

Student ID : 111062307, Name : 陳大佑

```
__data __at (0x30) char saved_SP[MAXTHREADS];  
__data __at (0x34) ThreadID cur_ID;  
__data __at (0x35) char bitmap_ID;  
__data __at (0x36) char temp_SP; // temporary save the SP  
__data __at (0x37) ThreadID new_ID;
```

```
__data __at (0x38) char sharedBuffer;  
__data __at (0x39) char bufferFull; // 0: empty, 1: full  
__data __at (0x3A) char nextChar;
```

Set some parameters on manually allocated memory.

```
void Producer(void) {  
    nextChar = 'A'; //  
    while (1) {  
        if (bufferFull) {  
            ThreadYield(); // wait for buffer  
            continue;  
        }  
        sharedBuffer = nextChar; // write for buffer  
        bufferFull = 1; // mark buffer is full  
        ThreadYield(); // switch  
        nextChar = (nextChar - 'A' + 1) % 26 + 'A';  
    }  
}
```

Since we want to print ABC...YZABC for loop so I use nextChar = (...) % 26 + 'A', and when bufferFull = 1, it means we have value now, and we can switch to consumer to print it.

```
void Consumer(void) {  
    initialize();  
    while (1) {  
        if (!bufferFull) {  
            ThreadYield(); // wait for buffer  
            continue;  
        }  
        SBUF = sharedBuffer; // write the content of buffer  
        while (!TI); // wait trans  
        TI = 0; // mark done  
        bufferFull = 0; // mark buffer is empty  
        ThreadYield(); // switch  
    }  
}
```

First we initialize it, and check whether buffer is full or not, then print it or switch it.

```
void initialize(){  
    TMOD = 0x20;  
    SCON = 0x50;  
    TH1 = (char) -6;  
    TR1 = 1;  
    TI = 1;  
}
```

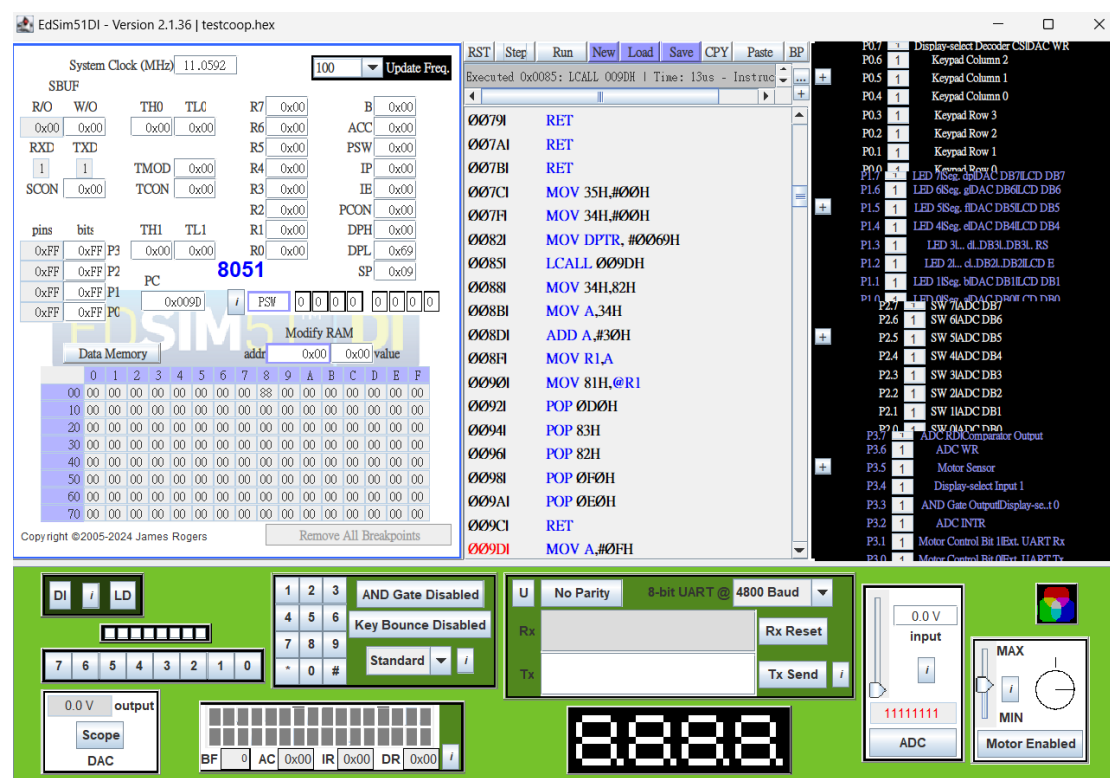
Screenshots for compilation.

```
dylan@LAPTOP-S5FOLV5V ~/os/ppc1
$ make clean
rm *.hex *.ihx *.lnk *.lst *.map *.mem *.rel *.rst *.sym *.asm *.lk
rm: cannot remove '*.ihx': No such file or directory
rm: cannot remove '*.lnk': No such file or directory
make: *** [clean] Error 1

dylan@LAPTOP-S5FOLV5V ~/os/ppc1
$ make
sdcc -c testcoop.c
sdcc -c cooperative.c
cooperative.c:154: warning 85: in function ThreadCreate unreferenced function argument : 'fp'
sdcc -o testcoop.hex testcoop.rel cooperative.rel
```

Screenshots and explanation:

Before the main thread was created, since by default the SP = 0x07, the 0x08 was numbered by first instruction(bootstrap).



After main thread had been created, the address of 40H was stored for main's address, and 42H, 43H, 44H, 45H, 46H are ACC, B, DPL, DPH, PSW, respectively.

EdSim51DI - Version 2.1.36 | testcoop.hex

System Clock (MHz): 11.0592

100 Update Freq.

Executed 0x00F1: PUSH 0E0H | Time: 49us - Instructi

MOV A,35H
JB 0E3H,06H
ORL 35H,#08H
MOV 37H,#03H
MOV A,37H
SWAP A
ANL A,#0F0H
MOV R7A
ADD A,#3FH
MOV 81H,A
PUSH 82H
PUSH 83H
MOV A,#00H
PUSH 0E0H
PUSH 0E0H
PUSH 0E0H
PUSH 0E0H
MOV A,37H
MOV R7A

PC: 8051
PSW: 0 0 0 0 0 0 0 0
SP: 0x45

Data Memory

addr	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
40	69	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Hardware Interface:

- DI, LD, TXD, RXD, SC0N, TCON, TH0, TL0, TH1, TL1, pins, bits, PC, PSW, SP, Data Memory, Modify RAM, Scope, DAC, AND Gate Disabled, Key Bounce Disabled, Standard, No Parity, 8-bit UART @ 4800 Baud, Rx Reset, Tx Send, input, 0.0 V, 11111111, ADC, Motor Enabled.

And after producer was created, the address of the 50H was stored for producer's address. and 52H~56H are ACC, B, DPL, DPH, PSW, respectively.

EdSim51DI - Version 2.1.36 | testcoop.hex

System Clock (MHz): 11.0592

100 Update Freq.

Executed 0x00FC: MOV R7A | Time: 144us - Instructi

ANL A,#0F0H
MOV R7A
ADD A,#3FH
MOV 81H,A
PUSH 82H
PUSH 83H
MOV A,#00H
PUSH 0E0H
PUSH 0E0H
PUSH 0E0H
PUSH 0E0H
MOV A,37H
MOV R7A
RR A
ANL A,#0F8H
MOV 0D0H,A
PUSH 0D0H
MOV A,37H

PC: 8051
PSW: 0 0 0 0 0 1 0 1
SP: 0x56

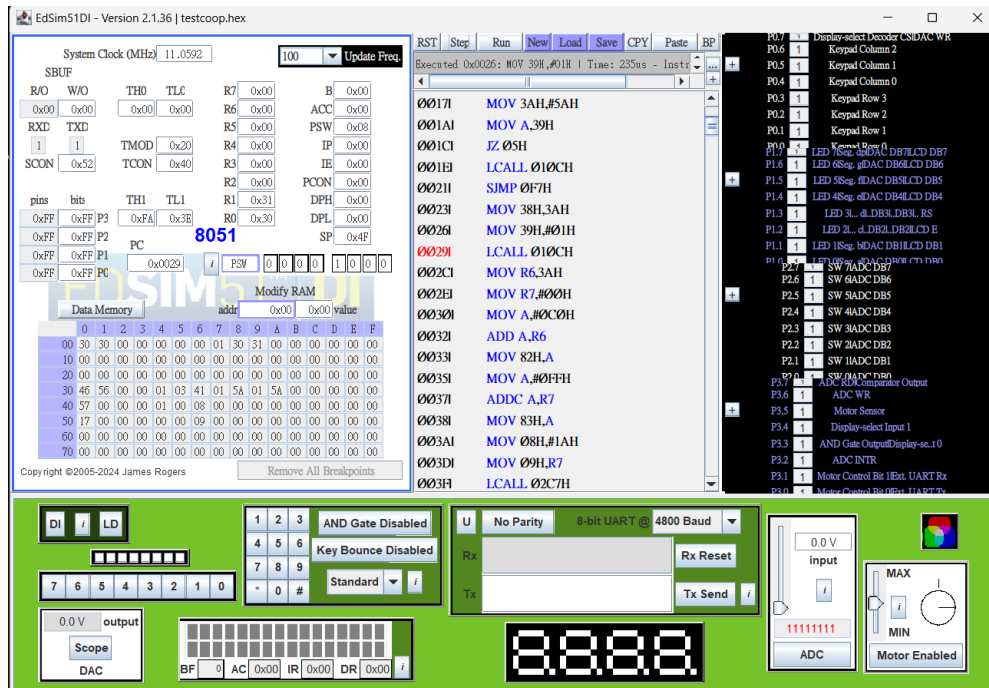
Data Memory

addr	0x00	0x01	0x02	0x03	0x04	0x05	0x06	0x07	0x08	0x09	0x0A	0x0B	0x0C	0x0D	0x0E	0x0F
00	30	30	00	00	00	00	00	00	00	00	00	00	00	00	00	00
10	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
20	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
30	46	00	00	00	00	03	41	01	00	00	00	00	00	00	00	00
40	72	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
50	17	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
60	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00
70	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Hardware Interface:

- DI, LD, TXD, RXD, SC0N, TCON, TH0, TL0, TH1, TL1, pins, bits, PC, PSW, SP, Data Memory, Modify RAM, Scope, DAC, AND Gate Disabled, Key Bounce Disabled, Standard, No Parity, 8-bit UART @ 4800 Baud, Rx Reset, Tx Send, input, 0.0 V, 11111111, ADC, Motor Enabled.

We can know the producer is running, since cur_ID on address(34H) is 01 which means producer and compare to previous picture we can find the addresses of(38H, 39H, 3AH) are replaced by other number(char'A').



We can know the consumer is running, since cur_ID on address(34H) is 00 which means it switches. And the address(39H) is changed from 1 to 0.

