Danish Society for Computer History

History

The **Danish Society for Computer history** was founded on August 15, 2002.

Prior to this, a group of people - named “Computer Archaeologists” - in Ballerup just outside Copenhagen had started to collect material about the three Danish computer manufactures: **Regnecentralen**, **Dansk Data Elektronik**, and **Christian Rovsing A/S**.

The purpose of this society is to collect information about computers (hardware, software, and documentation) that have been produced in Denmark.

We will arrange exhibitions to present the historic material we have collected.

We hope that we can open a physical museum not later than February 13, 2008 - this will be the 50 year anniversary of the inauguration of the first computer made in Denmark, the **DASK**.

Another important issue is running a “Virtual Museum” on the Internet - our home page.

The committee of the society has the following members:

- Jørgen O. Bjerregaard (chairman): job@datamuseum.dk
- Henning Isaksson (treasurer): hi@datamuseum.dk
- Poul Testmann (secretary): pt@datamuseum.dk
- Knud Viuf: kv@datamuseum.dk
- Mogens Kjær: mk@datamuseum.dk

We meet every Thursday, 19^{00}, on Gammel Rådhusvej 32, Ballerup.

Annual membership: 200 DKK for individuals, and 2000 DKK for institutions and companies.

For more information:

Dansk Datahistorisk Forening
Postbox 88
DK-2750 Ballerup
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http://www.datamuseum.dk

The logo of the society (above) was originally made as a logo for Regnecentralen.

In the late 60’s, the charismatic manager of Regnecentralen, Niels Ivar Bech, referred to the company as a “computer workshop in growth”. As the enthusiastic firm was populated with “dynamic jumping jacks”, a bright person suggested that a computer jumping jack was needed.

The jumping jack was designed by Freddi Schlechter, and we thank his family for permitting us to use it as logo for the society.

The home page

The home page of the society is found at the following address:

http://www.datamuseum.dk

Our plan is to make as much information as possible available on this site:

- Description of the three companies, Regnecentralen, Dansk Data Elektronik, and Christian Rovsing A/S.
- A database of our collection.
- Photographs from the companies.
- Documentation - scanned and presented as PDF files.
- Personal essays from the persons involved in these companies.
- A configurable time line: The visitor selects the subjects, level of details, time period, etc. and the search result is presented as a time line.

Much of this is still in the planning stage.

Examples of pictures from our home page:

Above: Left: Old picture of a GIER installation. Right: Picture of a GIER machine shown on an exhibition held i Ballerup, 1999-2000. The title of the exhibition was: “When the computer became adult”.

Below: Left: Microcomputers from Christian Rovsing A/S. Right: Supermax computers made by Dansk Data Elektronik. Both pictures were also taken at the exhibition mentioned above.

The GIER simulator

History

The first computer produced in Denmark was the **DASK** machine. The machine was inaugurated on February 13, 1958. This machine was modeled from the Swedish BESK machine. The DASK machine had a core store of 1024 words, each of 40 bits. A home-made drum storage contained 8192 words. The machine was equipped with vacuum tubes. The company, Regnecentralen, was established to produce this machine. Only one specimen of this machine was made.

Work on the **GIER** machine started immediately after DASK was built. It was ordered by the Royal Geodetic Institute from Regnecentralen, hence the name GIER: Geodætisk Instituts Elektroniske Regnemaskine. The first machine had a core memory of 1024 words of 42 bits, and a drum of 12800 words. The use of transistor technology made the machine much smaller and more reliable than the DASK.

The instruction set of the GIER machine had many new features: The logic of the instructions were coded into a microcode storage, making it possible change the instruction set. The instruction set includes floating point arithmetic.

The GIER machine was ready in 1960. Originally, only one copy of the machine was planned, but the machine was such a success than more than 50 copies were made and sold to institutions not only in Denmark, but also to many places in the rest of Europe.

A key element to the success of the GIER machine was the ALGOL compiler available. Programming a machine with only 1024 words is non-trivial: Every bit in every word had to be used. The GIER ALGOL compiler addresses this issue in two ways: The compilation takes place in 9 scans of the code. The first pass reads the source code from paper tape, and stores the analyzed code in intermediate form on the drum. Subsequent passes read intermediate code from the drum and store the result again on the drum. The code of the compiler for a single pass is kept entirely in the core store, together with the necessary tables. The last pass delivers the compiled program on the drum, ready for execution. The compiled program is divided into segments of 40 words (one drum track), and the running system of the compiler contains a smart method for reading in the segments to core, leaving as much memory as possible for data.

We find it important not only to describe the hardware of the old machines, but also the software produced for them. One way to bring life to this software is to **simulate** the machines on a modern PC. We have all the necessary information: A description of the electronics in the GIER machine, a listing of the microcode steps, and paper tapes with operating system (HJÆLP and Help 3), and of course the GIER ALGOL compiler itself. We have received GIER ALGOL programs from many places (some as paper tape, and some printed on paper), making it easy to test the simulated machine.

Watching the old ALGOL programs coming to life again on the simulator has been like *Jurassic Park*: Suddenly, we have brought the old “dinosaurs” into life again!

The simulator (source code for Linux and executable for Windows) is available for download on our home page. Included are tapes with Help 3, GIER ALGOL 4, and a lot of demonstration programs.

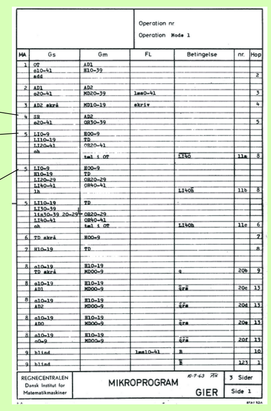
Implementation

An example of a page from the description of the GIER microcode is shown below, to the right.

Each step in the microcode consists of making bits from a register (this could be a general register, a register communicating with the core store, the adder in the arithmetic unit, etc) available on the bus (Gs), and moving the contents of the bus to another register (Gm). The execution of the instructions in the microcode is controlled by conditions, shown in the column labeled *Betingelse*. The column Hop contains the number of the next microstep to execute.

The GIER simulator is written in C. Manipulating a GIER word of 42 bits is done using 64-bit arithmetic. The Gs and Gm microstep building blocks are implemented as macros in C. This makes it easy to convert the microcode documentation into code. An example of this is shown below, to the left.

```
case 4:
 Gs_SR;
 Gs_o20_41;
                    Gm_AD2;
                    Gm_OR30_39;
 MA=5;
 break;
case 5:
 if(!IF_LI40)
 {
   Gs_LI0_9;
   Gs_LI10_19;
   Gs_LI20_41;
   Gs_0h;
                    Gm_H00_9;
                    Gm_TD;
                    Gm_OR20_41;
                    Gm_tael_i_ct;
   MA=8;
 }
 else if(IF_LI40 && !IF_h)
 {
  ...
```



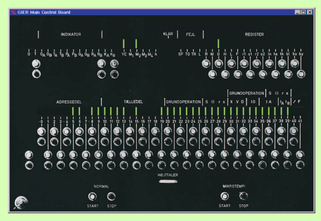
A special feature of the GIER machine was the loudspeaker: This was connected to the sign bit of the accumulator, a program changing the sign of this register 1000 times a second would thus produce a tone of 1 KHz. We have several GIER music programs on paper tape! The loudspeaker is implemented in the simulator by setting the sample rate on the sound card to 45 KHz, and sampling the sign bit every 10th microstep. This matches the clock speed of the GIER machine of 450 KHz.

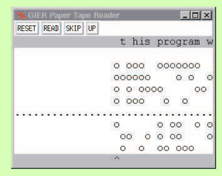
The user interface

A typical GIER machine is equipped with a paper tape reader, a tape punch, a typewriter, a main control board, and an auxiliary control board. The main control board has 42 lamps, one for each bit in a GIER word, and buttons to select registers to be displayed. 42 sets of buttons manipulate the selected register.

The control boards are implemented using scanned images of the control boards. The lamps are shown as green lines. Mouse clicks on the buttons simulate pressing a button. The state of the control boards are updated periodically when the machine executes.

Paper tapes are simulated as a file on the PC. Some GIER installations had a line printer or a drum plotter. This is simulated, and output is sent to the printer connected to the PC. Two examples of interface windows are shown below. The left window is the main control board, and the right window is the paper tape reader.





Below is an example of an ALGOL program, and the output produced on the attached typewriter. The program reads a tape with a series of numbers, and prints the sum. Note the use of “Jensen’s Device” in the SUM procedure.

```
algol<
Program d-MK-6. Sum
begin
    real sum;
    integer i,antal;
    real procedure SUM(x, i, første, sidste);
    value første, sidste;
    real x;
    integer i, første, sidste;
    begin
       real sum;
       sum := 0;
       for i := første step 1 until sidste do
       sum := sum + x;
       SUM := sum
    end SUM;
    select(16);
    antal := read integer;
    begin
       array A[1:antal];
       for i := 1 step 1 until antal do
       A[i] := read real;
       sum := SUM(A[i], i, 1, antal);
       writecr;
       writetext(|<<Sum: |>);
       write(|<-d.ddddd'-dd|>, sum)
    end indre blok
end
run<
10
1,2,3,4,5,6,7,8,9,10,
```