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RAND/UCSB NETWORK GRAPHICS EXPERIMENT

INTRODUCTION

During the Network Graphics Meeting in July, several experiments were outlined to explore graphics over the Network. One of these was the use of the UCSB On-Line System (OLS) from graphic consoles at Rand.

The connection was completed in the latter half of August and has been used on an experimental basis since then. OLS users from UCSB and TRW (in Los Angeles) have visited Rand and accessed OLS via Rand consoles and the Network. Thus, the first phase of the experiment was completed in August.

We are still in the midst of the second phase of the experiment which involves cleaning up the initial implementation and reviewing and modifying our initial strategies for the OLS connection.

IMPLEMENTATION OF THE EXPERIMENT

UCSB

UCSB has had a Network interface on the OLS for some time. For a description, see RFC #74. The descriptions in RFC #74 were modified to conform to current Network protocols (NCP and ICP) and to conform to what we considered a general graphics description.

Basically, the OLS receives an EBCDIC-like input byte stream and generates an unstructured graphical output stream. These protocols will be documented at the completion of our experimentation and presented at the Network graphics meeting in October.

The Rand Video-Graphics System (VGS) was used to access the OLS via the Network. The Video-Graphics System and its consoles are described in R-753-ARPA available from the Rand Reports Department.

VGS consoles had been connected previously to the Network via the Rand Network Services Program (NSP). Originally, NSP was designed to afford NCP checkout features, logging in to and use of remote systems and access to UCSB RJE and UCLA RJS. An additional module was easily added to access the OLS.

Input to the OLS was done via a Rand tablet on a VGS console. Input to the OLS module in NSP is accomplished by moving the tablet cursor (not shown in the attached figures) which appears as a small dot on the screen to the desired function button and pressing the tablet pen down on the tablet.

Figure 1 shows the initial display from the OLS module. The top of the screen has a feedback line, the remainder of the upper half is the output display from the OLS, and the lower half is a large sensitive area containing various function buttons (pic-table).

The sensitive areas fall into three classes:

- (1) the right most column (CALL, CLOSE) connects/disconnects to OLS over the Network. The third function (COPY) generates hardcopy via an SC 4060. (The figures are, in fact, SC 4060 hardcopy.)
- (2) The grid area contains the OLS function buttons normally on a special function keyboard. (See RFC #74.)
- (3) The lower area allows entry of number, characters and punctuation.

Figure 2 shows the login sequence to OLS and Figure 3, SIN and COS curves from $-\pi$ to $+\pi$ generated by OLS.

Completion of the Experiment

We plan to present the experiment at the October graphics meeting in two forms. First, a description of the protocols and techniques used in implementing the remote network connection along with conclusions. Second, we will make a film showing the use of the OLS from Rand and present it at the meeting.

UCSB OLS INIT STATS

-+
| Feed-
--+back
-+

OLS
Dis-
play
Area

```

+-----+
| 0 | I | II|III|IV | V |VI |VII|REL|CMX|SYS|USR|TYP|LST|CALL
+-----+
| PLS|MIN|TIM|DIV|SQ |SQT|CNJ|INV|DIF|SUM|PRD|SOR|PRD|TST|CLOSE
+-----+
| LS |RS |REF|UP |DWN|EVL|SUB|MAX|MOD|NEG|CTX|ENL|CON|RPT|COPY
+-----+
| SIN|COS|LOG|EXP|PWR|ATN|ARG|DEL|CNV|ID |LOD|STO|ENT|
+-----+
| CAS|  |  |  |  |  |  |DIS|<<<|BEL|  |ERS|RST|
+-----+
      ABCDEFG      + = / #   12345
      HIJKLMN      , ; = .   67890
      OPQRSTU      <-<-<-<-<-  ()?
      VWXYZ b      ' \ \

```

Input
But-
tons

```
UCSB OLS CONNECTED

ENTER USER NUMBER 196
ID NUMBER=
USER NAME= ARPA
JOB NAME= RAND/RFC
AUTOSAVE CODE = 3
LOAD MOLSF
FILE LOADED

+-----+
| 0 | I | II|III|IV | V |VI |VII|REL|CMX|SYS|USR|TYP|LST|CALL
+-----+
| PLS|MIN|TIM|DIV|SQ |SQT|CNJ|INV|DIF|SUM|PRD|SOR|PRD|TST|CLOSE
+-----+
| LS |RS |REF|UP |DWN|EVL|SUB|MAX|MOD|NEG|CTX|ENL|CON|RPT|COPY
+-----+
| SIN|COS|LOG|EXP|PWR|ATN|ARG|DEL|CNV|ID |LOD|STO|ENT|
+-----+
| CAS|   |   |   |   |   |DIS|<<<|BEL|   |ERS|RST|
+-----+
ABCDEF G      + = / #  12345
HIJKLMN      , ; = .  67890
OPQRSTU      <-<-<-<-<-  ( )?
VWXYZ b      ' \ \
+-----+
```

-+
| Feed-
-+back
-+

-+
-+
OLS
Dis-
play
Area

-+
-+
Input
But-
tons

-+
-+

0	I	II	III	IV	V	VI	VII	REL	CMX	SYS	USR	TYP	LST	CALL
PLS	MIN	TIM	DIV	SQ	SQT	CNJ	INV	DIF	SUM	PRD	SOR	PRD	TST	CLOSE
LS	RS	REF	UP	DWN	EVL	SUB	MAX	MOD	NEG	CTX	ENL	CON	RPT	COPY
SIN	COS	LOG	EXP	PWR	ATN	ARG	DEL	CNV	ID	LOD	STO	ENT		
CAS							DIS	<<<	BEL		ERS	RST		

OLS
Dis-
play
Area

Input
But-
tons

ABCDEFGH	+ = / #	12345
HIJKLMN	, ; = .	67890
OPQRSTU	<-<-<-<-<-	()?
VWXYZ b	' \ \	

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