

OPASKA!

- ☞ Ovi materijali namijenjeni su isključivo studenticama/studentima koji su upisali predmet "Računala i procesi" na FER-u u šk. g. 2002/2003.
- ☞ Za svako drugo korištenje potrebna je pismena suglasnost autora!
- ☞ Materijali služe kao pomoć u praćenju predavanja, a ne kao njihova zamjena te se ne mogu tumačiti izvan konteksta predavanja!

M. Žagar, 2002-10-01



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Mario Žagar



Sveučilište u Zagrebu

Fakultet elektrotehnike i računarstva
(FER)

13. RIP - viši programski jezici i
assembler

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Ugrađena računala

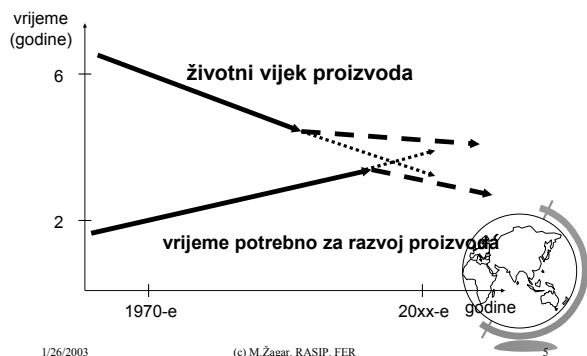
- ☞ Sastavni dio nekog uređaja (konačne dimenzije!!)
- ☞ svojstva mikroručunala određena svojstvima uređaja
- ☞ pristup unikatni - "po mjeri" (vrlo rijetko konfekcijski)
- ☞ vrijeme razvoja uređaja u pravilu **sta** kraće



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Razvoj - životni vijek proizvoda



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Korištenje HLL

- ☞ Prednosti
 - veća efikasnost
 - čitljiviji programi
 - lakše testiranje
 - bolja dokumentacija
- ☞ Nedostatci
 - veći kod
 - sporiji program



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Viši programski jezici

- Formalni opisni jezik kojim programer opisuje što mikroprocesor treba napraviti.
- Notacija kojom se programer služi lakša je za snalaženje nego u assembleru.
- Svaka naredba u višem programskom jeziku odgovara nizu naredaba u strojnom jeziku.

U nastavku, primjeri programskog jezika



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Primjer:

```

void main ()
{
    int a;
    int data b;
    char c;

    a= -15;
    b= 0x1532;
    c= 10;

    a++;
    a=a+b;
    a=b+c;
}

modul ( a );
while ( b<1000 ) {
    b=b+a;
}

int modul ( int x )
{
    if ( x > 0 ) {
        return ( x );
    } else {
        return ( -x );
    }
}
    
```



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Z80	I8051	PIC16c54
a = -15; /* a je tipa int */		
DEC SP	MOV R5,#0xF1	MOVLW 0F1h
PUSH BC	MOV R4,#0xFF	MOVWF ?(a_main+0)
PUSH BC		MOVLW 0FFh
LD HL,3		MOVWF ?(a_main+0+1)
ADD HL,SP		
EX DE,HL;		
LD HL,-15		
CALL CCPINT##		
b = 0x1532; /* b je tipa int kod i8051 se nalazi u DATA */		
LD HL,1	MOV 0x08,#0x15	MOVLW 032h
ADD HL,SP	MOV 0x09,#0x32	MOVWF ?(a_main+2)
EX DE,HL;		MOVLW 015h
LD HL,5426		MOVWF ?(a_main+2+1)
CALL CCPINT##		




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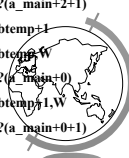
Z80	I8051	PIC16c54
<code>c = 10; /* a je tipa int*/</code>		
<code>LD HL,0</code>	<code>MOV R7,0x0A</code>	<code>MOVLW 0Ah</code>
<code>ADD HL,SP</code>		<code>MOVWF ?(a_main+4)</code>
<code>EX DE,HL;;</code>		
<code>LD HL,10</code>		
<code>LD A,L</code>		
<code>LD (DE),A</code>		
<code>a++ ;</code>		
<code>LD HL,3</code>		<code>INCF ?(a_main+0)</code>
<code>ADD HL,SP</code>	<code>INC R5</code>	<code>BTFSF status,2</code>
<code>LD D,H</code>	<code>CJNE R5,#0x00,L20</code>	<code>BTFSF ?(a_main+0+1)</code>
<code>LD E,L</code>	<code>INC R4</code>	<code>INCF ?(a_main+0+1)</code>
<code>CALL CCGINT##</code>	<code>L20: NOP</code>	
<code>INC HL</code>		
<code>CALL CCPINT##</code>		
<code>DEC HL</code>		

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Z80	I8051	PIC16c54
<code>a = a + b; /* a i b su tipa int*/</code>		
<code>LD HL,3</code>	<code>MOV A,R7</code>	<code>MOVF ?(a_main+2+1),W</code>
<code>ADD HL,SP</code>	<code>RLC A</code>	<code>MOVF btemp+1</code>
<code>PUSH HL</code>	<code>SUBB A,0xE0</code>	<code>MOVF ?(a_main+2),W</code>
<code>LD HL,5</code>		
<code>ADD HL,SP</code>	<code>MOV R6,A</code>	<code>MOVWF btemp</code>
<code>CALL CCGINT##</code>	<code>MOV A,0x09</code>	<code>MOVWF btemp,w</code>
<code>EX DE,HL;;</code>	<code>ADD A,R7</code>	<code>ADDWF ?(a_main+0)</code>
<code>LD HL,3</code>	<code>MOV R5,A</code>	<code>BTFSF status,0</code>
<code>ADD HL,SP</code>	<code>MOV A,0x08</code>	<code>INCF ?(a_main+0+1)</code>
<code>CALL CCGINT##</code>	<code>ADDC A,R6</code>	<code>MOVWF btemp+1,W</code>
<code>ADD HL,DE</code>	<code>MOV R4,A</code>	<code>ADDWF ?(a_main+0+1)</code>
<code>POP DE</code>		
<code>CALL CCPINT##</code>		

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Z80	I8051	PIC16c54
<code>a = b + c; /* a i b su tipa int, c je tipa char */</code>		
<code>LD HL,3</code>	<code>MOV A,R7</code>	<code>MOVF ?(a_main+4),W</code>
<code>ADD HL,SP</code>	<code>RLC A</code>	<code>MOVF btemp</code>
<code>PUSH HL</code>	<code>SUBB A,0xE0</code>	<code>CLRF btemp+1</code>
<code>LD HL,3</code>	<code>MOV R6,A</code>	<code>MOVF ?(a_main+2),W</code>
<code>ADD HL,SP</code>	<code>MOV A,0x09</code>	<code>MOVWF btemp</code>
<code>CALL CCGINT##</code>	<code>ADD A,R7</code>	<code>BTFSF status,0</code>
<code>EX DE,HL;;</code>	<code>MOV R5,A</code>	<code>INCF btemp+1</code>
<code>LD HL,2</code>	<code>MOV A,0x08</code>	<code>MOVWF ?(a_main+2+1)</code>
<code>ADD HL,SP</code>	<code>ADD A,R6</code>	<code>ADDWF btemp+1</code>
<code>CALL CCGCHAR##</code>	<code>MOV R4,A</code>	<code>MOVWF btemp,W</code>
<code>ADD HL,DE</code>		<code>MOVF ?(a_main+0)</code>
<code>POP DE</code>		<code>MOVWF btemp+1,W</code>
<code>CALL CCPINT##</code>		<code>MOVWF ?(a_main+0+1)</code>

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```

Z80                I8051                PIC16c54

    modul (a);      /* poziv funkcije sa parametrom */

LD    HL,3          MOV    R6,A          MOVF   ?(a_main+0+1),W
ADD   HL,SP         MOV    R7,0x05       MOVWF  btemp+1
CALL  CCGINT##     LCALL  _modul        MOVF   ?(a_main+0),w
PUSH  HL           MOVWF  btemp
CALL  modul        MOVWF  btemp,W
POP   BC           MOVWF  ?(0+a_modul+1)
                          MOVWF  btemp+1,W
                          MOVWF  ?(1+a_modul+1)
                          MOVWF  u28&0011 //pov. 31f.
                          MOVWF  ?(a_modul)
                          LJMP  (_modul)
    
```

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```

Z80                I8051                PIC16c54

    while (b < 1000) {

LD    HL,1          I24:                I5:
ADD   HL,SP         CLR    C                MOVF   ?(a_main+2+1),W
CALL  CCGINT##     MOV    A,0x09          XORLW  80h
EX    DE,HL;;      SUBB  A,#0xE8          MOVWF  btemp
LD    HL,1000      MOV    A,0x08          MOVLW  (03)*80h
CALL  CCLT##       MOV    A,#0x80        SUBWF  btemp,W
LD    A,H           XRL   A,#0x83        MOVLW  0E8h
OR    L            SUBB  A,#0x83        BTFS   3,2
JP    Z,CC7        JNC   0x5C // while gotov
                          SUBWF  ?(a_main+2),W
                          BTFS   4,0
                          GOTO  16 // prva while
                          GOTO  17 // while je gotov
    
```

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```


Z80                I8051                PIC16c54

    b = b + a;

LD    HL,1          MOV    A,R5          I6:
ADD   HL,SP         ADD    A,0x09          MOVF   ?(a_main+0+1),W
PUSH  HL           MOV    0x09,A          MOVWF  btemp+1
LD    HL,3          MOV    A,R4          MOVF   ?(a_main+0),W
ADD   HL,SP         MOV    A,0x08        MOVWF  btemp
CALL  CCGINT##     ADDC   A,0x08          MOVWF  btemp,W
EX    DE,HL;;      MOV    0x08,A          ADDWF  ?(a_main+2)
LD    HL,5          SJMP  I24            BTFS   status,0
ADD   HL,SP        INC    A                INCF   ?(a_main+2+1)
CALL  CCGINT##     MOVWF  btemp+1,W
ADD   HL,DE        MOVWF  ?(a_main+2+1)
POP   DE           ADDWF  ?(a_main+2+1)
CALL  CCPINT##     GOTO  I5
    
```


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Z80	I8051	PIC16c54	
<pre> init modul (int x){ if (x > 0){ </pre>			
POP BC	SETB C	MOVF	?(a_modul+1+1),W
POP HL	MOV A,R7	XORLW	080h
PUSH HL	SUBB A,#0x00	MOVWF	btemp
PUSH BC	MOV A,R6	MOVLW	(0)*80h
XOR A	XRL A,#0x80	SUBWF	btemp,W
OR H	SUBB A,#0x80	MOVLW	01h
JP M,CC3	JC _else(#0x0F)	BTFSC	3,2
OR L		SUBWF	?(a_modul+1),W
JP Z,CC3		BTFSF	status
		GOTO	u11
		GOTO	u10


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Z80	I8051	PIC16c54	
<pre> return (x); </pre>			
POP BC	RET	MOV	?(a_modul+1+1),W
POP HL		MOVWF	btemp+1
PUSH HL		MOVF	?(a_modul+1)
PUSH BC		MOVWF	btemp
RET		GOTO	11 //koda za povra.


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Z80	I8051	PIC16c54	
<pre> } else { return (-x);}} </pre>			
POP BC	CLR C	MOV	?(a_modul+1+1),W
POP HL	CLR A	MOVWF	btemp+1
PUSH HL	SUBB A,R7	MOVF	?(a_modul+1)
PUSH BC	MOV R7,A	MOVWF	btemp
CALL CCNEG##	CLR A	COMP	btemp
RET	SUBB A,R6	COMP	btemp+1
	MOV R6,A	INCF	btemp
	RET	BTFSC	3,2
		INCF	btemp+1
		GOTO	11 //koda za povra.


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C-- - Z80

- ☞ C--
- ☞ telnet



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Nije svejedno kako se izražavamo!

- ☞ istu aktivnost možemo izraziti na različite načine
- ☞ pri obradi plaće o tome baš ne razmišljamo



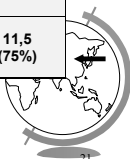
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Usporedba (I)

C-- naredba	prevedeni kod za μ P Z80A(4MHz)	zauzeće memorije	broj taktova	vrijeme izv. (μ s)
a = a + 1;	LD HL,(a) LD DE,1 ADD HL,DE LD (a),HL	12 x 8 (100%)	61	15,25 (100%)
a++;	LD HL,(a) INC HL LD (a),HL DEC HL	10 x 8 (84%)	52	13 (85%)
++a;	LD HL,(a) INC HL LD (a),HL	9 x 8 (75%)	46	11,5 (75%)



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Usporedba (II)

C— naredba	prevedeni kod za μP Z80A(4MHz)	zauzeće memorije	broj taktova	vrijeme izv. (μs)
a = a + 2;	LD HL,(a) LD DE,2 ADD HL,DE LD (a),HL	12 x 8 (100%)	61	15,25 (100%)
++a; ++a;	LD HL,(a) INC HL LD (a),HL LD HL,(a) INC HL LD (a),HL	18 x 8 (150%)	92	23 (150%)
a; #asm INC HL INC HL LD (a), HL #endasm	LD HL,(a) INC HL INC HL LD (a),HL	10 x 8 (84%)	52	13 (84%)



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