PROGRM DKU

AN OVERVIEW OF SYSTEMS FOR PROGRAMMING MUSIC AT EMS, STOCKHOLM.

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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 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 ENOUGH DEBUGGED TO BE OPERABLE. 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 FUNCTIONS 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.

AN 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 E.G.

FG(2,FOR+17)

THERE IS ALSO AN ARRAY THAT CAN BE ACCESSED FROM EITHER EMS1 OR FORTRAN. THE CODEGENERATION 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 STUDIOVALUE. 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 (I.E. 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 CODEGENERATION 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

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CALL SG(6,440,3,80)
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TO CONNECT THE DEVICE TO AN OUTPUT CHANNEL

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CALL CONNEC(SG6,CH1)
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WHERE SG6 AND CH1 ARE INTEGER DEVICE NUMBERS.
THE NOTATION TO LET THIS SETTING LAST FOR HALF A SECOND IS

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CALL TIME(500)
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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 DKU).
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:

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K2318            TO CONNECT DEVICES 23 AND 18
A1810000         TO GIVE DEVICE 18 THE LEVEL 100 DB
S0600440300000   TO SET FREQUENCY GENERATOR 6
T00500           TO GIVE TIME
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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 HACE 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 STUDIOCODE 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 DKU (THIS PAPER)

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 OR SWEDISH). ANYONE INTERESTED IN DEBUGGING SYNTAL IS WELCOME.

THE TECHNICAL DOCUMENTATION ON THE FORMAT OF THE STUDIOCODE:
BINREP DKU
INTERF DKU
BINREP DEM