

城西大学女子短大生を支援する情報リテラシー (I)

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情報科学の急激な発展は私達の想像を超えたものがある。言葉をかえていえば、私達の認識を超えた領域で使用されていることに驚嘆する。この最先端の情報科学は、とりわけ情報処理技術者に対する教育に大きな影響を与える。そこで、これら情報科学教育を支援する教育支援システムをパソコン上で実現するようシミュレーションしたコンピュータのソフトウェアシミュレータを研究したものである。城西大学女子短大生がこのシステムを利用すればパソコン実習室にて、インタフェース、コンピュータ言語を含めたコンピュータシステムの学習が体得できる。

Information Literacy Which Supports Students in Josai Junior College for Women (I)

1. Computer Interface Study System Which Supports Information Technology

Drastic development of the microelectronics is beyond our imagination. In other words, we are surprised that it is being used in the area which is beyond our recognition. In the microelectronic field, demand for microcomputer engineer can not be met in the present situation. The development of the educational system to train microcomputer engineer has already completed. Software simulation of the microcomputer, simulated to realize this educational system on personal computer, has been tried. Using this system, the study of the microcomputer system including interface and assembler can be done in the personal computer exercise room.

Since COMET-CASL is a virtual machine, it is difficult for beginners to learn and master CASL, the assembly language to control machine I/O. Despite such difficulty, assembly language is still essential for I/O control and needs to be studied. To facilitate this difficult task, we have developed an intelligent simulation along with CAI for a CASL courseware. Its outline of organization, usage, and characteristics are explained as following.

1. Present assembly language learning method

1.1 Theoretical trace

1.2 COMET•CASL softwares

Unfortunately, these softwares are not good enough for beginners to learn CASL editor function and I/O control.

1.3 CAI coursewares, manuals, documentation, others

2. Policy of the intelligent simulator

By improving the present training facilities, we have developed a new intelligent simulator in order to improve the learning effect. The new simulator will emphasize on :

- 2.1 Concept of filing is adjusted to general OS like MS-DOS and CP/M-86 so that learners can feel more familiar with.
- 2.2 There is an editor function to debug mistake in programs.
- 2.3 The simulator has I/O control which connects to actuator for helping the learner understand the interface functions.
- 2.4 The simulator also includes many supporting materials such as CAI, documentation, manual, HELP functions, to facilitate the beginners in coping with the assembly language.
- 2.5 Any external sensor or actuator can easily be connected to Programmable Peripheral Interface (PPI) via a connector.
- 2.6 The system was designed to draw out the learners ability to apply their knowledge with creativity.



Figure 1

3. Hardware construction of intelligent simulator

The outline of the tested intelligent simulator is shown in Figure 2. It can be connected to PC 9801 series Personal computer.

1. LED's ×8
2. switch interrupts ×8
3. thermistor ×1
4. photo transistor ×1
5. microphone ×1

Output section

1. relay circuits ×3
2. speaker circuit ×1

Shared section

1. PPI
2. A/D, D/A converter

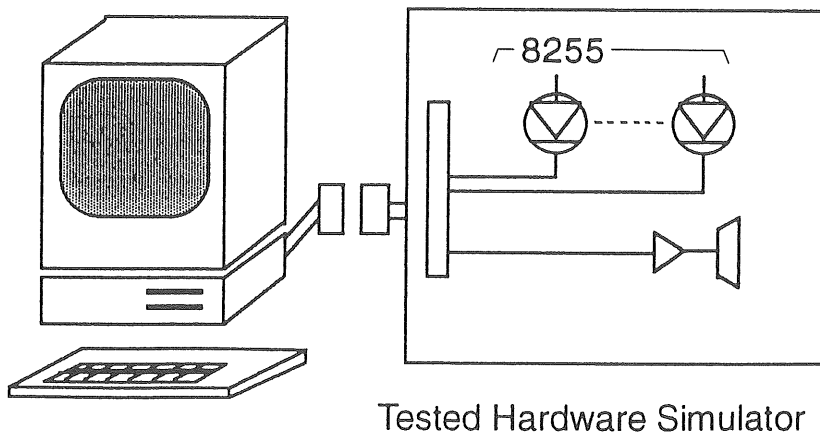


Figure 2
Hardware Construction

4. Software Outline of the Intelligent Simulator Specification

- 4.1 Host machine: PC 9801 (personal computer)
- 4.2 CASL simulation language: BASIC
- 4.3 Total steps of CASL simulation: 900

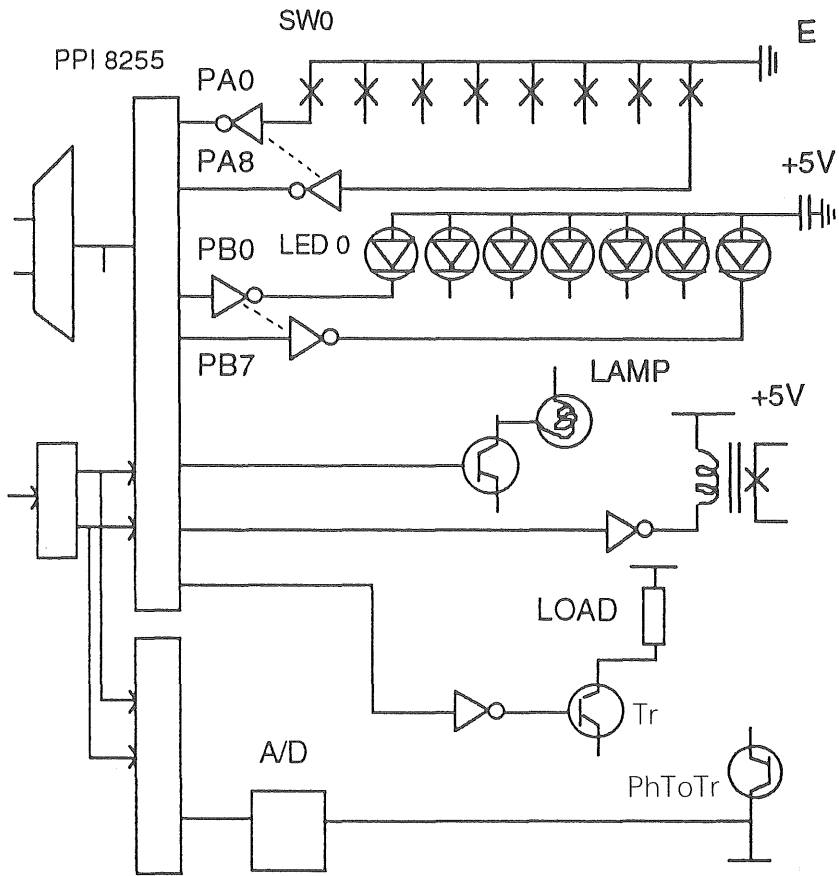


Figure 3
Tested Hardware Simulator Construction

4.4 CASL software function

4.4.1 File creating function

4.4.1.1 Source file creating and editing function

4.4.1.2 Assembling function (creating the object file)

4.4.2 Editor function

4.4.2.1 Trace function

4.4.2.2 Step (operating) function

4.4.2.3 Register display function, etc

4.4.3 HELP function

- 4.4.4 CAI function
- 4.4.5 I/O function
- 5. Outline of the intelligent simulator
 - 5.1 Usage
 - 5.1.1 To create object files from source files via the file creating function.
 - 5.1.2 To edit programs via editor command when any bug is detected.
 - 5.1.3 "GO" is the command to execute program.
 - 5.1.3.1 Commands change to white by step operation in order to distinguish from unexecuted ones. Therefore, it is easier for learners to understand.
 - 5.1.3.2 I/O control training can be done via the tested hardware simulator.
 - 5.1.4 It traces the object file image after the assembling or CASL execution. Example of this trace is shown in Figure 4 (at the end)
 - 5.1.5 When CASL operation command is unknown, learners can ask for help by the HELP command.
 - 5.1.6 When learners want to learn the basic of CASL, they will be able to systematically repeat it by CAI command which executes CASL courseware.
 - 5.2 Practice Lists of the Intelligent Simulator Main practice Lists
 - 5.2.1 LED display function program
 - 5.2.2 A/D, D/A converter function program
 - 5.2.3 Thermistor function program
 - 5.2.4 Photo transistor function program
 - 5.2.5 Speaker function program
- 6. Characteristics of the Test Intelligent Simulator
 - 6.1 We have simulated the imaginary machine COMET•CASL to the concrete machine so that it can be easier for beginners.
 - 6.2 It uses the same concept of filing like those of general OS such as MS-DOS and CP/M-86
 - 6.3 It has editor function and trace function which can help learners to know where they are, using color to indicate the being executed command can be good indicator.
 - 4.6 HELP function was included.
 - 6.5 The hardware simulator helps learners use I/O control command which enhance their understanding of I/O interface and programs.

- 6.6 Learners can prepare the Information-Technology Engineers Examination by using intelligent simulator.
- 6.7 CAI function eases beginners to learn assembly language.
- 7. We would like to report the following topics in the future.
 - 7.1 The effect of using simulator.
 - 7.2 Improvement of the hardware and software.
 - 7.3 Friendly environment of simulation
 - 7.4 AI (Artificial Intelligence) development of the system

*** COMET System,CASL ASSEMBLE`LIST FOR NEC PC-9800 SERIES FILE : <HIKAKU> ***

```

000          100 HIKAKU  START
002 1010 0020 110      LD      GR1,DATA1
004 1020 0021 120      LD      GR2,DATA2  GR0=X'0000'      0  GR1=X'0000'      0
006 1030 0022 130      LD      GR3,DATA3  GR2=X'0000'      0  GR3=X'0000'      0
008 4010 0021 140      CPA      GR1,DATA2  GR4=X'003A'      58  PC =X'0002'      2
00A 6100 0014 150      JMI      NEXT1      FR = 0
00C 4010 0022 160      CPA      GR1,DATA3  OBJ-CD=
00E 6100 001C 170      JMI      NEXT2      DATA1 =0000
010 1110 0023 180      ST       GR1,MAX   DATA2 =0000
012 6400 001E 190      JMP      OWARI   DATA3 =0000
014 4020 0022 200 NEXT1 CPA      GR2,DATA3  DATA3 =0000
016 6100 001C 210      JMI      NEXT2      MAX   =0000
018 1120 0023 220      ST       GR2,MAX
01A 6400 001E 230      JMP      OWARI
01C 1130 0023 240 NEXT2 ST       GR3,MAX
01E          250 OWARI  EXIT
          260 ;
020          270 DATA1 DS      1
021          280 DATA2 DS      1
022          290 DATA3 DS      1
023          300 MAX    DS      1
024          310      END

```

*** COMET System,CASL TRACK ON LIST FOR NEC PC-9800 SERIES FILE : <HIKAKU> ***

```

HIKAKU START      R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0002
LD      GR1,DATA1  R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0004
LD      GR2,DATA2  R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0006
LD      GR3,DATA3  R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0008
CPA      GR1,DATA2  R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=000A
JMI      NEXT1      R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=000C
CPA      GR1,DATA3  R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=000E
JMI      NEXT2      R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0010
ST       GR1,MAX    R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=0012
JMP      OWARI      R0=0000 R1=0000 R2=0000 R3=0000 R4=003A PC=001E
OWARI  EXIT
PROGRAM STOP

```