FAME—A MICROPROCESSOR BASED FRONT-END ANALYSIS AND MODELING ENVIRONMENT

Jacob D. Rosenbaum and Edward B. Kutin
Higher Order Software
Jericho, New York

FAME, (Front-End Analysis and Modeling Environment) is a microprocessor based interactive computer aided design aid, for designers and developers of computer-based systems. FAME is especially useful in microprocessor applications where systems complexity has increased the need for more rigorous approaches to the development process.

A variety of techniques and methods are being proposed by government and industry to meet the extensive need for better approaches to development, documentation and verification of systems. Some of the more widely used include; formal specification of system requirements and designs, static analysis of related models, and simulation to insure that the system to be developed meets the intended objective. To date, support of these activities involve large, costly computerized systems or extensive manual procedures.

Higher Order Software (HOS) is a methodology for the specification and verification of large scale, complex, real-time systems. An emphasis in its development has been the aerospace environment. Typical systems applications include guidance and control, navigation, communications, radar imaging, satellite tracking and many others. The methodology integrates Functional Decomposition, Abstract Data Types, and Control Structures in accordance with a set of axioms that describe decomposition rules, nodal relationships and responsibilities. The systems models produced can be verified statically using small amounts of computer resources and time.

The HOS methodology has now been implemented as FAME (Front-End Analysis and Modeling Environment), a microprocessor based system for interactively developing, analyzing and displaying system models in a low cost user-friendly environment. The nature of the model is such that when completed it can be the basis for projection to a variety of forms such as Structured Design Diagrams, Petri-Nets, Data Flow Diagrams, PSL/PSA Source Code etc. The user's interface with the analyzer is easily recognized by any current user of a structured modeling approach; therefore extensive training is unnecessary. Furthermore, when all the system capabilities are used one can check on proper usage of Data Types, Functions and Control Structures and thereby add a new dimension to the design process that will lead to better, and more easily verified software designs.

FAME is now available on a range of computer systems as well as on any Microprocessor with 64K of memory and dual floppy disks that can use the CP/M operating system. It is especially useful on Microprocessor Development Systems where one would now be able to combine the requirements, documentation analysis, verification and code development activities on a single device.
FAME CAPABILITIES

MAIN FRAME COMPUTER
- CORPORATE MODELS
- CONFIGURATION CONTROL
- OTHER MODELING/ANALYSIS TOOLS
  - PSL/PSA
  - SREM
  - HIPO

MICRO-COMPUTER
- FAME
  - MODELING
  - ANALYSIS
  - DOCUMENTATION
  - PROJECTIONS

OPTIONAL INTERFACE

BENEFITS OF HOS
- MODELS ARE VERIFIABLE STATICALLY
- MODELS INTEGRATE
  - FUNCTIONS
  - DATA TYPES
  - LIBRARIES OF OPERATIONS & STRUCTURES
  - RULES FOR MODEL CREATION
- SUPPORTS ALL PHASES OF DEVELOPMENT
- MODELS CAN SUPPORT DIRECT SIMULATION
- MODELS CAN PROVIDE EXTRACTS TO SATISFY OTHER METHODS
- AN HOS ANALYSIS REQUIRES KNOWLEDGE OF ONLY A PARENT & ITS OFFSPRING
COST BENEFITS OF FAME ON MICRO

0 OFFLOADS MAINFRAME T/S SYSTEMS
0 PROVIDES GOOD RESPONSE & <$4/HOUR
0 MINIMUM LINE CHARGES
0 HOS MODELING & ANALYSIS COSTS ESTIMATES (ON 8080 MICROCOMPUTER)

<table>
<thead>
<tr>
<th>MODELING PHASE</th>
<th>CLOCK MINUTES/NODE</th>
<th>NODES INVOLVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECOMPOSITION</td>
<td>15 MIN</td>
<td>PARENTS</td>
</tr>
<tr>
<td>ANALYSIS</td>
<td>1.5 MIN</td>
<td>PARENTS</td>
</tr>
<tr>
<td>DISPLAY</td>
<td>1.0 MIN</td>
<td>PARENTS</td>
</tr>
</tbody>
</table>

CURRENT STATUS

0 PROTOTYPE (C BASIC) ON 8080 MICRO-COMPUTERS (CPM)
0 PROTOTYPE (C BASIC) ON INTEL MDS
0 PASCAL VERSION ON MICRO (IN DEVELOPMENT)
0 PASCAL VERSION ON VAX 11/780
0 CURRENTLY REHOSTING TO:
  - HARRIS
  - CONTROL DATA (CYBERNET)
  - MULTICS
MODEL OF SATELLITE NAVIGATION SYSTEM

PARENT/OFFSPRING DIAGRAM

ABB

PERFORM AUTOCL

SELECT

OVERIDE

UPDATE SATELLITE STATE

SELECT FIRST PLACE

NEW STATE

LEAST FIRST

PARENT/OFFSPRING DIAGRAM

SATNAV

PARENT

SATNAV

SUBTRACT

PERFORM SATNAV FUNCTIONS

UPDATE SATELLITE STATE

SELECT FIRST PLACE

COPY OF STATE

NEW STATE

LEAST FIRST

PARENT/OFFSPRING DIAGRAM

SATNAV

PARENT

SATNAV

SUBTRACT

PERFORM SATNAV FUNCTIONS

UPDATE SATELLITE STATE

SELECT FIRST PLACE

COPY OF STATE

NEW STATE

LEAST FIRST

DATA

-data type--part of

XSATST --> STATE OF SATELLITES
YSATST --> STATE OF SATELLITES
SSEIM --> ORDERED SETS OF IMAGES
LSETH --> ORDERED SETS OF PLACES
CSEIM --> ORDERED SET OF ORDERED SETS OF IMAGES
LSETPL 1 --> ORDERED SET OF PLACES 1
LSETPL 2 --> ORDERED SET OF PLACES 2
LSETPL 3 --> ORDERED SET OF PLACES 3

CONDITION

0=PROC --> EQUAL (0,PROCEDURE)
TYPICAL PROMPTED SCENARIO

HOW MANY OFFSPRING DO YOU WANT TO ADD? 2
FOR NODE ABCDE
FN NAME (8): AUIOCOR
OF NAME (8): _______
LONG NAME (10): AUIOMAIIIC
LONG NAME (10): CUREBELAIIO
LONG NAME (10): _______
CONNECTOR (8): _______
INPUT (8): 2_______
INPUT (8): 4_______
INPUT (8): 8_______
INPUT (8): 6_______
INPUT (8): _______
OUTPUT (8): XSAISI___

FOR OUTPUT XSATSST''
DATA TYPE (8): SIGIE___
LONG NAME (10): SIGIE_0E___
LONG NAME (10): SIGIEIIIIES
LONG NAME (10): _______
OUTPUT (8): _______
CONDITION (8): _______
FOR NODE ABCDE
FN NAME (8): SAIAACCCV
OF NAME (8): _______
LONG NAME (10): SAIAACCCV
LONG NAME (10): _______
CONNECTOR (8): COJOIN____
INPUT (8): XSAISI___
INPUT (8): 4_______
INPUT (8): 10_______
INPUT (8): 6_______
INPUT (8): _______
OUTPUT (8): 1_______
OUTPUT (8): _______
DO YOU WANT TO MAKE ANY CHANGES TO INPUTTED INFORMATION?
FILES CLOSED---RUNNING UPDATE
PASSWORD _______
UPDATE COMPLETED
TREE DIAGRAM

:AA
:CHOOSE
:OPTIONS

ABA
:CLONE(1)
:COPY OF
:STATE

:ABB
:PERFORM
:FUNCTIONS

:ABC
:EXECUTE
:MANUAL
:OVERRIDE

:AB
:PERFORM
:FUNCTIONS

:ABB
:PERFORM
:FUNCTIONS

:ABC
:UPDATE
:SATELLITE
:STATE

:AB
:SATNAV

:ABB
:PERFORM
:AUTO
:PROCESSING
:PLACE

:ABC
:UPDATE
:SATELLITE
:STATE

:ABB
:PERFORM
:FUNCTIONS

:ABC
:EXECUTE
:MANUAL
:OVERRIDE

:AB
:PERFORM
:FUNCTIONS

:ABC
:UPDATE
:SATELLITE
:STATE