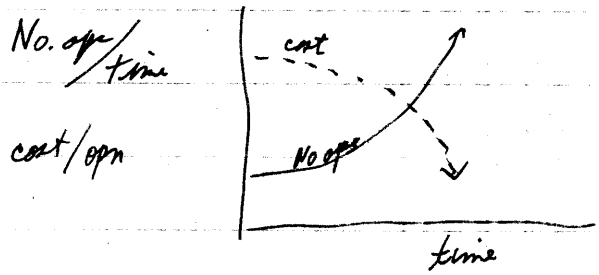
Talk with Hamming; Visit to Poughkeepsie

Automatic Programming.

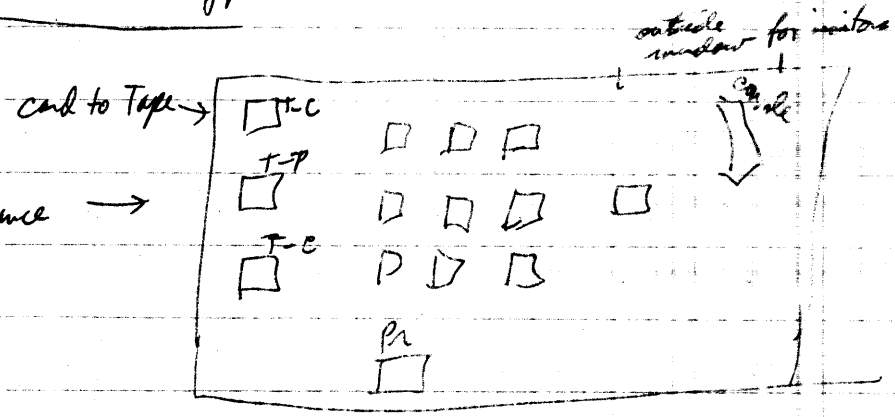
(1) Redundancy 60% in human speech but Fortran 20% { better to be redundant & have machine catch them?
(2) Logic in "small" — not logic in large what is needed,
a language — designed for thinking.
- a compiler to operate on the compiler.
- compiles — to compile itself — & optomize for new machine.
- do away with "Trickery" in coding
human is now weakest link. --



$$N = Ae^{bt^2}$$

Bell is coding a Monitor: Two Tapes: Short probs on one tape
Long probs on other (machine samples) (break-points in problems.)

→ Clock control
30 min on long probs



penalty of indiscretion — no one else can help you

eg. Fortran — others can help.

working habits which help — important to develop

pre-editing routines (maybe 20 or so diff. ones) — for all input data — statisticians can examine for quality control, etc.

Bell's Electronic Central office being developed.

— photographic film — spots will cause error every time

— need error correction.

Fortran should be 24K ops on film, 1900 words in cores.

Films rewritten for changes every week or 2.

Error correcting: use — cost of time of steps.

detection of errors

— machine runs alone but man-using machine tends to propagate errors. — adjusting

— "flurry of errors" will call repairman at once — isolated errors will be accumulated.

— life Testing is rapidly going out 20 yrs — lead to accelerate life Testing,

Simulation:

- check logic of Elec. Central Office. on 7.04
- did freq. distribution of ops. used etc.
- speeded up — didn't simulate time exactly.

10,000 samples/sec — speech analysis.

- tape was used to feed thru circuit — tell how they come out.

Important to bring theory along with simulation.

better to do piece-wise.

Poisson approx: distribution

$$X_1 X_2 X_3 \cdots X_n \geq e^{-A}$$
$$\cdots\cdots X_{n+1} < e^{-A}$$

Random numbers } H. Kahn ← book being written.
Von Neuman

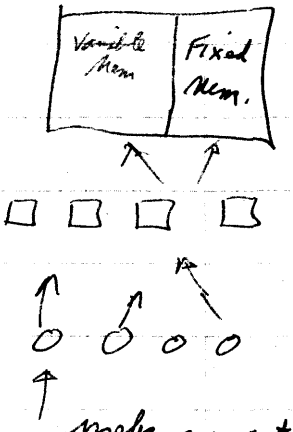
- Random w.r.t. the process it's being used.

Length of chain
$\sim \frac{2^n}{4}$
n = no. of bits

No. of mds: fl. point

650: 8 dec $10^{\pm 50}$ in exponent
↑ get into trouble here

Stretch: 14.5 dec $10^{\pm 612}$
↑ too large
↑ should not decrease this



reliability because part can be out - [illegible]

probs are put into one drum — + done when ready

Divide by 127

$$\frac{1}{2^7-1} = \frac{1}{2^7}\left(1 + \frac{1}{2^7} + \left(\frac{1}{2^7}\right)^2 + \cdots\right)$$

$$= \frac{1}{2^7}\left[\left(1 + \frac{1}{2^7}\right) + \frac{1}{2^{14}}(\quad)\right] + \frac{1}{2^{21}}[\quad] \cdots$$

No. of branches — most are not taken —

"optional stopping" of Stp. data

Example: all 6 toss coins take only those with Heads.
have them toss take only Heads.
etc.

end up someone has tossed 6 heads in a row
and total no. of heads is larger than total no. of tails

Milnes method: better than Runge-Kutta for large systems,

$$P_{n+1} = y_{n-3} + \frac{4h}{3}\left[2y'_n - y'_{n-1} + 2y'_{n-2}\right]$$

$$y_{n+1} = y_{n-1} + \frac{h}{3}\left[P'_{n+1} + 4y'_n + y'_{n-1}\right]$$

$$\text{error} \left[P_{n+1} - y_{n+1}\right] = \frac{29}{90} h^5 y^{(5)}$$

predictor = corrector

also good for varying interval size

and unreliable machine

generalized corrector:

$$y_{n+1} = a y_n + b y_{n-1} + c y_{n-2} + \cdots$$

True solution

$z = [\ ] + \text{Error term}$

$y' = f(\ ) + \text{Error term}, \ \varepsilon_1(n)$

$\varepsilon'_n = \frac{\partial f}{\partial y} \varepsilon_n - \varepsilon_1(n)$ error satisfies this.

get characteristic eq. for h.

Mine ρ_1, ρ_2 terms

absolute error or rel error,

use of $b = 0$ if h less than 0.75

other bs could be better for other eqns

Simulation probs.

Need to follow @ 10 cycles/sec.

Info. Theory says need to follow 20 cycles/sec but actually need 70 or 80 cycles/sec (3.5 X) "Sampling Theorem"

Important to realized That Band Width is imp. consideration

eg. Time steps 10Kcps are not needed in missile prob.

not polynomial approx. — exponentials @, etc. are better.

→ Imp. one could derive the formulas for the problem at hand.

a Theory of exponential fns is needed in Info. Theory