactions with Dennis, or anything else that might shed light on this?

best regards, tom

Let's make sure of what we know.

1. Dennis was working at home using a remote terminal in 67-68. Probably using CTSS.
He had a 1050 or 2741 in the basement. Bill remembers the spinning type ball.
Do we actually know that he typed a draft of his thesis on this terminal?

(We don't really need to know which device it was, but Bill, do you remember a if it had an L-shaped desk like so:
https://ub.fnwi.uva.nl/computermuseum/ibm1050.html
or just an electric typewriter sunk into a desk like so:
https://en.wikipedia.org/wiki/IBM_2741?)

A 1050 or 2741 driven by CTSS probably could not have produced the drafts we have, because of the nonstandard characters and super- and subscripting.
RUNOFF could not do it.
The "snippet page" seems to have expressions with at least 4 baselines in one line.
Plus the squiggly underscore.

If a page of the draft was produced by some other software program, was each line typed once with a Courier ball, then again with a Symbol ball, and perhaps again with a third ball?
I would think we'd see occasional mis-registrations and mistakes, unless the terminal was extremely well maintained.

If some hypothetical program typed a whole page once with the Courier ball, then backed the paper up with reverse linefeeds, changed balls, and typed the special letters, we might find variations in letter positioning, depending on paper stretch, etc. Anything like that?

Paper. My 2741s at home used tractor-feed paper, slightly smaller than regular printer paper.
There was perforation between pages, and some styles of paper had the tractor hole strip also removable. Do we see any perf artifacts at the bottom or top of pages?

Using RUNOFF you could produce a letter or final document by hand feeding
letter pages one at a time into a Selectric terminal and hitting RETURN to
un-pause. For a long document there would be the risk that one or more pages
would be hand inserted slightly crooked. Do we see anything like this in any
draft?

In the bad old days, I think I remember manual typists having a set of
character slugs on little sticks, so that they could type an omega, say, by
reaching over, picking the correct stick, inserting it into the type guide,
and striking a key. It is possible that there were different sticks for
superscript-omega, regular-omega, and subscript-omega. Looking at the
snippet page, how many characters are used, counting each different size and
position relative to the baseline as different? Do we see any variation
between the same character in different elevations that could identify these
as different slugs?

Ribbons. Selectrics usually used a cloth ribbon cartridge that would reverse
when it came to the end and eventually show wear. Do we see any? For final
output, people used a one-pass carbon ribbon which produced sharper letters.
Can we tell what was used?

Typeballs. Eventually a typeball would show some wear on often used letters.
Are there any imperfections in any character?

We can only get so far looking at PDFs of scans of Xeroxes of documents.
Wish we had an FBI document examiner with a microscope.
This goes back as far as Sherlock Holmes...

On Sep 12, 2020, at 12:19 AM, Jerry Saltzer <Saltzer@mit.edu> wrote:

> To keep the record accurate, it was originally for my thesis proposal, in
1964. Since I enjoy designing things and programming more than I enjoy
writing proposals, TYPSET and RUNOFF got more of my attention than the
proposal itself. Then, two years later, when the time came to write up the
thesis, I needed a few additional features so I added them at that time.

Noel Morris and I had part-time jobs at MIT as undergraduates in fall 1964,
and used RUNOFF on CTSS to produce long documentation for several programs.
We thought the straight right margins it produced were very cool.

> Not so fast: there is another possibility: To type up the thesis Dennis
might have simply rented an ordinary Selectric typewriter with an appropriate
collection of golf balls. That would be an obvious option for any student
facing the prospect of typing a thesis with a lot of math and unwilling to
hire a professional typist.

This sounds like a possibility. The only way I can think of to type some of
the equations in the snippet page would be to type some stuff, then backspace
over it, roll the platen a fraction of a line up or down, and type some more,
possibly changing type balls several times in each line.

I don't think there was any way for RUNOFF or any other CTSS program to make a 2741 do that.
IBM manual GA24-3415 lists the physical device codes for 2741's and there are only two codes for indexing the paper up:
INDEX and NEW LINE.

http://vtda.org/docs/computing/IBM/Mainframe/Hardware/Comm/GA24-3415-2_2741CommunicationTerminal_1970.pdf

I don't think a 2741 could have produced the thesis, given the difficulty of rolling the platen up and down by a third of a line consistently.

There was a device that could do what the document would have needed:
the IBM Selectric Composer existed in 1966.

http://self.gutenberg.org/articles/eng/ibm_selectric_composer

These devices were very expensive.. 10x the cost of a 2741.
Bill, do you happen to remember if there were dials to the left and right of the keyboard?

(unfortunately, many discussions of the Selectric Composer get mired in arguments about whether documents about Bush's National Guard service were faked.)

(Here is a mathematical article with lots of symbols and superscripts, done on the Selectric Composer in the 1970s.
https://www.maths.ed.ac.uk/~v1ranick/papers/ks.pdf)

Chuck is right. The IBM Selectric Composer supported proportionally spaced fonts.
A letter i was 3 units wide, a letter m was 9. A unit was 1/72, 1/84 or 1/96 inch.
Found this information in http://www.quadibloc.com/comp/propint.htm

So it seems like this was not the device that produced the drafts.

Jerry suggested the Mag Tape Selectric Composer, available in 1966. It used fixed pitch fonts.
Maybe one of those could have produced the thesis drafts, with a lot of type ball swaps.
But some of the characters in the drafts are not in the Symbol or Math or Greek fonts listed in the catalogs I have found online.

> On Sep 12, 2020, at 9:21 PM, Chuck Bigelow <chuck.bigelow@gmail.com> wrote:
>
> Interesting, but typographic indications tend to run against the hypothesis:

>
> a) The IBM Selectric Composer used proportionally spaced fonts, such
> as the "Press Roman" font in the linked Kirby and Siebenmann book from
> Princeton. (Press Roman is a version of Times Roman that IBM adapted
> to the unitized proportions of the Selectric Composer letters and
> characters, which have different widths in a system that enabled
> widths from 3 to 9 units. Monotype Times Roman used a unit system of
> 18 units, so Press Roman was not quite as typographically precise as
> the original Times design. (IBM changed the font name to avoid
> trademark infringement.)
>
> But, the font in the DMR thesis is a fixed-pitch (= monospaced) font
> in which all characters have the same width. all characters have the same
width.
>
> Though IBM offered mathematical, technical, and Greek fonts for the
> Selectric Composer, those were also proportionally-spaced to go with Press
Roman and a few other of the Composer fonts.
>
> b) The IBM Selectric Composer font catalog of the era did not include
> a fixed-pitch font, and in particular did not include the "Pica" or
> "Elite" fixed-pitch fonts that most closely resemble the font in the
> DMR thesis. I designed a few books and was the typographer/art
> director of a small monthly magazine in the early 1970s, all of which
> used the Selectric Composer system, but I don't recall a fixed-pitch
> font for it. I can't find my old Selectric Composer font catalog at
> the moment to verify my recollection, but a digitized copy of the old
catalog on-line does not show a fixed-pitch font nor the Pica and Elite
fonts. The catalog is undated, so I don't know if it was contemporary with
DMR's thesis.
>
> https://dokumen.tips/documents/ibm-selectric-composer-fonts-catalog.ht
> ml
>
> The Wikipedia article on the Selectric
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> discusses the Selectric Composer and says there was a "Typewriter"
> font for it, but the list of the fonts for the Composer in the article
> doesn't include a fixed-pitch font. Possibly that was a later addition.
>
> c) The Selectric Composer was designed for, and was mainly used to
> strike type on a special smooth-coated paper to make master images
> that would be photographed and reproduced by photo-offset lithography.
>
> Although a Composer could conceivably have been used to typeset on
> common bond paper, the scans of the DMR thesis don't look like that. though
it may be hard to tell from a scan.
> For those of you who have a physical copy, is the paper super-smooth and
bright white?
>

```
> If I find my Selectric Composer catalog, I'll report any new finding on the
fonts.
>
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From the parts lists I have seen, the standard Selectric typewriter mechanism had at least an option for a pin-feed platen, which potentially could address the alignment concern that Tom raises. Does anyone know whether or not the Selectric mechanism also included the ability to rotate the platen up/down by a fractional line to allow superscripts and subscripts?

If so, another possibility is that Dennis got his hands on a Mag Tape Selectric Typewriter (MT/ST). The MT/ST would provide everything needed for his thesis except a few special characters that had to be drawn by hand. It would also eliminate the need to speculate about a computer connection.

Jerry

(Sent from mobile, please excuse typos and brevity.)

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with DMR's thesis.

https://dokumen.tips/documents/ibm-selectric-composer-fonts-catalog.html

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-- Chuck