BULLETIN OF THE COMPUTER ART SOCIETY

STOCKHOLM

The success of the 1972 electronic music course at Stockholm's computer-controlled studio (EMS) has prompted CAS and the EMS Director, Knut Wiggen, to arrange a similar course for this summer.

This course will run 5-23 August 1974 and, although anyone will be welcome, those who already have some experience in electronic music and who wish to realise a piece will find it most valuable.

The course and use of the computer studio is free but you will have to arrange and pay for your own accommodation and transport.

We advise you to do this as soon as possible because the first week of the course coincides with the IFIP Conference and hotels and flights are expected to be heavily booked.

If you want a place on the course (which will be quite informal) or more details write to Alan Sutcliffe or John Lansdown.

The notes on the Studio published in this issue of PAGE have been prepared by Knut Wiggen to whom we express our thanks.

MONEY OFFERED

THE ARTS COUNCIL/THE HATFIELD POLYTECHNIC

"The Computer as a Creative Medium"

RESEARCH FELLOW

Applications from suitably qualified practising (Fine or Graphic) artists are invited for the post of Research Fellow at Hatfield Polytechnic to investigate the use of the computer as a creative medium.

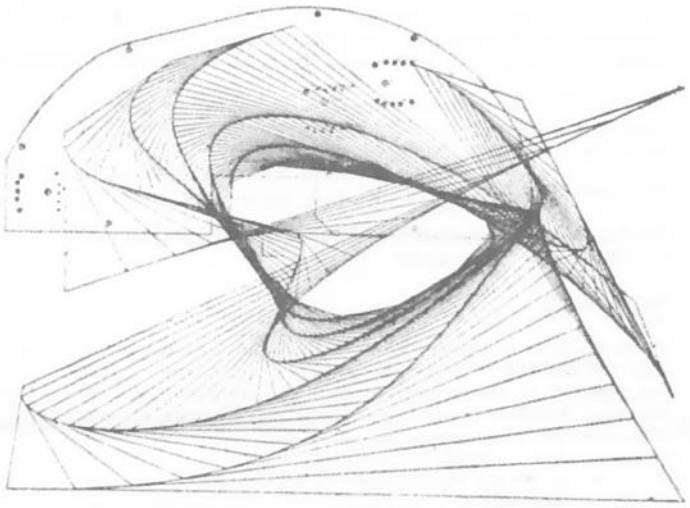
The project is jointly sponsored by the Arts Council and Hatfield Polytechnic, and it is expected to run for 2 to 3 years from September 1974. The polytechnic is well equipped with computer facilities, including a range of computer graphics devices.

The salary ...£2,500

Further details and application form can be obtained... from the Staffing Officer, The Hatfield Polytechnic, P O Box 109 Hatfield, Herts AL10 9AB. telephone Hatfield 68100 Ext 309

Please quote ref. 480

THE OBSERVER 7th APRIL 1974



An independent line

A computer connected to an automatic draughting machine was recently programmed to make a drawing of a roughly semi-circular fibreglass board, and to mark hole centres for drilling. When it reached the last hole in a row of four on the top right-hand side of the board, some unexplained fault developed, and the machine went out of control. The operators, seeing what was happening, left the machine alone to discover what pattern it would draw. The result is shown above. It is interesting to note that there was no fault with the computer programme, since the same tape was used later on the same machine and then made the drawing correctly. However, compare this drawing with your recent photograph in Briefing. That was a picture drawn by a computer programmed by a man. This is a picture drawn by a computer without human assistance or connivance. It has a kind of psychedelic fascination and a distinctly three-dimensional appearance. I feel that it should be possible to construct a solid object which represents the drawing but its precise nature is elusive and never quite within the mind's grasp.

Robert P. F. Lauder
Edinburgh.

MAKE AN EXHIBITION OF YRSELF?

PERMANENT EXHIBITION OF COMPUTER ART.
CONTRIBUTIONS INVITED.

The Science Museum in London is assembling a permanent exhibit on computers and their applications and has asked CAS to prepare a portion of the exhibit. One part of our contribution will consist of approximately 250 slides (35mm) illustrating a variety of styles and types of Computer Art.

We would like the slides to be as representative and of as high a quality as possible. To ensure this, we invite all members of CAS to send slides of their works to John Lansdown. Selections will be made by the CAS group setting up the museum exhibit. Slides selected will be copied for the exhibit and all of the originals will be permanently stored at John Lansdown's office. We would greatly appreciate it if all slides could be sent in as soon as possible.

There exist several ways of programming music at EMS:

EMS1, which if needed, can be extended with user's own FORTRAN programs. Compositions can be written in pure FORTRAN using the EMSALL program package, where devices in the hardware studio can be referenced as subroutines, or one can use the SYNTET program to translate control code output from a distant computer as an ASCII paper tape into code that controls the studio. There is a language called MUSIC BOX, and Wayne Slawsson's SYNTAL which is implemented but not debugged enough to be operational. Gary Nelson from Perdue University has done some work on combining certain MUSIC4 routines with EMSALL into a system called MUSIC15.

The facility in EMS1 to enter user's FORTRAN routines is somewhat similar to a possibility of MUSIC4 and its relatives. EMS1, which ordinarily operates on the macro level, in this way also becomes powerful on the object time level. Random and trigonometric function also become available. After an initialization on the EMS1 level it is possible to write all of the composition, or any part of it, in FORTRAN. This includes sequence control, letting each device live its own life or communicate with its colleagues in simulated time.

For example: the notation in EMS1 to express that the frequency of generator 2 should be FORTRAN controlled from the local time 5 1/2 seconds is

```
LT(5,500)FG(2,FOR)
```

Optionally, a parameter could be transferred from EMS1 to FORTRAN by for example

```
FG(2,FOR+17)
```

There is also an array that can be access from either EMS1 or FORTRAN. The code generation program in EMS1 (as opposed to the compilation part) calls FORTRAN once for each FORTRAN-controlled device and then at different time samples as frequent as is requested by the FORTRAN program. The FORTRAN program has access to information about which device it is time to service, the optional argument that was once given in EMS1 and the current time and studio value. The additional FORTRAN programs must be chained into the usual EMS1-system before the run starts.

Composition rules can be formulated, to an extent, in the form of macros in EMS1 (during the compilation phase) but this is frequently slower than doing the same thing at the runtime level in FORTRAN. For a fairly complex piece in EMS1 the compilation phase, which includes expansion of all macros, may take a few times real time and the code generation phase something like real time.

The first working system at EMS was EMSALL, which enables pure FORTRAN composing. (EMSTOT is the counterpart with Swedish notation). The way of giving frequency generator 6 a typical frequency, waveshape and level in decibels is

```
CALL SG(6,440,3,80)
```

To connect the device to an output channel

```
CALL CONNEC(SG6,CH1)
```

where SG6 and CH1 are integer device numbers.
The notation to let this setting last for half a second is

```
CALL TIME(500)
```

The full reportoire of loops and subroutines in FORTRAN is available to describe composition rules, but it takes some skill in programming to synchronize parallel events. The procedure is: compile, load and execute the program (as described in the paper KNOWHW OKU) The result is output to a digital magnetic tape (9-channel industry standard) that can be played in the studio, on line or off line.

SYNTET is another system that converts straight code into studio code and puts it on magnetic tape. The input code, which should reside on paper tape in ASCII format, looks like:

```
K2318                to connect devices 23 and 18
A1810000             to give device 18 the level 100 DB
SO600440308000       to set frequency generator 6
T00500               to give time
```

The example is the same as above.
SYNTET generates calls to the EMSTOT package. (notice that the device numbering of EMSTOT, not EMSALL, must be used.)

A summary of the possible formats of communicating with EMS.

Any visitor who knows the studio could prepare material at home. He or she can bring ASCII-coded paper tape, or if he (she) happens to have access to a PDP-15, so called DEC-tapes, the material could be:

1) EMS1-text, since there is only one implementation of EMS1 the syntax can be checked only in Stockholm.

2) FORTRAN programs for EMSALL or EMS1. These can be run and tested at another computer, but there exist incompatibilities between different FORTRAN versions, so it is good to consult a PDP manual.

3) Compactly coded control signals to be read by the SYNTET program. The advantage is the straightforward run. There is no compilation at EMS. All pretesting can be done at any computer. EMS could even convert a paper tape sent by mail and send an audio tape back.

4) This would be to generate a magnetic tape at industry standard with the studio code of EMS, to be played directly. This is very difficult.

The following documentation is available:

EMS1 MAN. The basic documentation in English.
A paper on linking FORTRAN to EMS1 (Swedish or English).
Material for a complete course in the studio and EMS1 (in Swedish).

```
PROGRM DKO          (this paper)
EMS1 INT            (a short introduction to EMS1
                     reproduced in this issue)

EMSALL DKU
EMSTOT DKU
KNOWHW DKU          (how to find your way in the user's
                     guide for PDP-15 when using EMSALL)

SYNTET DKU
```

A paper on SYNTAL (English to Swedish). Anyone interested in debugging SYNTAL is welcome.

The technical documentation on the format of the studio code:

```
BINREP DKU
INTERR DKU
BINREP DEM
```

AN INTRODUCTION TO EMS1

The most used computer program at EMS is EMS-1 which is a program that primarily was meant to be a replacement for the manual work in the EMS studio, words and statements replacing manual commands in order to get the studio sound after one's intentions.

From a programmers and/or from a pedagocical point of view there exist four distinct levels of complexity in EMS-1 programming.

The first one gently interfaces the composer to the usage of computers for composing.

Before the composer starts using EMS-1 he has learnt how to control the EMS studio manually. The first step or level just consists of writing down the studio settings interactively instead of setting the parameters manually, listening to them by giving the command PLAY and then, if the composer is not satisfied, changing some parameters. When the composer is satisfied with a sound he mixes it together with other accepted sounds. With these sounds, step by step, the composer constructs musical objects. A set of these objects will eventually make up a piece of musical structure.

The second level consists of abbreviating EMS-1 statements by defining macros and of calling and mixing sound objects that the composer has created in a previous run and reside on magnetic tape or disk.

The third level consists of using the whole repertoire of conditionals, macros (recursive macros definition is allowed) and file handling capability that are included in the macro-phase of EMS-1.

The fourth level of complexity is for the composer who is skilful in programming and consists of using the linkage-facilities that exist between EMS-1 and FORTRAN.

We are going to give you some examples of EMS-1 programs but before that I will say some words about the EMS-1 source text.

EMS-1 source text consists of blocks which begin with the word PART and end with END. The musical counterpart to a part is a piece of a part of a musical structure.

PARTS are divided into objects. Each object is placed into its place in a PART with the help of a MIX command.

Each object consists of sounds and sounds consist of device terms envelope- and/or glissandi- terms and connection terms.

For example:

FG(2,440,50,3)>ENV(50,89,2000,-5)>GLIS(440,900,2500,2,5)>CHA(3,90):

This means that frequency generator number 2 gets the frequency 440 hertz and gets a level of 50 decibels and wave shape three also that a square wave is used. Then an envelope is specified. The envelope term will change the level of frequency generator number 2 according to the given parameters. In this case the level will change from 50 decibels to 89 decibels in 2000 milliseconds and the envelope will follow curve form number -5.
The curve form specifies the relative speed of the change in the beginning and in the end if the envelope.
Then the frequency of frequency generator number 2 will change according to the parameters in the glissando term. That means that the frequency will start on 440 hertz go up to 900 hertz in 2500 milliseconds following curve form No.2 and the frequency steps each 5 milliseconds.

Parameters can be manipulated with the help of arithmetical statements.

For example:

A=A+20-10*B;

Conditional statements are allowed.

For example:

IFPOS(A)A=A-1;< which means that if A is greater than zero A will be decreased by one.

Sounds or sound complexes can be manipulated with the help of macros:

For example:

MACRO1="ENV(50,89,2000,-5)>GLIS(440,900,2,5)"

MRECMAC="A=A-1;IFPOS(A)FG(2)>MACRO1;RECMAC;"

If we write:

FG(2)>MACRO1

This will be interpreted as equivalent to:

FG(2)>ENV(50,89,2000,-5)>GLIS(440,900,2,5)

by the computer.

If we write:

A=3;

RECMAC;

The computer will produce the following studio terms:

FOR A=3: FG(3)>ENV(50,89,2000,-5)>GLIS(440,900,2500,2,5)

FOR A=2: FG(2)>ENV(50,89,2000,-5)>GLIS(440,900,2500,2,5)

AND FOR A=1: FG(1)>ENV(50,89,2000,-5)>GLIS(440,900,2500,2,9)

Nothing will happen for A=0 because A has to be greater than zero in order to satisfy the conditional.

In EMS-1 events can be sequenced in time with the help of a so-called local time statement:

LT(320)FG(1,440); this statement means that frequency generator number one will be given a frequency of 440 hertz 320 milliseconds after the beginning of the latest part.

LT terms need not come in time order. The local time tagged sounds are sorted before the object time run or before the code generation starts.

The composer has the possibility of using commands for playing, file handling and object creation.

The command PLAY plays the statements written since the last MIX command was given.

The command MIX(TIME) mixes the new object into the set of already prepared objects. The argument defines the starting point in time from the beginning of the part for the object to mix.

The command PLAY(MIX) plays the objects defined in the last part.

If you are not sure whether you want to mix the latest written object together with the ready ones or if you are not sure of when the objects shall start you can try different sound configurations with the help of the TRY command. TRY(TIME) functions in the same way as MIX (TIME) but the resulting mix is not permanent.

If you want to keep the source text of an object this facility is provided by the save command which saves the source text onto magnetic tape.

If the composer wants the source text of old objects that reside on magnetic tape he can get them with a CALL(FILENAME) command.

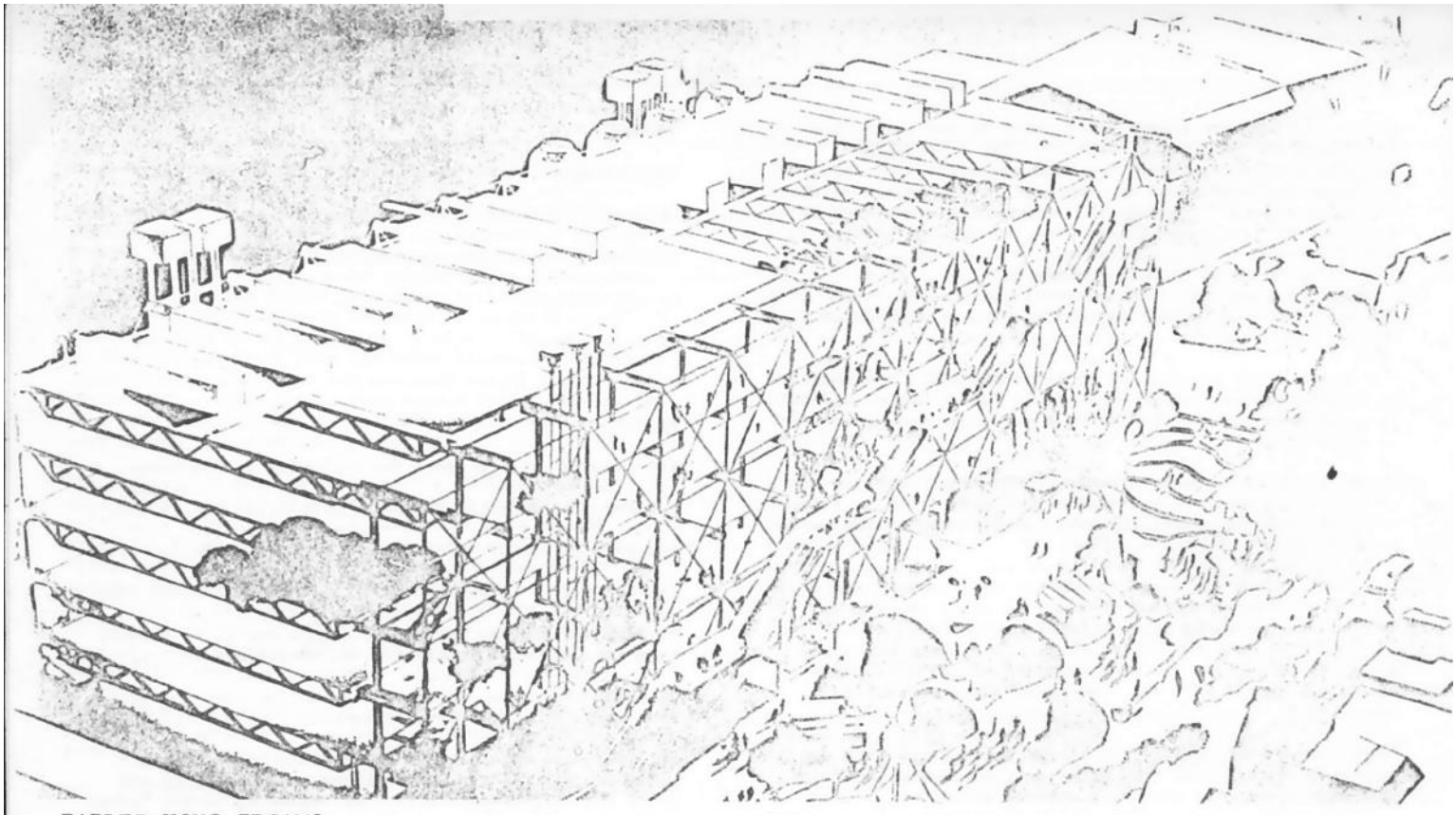
An EMS-1 run consists of the following phases:

1. A macrophase during which conditionals and/or arithmetical statements are evaluated. Macros expanded according to the values in conditionals-if there are any-all statements are checked for SYNTAX errors and if an error is discovered there is a facility for the composer to correct it interactively.

2. Terms that change connections or parameters in the studio are translated or assembled into (TIMETAGGED) records.

3. These records are sorted in time order.

4. During the object time run these records are translated into studio code (if the composer has linked FORTRAN to EMS-1 these FORTRAN programs are executed in the object time phase). The studio code is then registered on magnetic tape.



PARLEZ-VOUS IRCAM?

On a site between Les Halles and Le Marais in Paris, a centre for twentieth-century art and culture is being built. The Centre Beaubourg is financed by the French Government and, when it is completed at the end of 1975, will contain, among many other things, the 'Institut de Recherche et de Coordination Acoustique/Musique'.

Under the general directorship of Pierre Boulez, IRCAM aims to "supress the traditional borderline between art and science and to create a new rapport between musicians and scientists". Musicians seek new means of expression. Scientists have the technical ability to help them in this search. IRCAM will bring scientists and musicians together to work on the same projects.

Their interdisciplinary research will cover fields which are usually considered in isolation - computer science, acoustics, electro-acoustics, instrumental studies and the psychology of perception.

Every year IRCAM will invite musicians and scientists from both France and abroad to work on projects. Completely interdisiplinary projects will be run in close liason with universities and research centres whilst research of a less diffuse nature will be carried out entirely at IRCAM.

CHILE

One of our members, Josefina Mena, was in Chile during the recent coup and has given us harrowing details of the activities of the new regime. There are rumours of computers being used to brainwash members of the former Government and its supporters although we have no details of these. Could anyone who has details or any news of artists or those who worked on Stafford Beer's computer project, please contact us.

AN APOLOGY

Recent copies of PAGE have been very much overdue. We could blame the famous 'three-day-week' but feel that you may have heard that one before. The truth is that in recent months, the Organisers have been under such pressure that not even a seven-day-week can suffice. We apologise for the delays and will do our utmost to bring out future issues on time. Why not volunteer to be editor? For one issue or more. No money but a free hand.
This issue was edited by Karen Lansdown.

XPLOR? EKSPLOOR? no EXPLOR

Bob Weinberg has implemented Ken Knowlton's EXPLOR program on a large machine not 1000 miles from Kensington, London. CAS hopes to organise a short course on the use of this very powerful graphic program very soon. Watch out for details.