Sveučilište u Zagrebu

Fakultet elektrotehnike i računarstva

University of Zagreb

Faculty of Electrical Engineering and Computing

Arhitektura računala 1

*Computer Architecture 1*

**Laboratorijska vježba broj 3**

*Laboratory exercise no. 3*

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# Zadatak / Exercise

Na 5 crvenih LED dioda potrebno je napraviti trčeće svijetlo. Brzina trčećeg svietla podešava se s potenciometrom RP1.

# Rješenje / Solution

U prostor između linija kopirati asemblerski kod Vašeg rješenja uz komentare (na engleskom jeziku). Uključite i kod potreban za provjeru rješenja. Prilikom kopiranja koristite opciju Paste -> Keep text only kako bi sačuvali izvorni format.

Copy your assembly code between lines. Include code required for verification of the solution. Please comment the code. Use Paste -> Keep text only when copying to preserve original formatting.

;;;DO NOT EDIT BELOW THIS LINE;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

AREA MAIN, CODE, READONLY

EXPORT \_\_use\_two\_region\_memory

\_\_use\_two\_region\_memory

NOP

EXPORT \_\_main

;;;DO NOT EDIT ABOVE THIS LINE;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;

PCONP EQU 0xE01FC0C4

PCLKSEL0 EQU 0xE01FC1A8

PINSEL3 EQU 0xE002C00C

PINMODE3 EQU 0xE002C04C

AD0CR EQU 0xE0034000 ;select the operating mode

AD0DR5 EQU 0xE0034024 ;contains the result of the

;most recent conversion completed on channel 5

AD0STAT EQU 0xE0034030 ;contains DONE and OVERRUN

;flags for all of the A/D channels, as well as the A/D interrupt flag

SCS EQU 0xE01FC1A0

FIO1DIR EQU 0x3FFFC020

FIO1SET EQU 0x3FFFC038

FIO1CLR EQU 0x3FFFC03C

\_\_main

MOV R1, #0X05

MOV R2, #0X03

ADD R1, R1, R2

;----------------------settings of LED diodas------------------------------

LDR R1, =SCS ;R1 - the address od System

;controls and Status register

LDR R2,[R1] ;load SCS

ORR R2, R2, #0x1 ;set up the lowest bit –

;set GPIOM -> fast mode

STR R2, [R1] ;save it to SCS

LDR R1, =FIO1DIR ;set FIO1DIR

LDR R2, [R1] ;load FIO1DIR

LDR R3, =0x07F80000

ORR R2, R2, R3 ;set LED diodas (output)

STR R2, [R1] ;save it

LDR R1, =FIO1CLR ;R1 - the address of FIO1CLR

LDR R2, [R1] ;load FIOCLR

LDR R3, =0x07F80000 ;turn off 8 LED diodas –

;P1.19-P1.23 + P1.24-P1.26

ORR R2, R2, R3 ;initially turn off LEDs

STR R2, [R1] ;save it

;-------------------------------------settings of ADC----------------------

LDR R1, =PCONP ;R1 - the address of PCONP

MOV R2, #0x1000

STR R2, [R1] ;enable AD

LDR R1, =AD0CR ;R1 - the address of AD0CR

MOV R2, #0x2B0000

ORR R2, R2, #0x0420 ;#0x2B0420

STR R2, [R1] ;set AD0CR

LDR R1, =PCLKSEL0 ;R1 - the address of PCLKSEL0

MOV R2, #0x1000000

STR R2, [R1] ;save to PCLKSEL0

LDR R1, =PINSEL3 ;R1 - the address of PINSEL3

MOV R2, #0xC0000000

STR R2, [R1] ;select pin-set up the

;highest two bits - third alternate function

LDR R1, =PINMODE3 ;R1 -the address of PINMODE3

MOV R2, #0xC0000000

STR R2, [R1] ;pin has an on-chip pull-

;down resistor enabled

;----------------------------------------------------------------------------

LDR R1, =FIO1SET ;R1 - the address of FIO1SET

LDR R2, [R1] ;load FIO1SET

LDR R3, =0x00400000 ;P1.23

ORR R2, R2, R3 ;turn on the first LED dioda

STR R2, [R1] ;save it

petlja

LDR R1, =FIO1SET ;R1 - the address of FIO1SET

LDR R5, =FIO1CLR ;R5 - the address of FIO1CLR

LDR R2,[R1] ;load FIO1SET

CMP R2, #0x4000000 ;check if the last LED diode

;is turned on

BNE DALJE ;if it's not, do not reset

;LED diodas

MOV R2, #0x200000 ;reset LED dioda

DALJE BL CEKAJ ;wait

MOV R2, R2, LSL #1 ;shift bits - to turn on the

;next LED dioda

LED STR R2, [R1] ;store it

MVN R4, #0 ;R4 = FFFFFFFF

EOR R2, R2, R4 ;complement the bits

STR R2, [R5] ;save it to FIO1CLR - clear

;all bits except one for selected LED dioda (from FIO1SET)

B petlja

;------------------------------------------------------------------------

CEKAJ

STMFD R13!, {R1,R2,R3,R4,R5} ;save registers to stack

LDR R1, =AD0DR5 ;R1 - the address of AD0DR5

CEK LDR R2, [R1] ;load the AD0DRS

ANDS R3, R2, #0x80000000 ;check the first bit to see

;if the conversion is done

BEQ CEK ;if it's not, wait

;AND R2, R2, #0xF800

LDR R3, =0xFFC0 ;R3 - 0xFFC0 - 15:6

AND R2, R2, R3 ;V/VREF - a binary fraction

;representing the voltage on the Ain

;pin selected by the SEL field,

;divided by the voltage on the VDDA pin

MOV R2, R2, LSR #6 ;shift R2

ADD R2, R2, #1 ;add 1 to R2

MOV R5, #0x00000800

MOV R4, R2

MUL R2, R4, R5 ;make a counter

BROJI SUBS R2, R2, #1 ;wait while it is counting

BNE BROJI

LDMFD R13!, {R1,R2,R3,R4,R5} ;load back registers from stack

MOV PC,LR ;move LR to PC to return

;from the subprogram

END

# Ispitivanje rješenja / Solution Verification

U prostor između linija objasnite kako se provjerava ispravnost rješenja (na hrvatskom ili na engleskom jeziku):

Write detailed explanation how is the solution verified:

Nakon što se pokrene program, okrećemo potenciometar te se u skladu s tim mijenja brzina trčećeg svjetla od sporijeg prema bržem (najbrže je kad se čini da su sve crvene LED diode istovremeno upaljene).