Cybernetics and the Pioneers of Computer Art

URL: http://dreher.netzliteratur.net/4_Medienkunst_Kybernetike.html

Base Two
Lecture, part of the series of events “Base Two” commemorating the 300th anniversary of Gottfried Wilhelm Leibniz’s death
Sprengel Museum Hannover, 10/19/2016

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The Founders of Cybernetics


Claude Elwood Shannon with "Theseus" (1952) and the mouse navigating itself through the labyrinth (Credit: MIT Museum, Boston / Nixdorf MuseumsForum, Paderborn).

Image source: https://www.flickr.com/photos/arselectronica/5056388921/
If the target moves across the course of the fighter, a certain amount of lead has to be taken into account: One has to fire at the point in space where the target will be when the projectiles arrive. The fighter therefore has to fly a curve while firing, i.e. it is turning at some rate. Evidently, there would be no problem if the projectiles arrived instantaneously. Of course they do not, but it is advantageous to reduce the time of flight as much as possible, by using guns with a high muzzle velocity.

Fire Control Systems

Fig. 9.1. M-9 gun director, tracking head with operators. One follows the target in elevation, the other in azimuth. The unit and the operators rotate while tracking. Courtesy of AT&T Archives.


Fig. 9.6. A glimpse of automated war. The SCR-584 radar, driving the M-9 gun director, and 90 mm guns with Sperry servo drives. The 584 itself is in the foreground, as well as buried into a revetment as part of the system in the background. This system proved successful against the V-1 buzz bombs in 1944. Courtesy of MIT Museum.


Left: Pursuit of a goal (one operator) and localisation (two operators) without radar. Right: Pursuit of a goal with radar and the localisation, the calculation of the goal’s flight line for predictions and their transfers to cannons.
Feedback


Fig. 2: Negative feedback.

Communication diagram Nike, 1945 (Roch: Shannon 2009, p.159).
Cybernetic Model: Homeostat

William Ross Ashby beside the "Homeostat", realised in 1946-47.

Image source: URL: http://www.rossashby.info/gallery/images/WRA%20+%20Homeostat.jpg

Ashby, William Ross: Homeostat, 1946-47
Cybernetic Models: Maze-Solving Machine

Left: Shannon, Claude Elwood: Maze-Solving Machine, plan (Shannon: Presentation 1951, p.174, figure 8).

Right: Claude Elwood Shannon with "Theseus" (1952) and the mouse navigating itself through the labyrinth (Credit: MIT Museum, Boston / Nixdorf MuseumsForum, Paderborn).

Image source: https://www.flickr.com/photos/arselectronica/5056388921/
Cybernetic Models: Robots


Gordon Pask: Early Works

Solartron EUCRATES II, ca. 1956 (Pask: Approach 1961, pl.I 8(i)).

Musicolour, Boltons Theatre Club, South Kensington 1954.
Left: Stage with a projection screen for Musicolour.
Gordon Pask: Musicolour 1953-57

Circuit diagram (Pask: Comment 1971, p.79, fig. 26).

Electrochemical system (Pask: Comment 1971, p.85, fig.31).

Projection wheel controlled by a servomechanism (Pask: Comment 1971, p.81, fig.27).
Nicolas Schöffer: CYSP 1, 1956

Left: exhibition, Institute of Contemporary Arts, London 1960. The navigation desk at the right side was normally substituted by autonavigation.

Image source: URL: http://www.olats.org/schoffer/img/cyspica2.jpg

Image Source: http://www.thecentreofattention.org/exhibitions/feCYP1sm.jpg
Reactive Installations with Computing Processes


Fig. 34. A rough sketch of powered mobiles.
- Horizontal plan
- Vertical section taken through line L in horizontal plan.
- $d$ = drive state display for male
- $f$ = main body of male, bearing ‘energetic’ light projectors $O$ and $P$
- $C$ = upper ‘energetic’ receptors
- $B$ = lower ‘energetic’ receptors
- $u$ = non ‘energetic’, intermittent signal lamp
- $a$ = female receptor for intermittent positional signal
- $b$ = vertically movable reflector of female
- $Z$ = bar linkage bearing male I and male II
- $\times$ = Drive motor
- $\times$ = Free coupling
- $\times$ = Fixed coupling
- $\times$ = Bar linkage
The stored word library contained a selection from Roget’s Thesaurus. The words supplied with syntax indices – "adjectives", "substantives", "adverbs" and "verbs" – are combined following two syntactical structures: "My—[Adjective]—Substantive—[Adverb (adv)]—Verb (verb) —Your—[Adjective]—Substantive" or "You are my—Adjective (adj)—Substantive (noun)". In the case of repetitions the second structure was reduced to "My—Adjective—Substantive". After a salutation combined by using a database called "Letter Start" to select words followed five sentences generated by combinations of stored words using the syntactical schemes described above. The end of the letter was constructed with the scheme "Yours—Adverb—MUC" (MUC = Manchester University Computer).

Left: Link, David: Ferranti Mark I Emulator with Christopher Strachey’s “Love-letters”, 1952 (Link: Angel 2006, p.16, fig.1).

The database contained a selection of 16 subjects and 16 predicates as they were found in Kafka’s "The Castle". Four "logical constants" ("und", "oder", “so gilt”, “." ["and", "or", "if..then", "]") for the syntax of the combinations, four "logical operators" for the subject’s existence ("ein”, “jeder”, “kein”, “nicht jeder” ["one", "each", "no one" and "not each"] in feminine, masculine and factual German forms) as well as the stored subjects and predicates should appear with equal frequency in a computer-generated text. Only the "relative frequency" of the point (the sign for the negation) was determined higher than the frequency of the other logical constants.


Noll, Nees and Nake revived the following procedures of computer literature being developed by Christopher Strachey, Theo Lutz and a few others:

- The selection of basic elements,
- a random generator,
- determinations of the frequency the program chooses elements, and
- a syntax combining the elements.
23-Ecke (23 corners), 1964, plotter drawing (Nees: Grundlagenstudien 1964, p.124, ill. 2).

Frieder Nake: Walk-Through-Raster, 1966

Left: Walk-Through-Raster, series 2.1, four realisations, 1966, plotter drawings (Nake: Ästhetik 1974, p.236, ill. 5.5-5).

Right, top: Walk-Through-Rasters, 1966, six modes of a computing process to step across the plane (Nake: Ästhetik 1974, p.229, ill. 5.5-1).

Center right and bottom right: Walk-Through-Raster, 1966, diagram of the tree structure (Nake: Ästhetik 1974, p.235, ill. 5.5-4).
De Stijl/Computer Graphics/Serial Art

Piet Mondriaan: Composition with Large Red Plane, Yellow, Black, Grey and Blue, 1921. Oil on canvas. Gemeentemuseum Den Haag. Source: URL: http://www.gemeentemuseum.nl/de/collection/item/6496


Frieder Nake: Walk-Through-Raster, series 2.1, four realisations, 1966, plotter drawings (Nake: Ästhetik 1974, p.236, ill. 5.5-5).


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Bibliography with informations about the abbreviations used in the captions: