**Instituto Politécnico Nacional**

**Escuela Superior de Cómputo**

Introducción a los Microcontroladores

***PROYECTO FINAL:*** *Juego de Ping-Pong*

**Integrantes del equipo:**

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Sampayo Hernández Mauro

**Grupo:** 3CM6

**Profesor:** *Fernando Aguilar Sánchez* **Fecha de entrega:** 22 de noviembre de 2020

Práctica 6: Cronómetro de 60 segundos

3CM6

ESCOM-IPN

*1. Introducción Teórica*

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

This program was produced by the

CodeWizardAVR V2.05.0 Professional

Automatic Program Generator

Copyright 1998-2010 Pavel Haiduc, HP InfoTech s.r.l.

http://www.hpinfotech.com

Project :

Version :

Date : 24/01/2021

Author : NeVaDa

Company :

Comments:

Chip type : ATmega8535

Program type : Application

AVR Core Clock frequency: 1.000000 MHz

Memory model : Small

External RAM size : 0

Data Stack size : 128

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

#include <mega8535.h>

#include <delay.h>

#define izquierda1 PINB.1

#define derecha1 PINB.2

#define izquierda2 PINB.3

#define derecha2 PINB.4

eeprom short random**;**

eeprom short barra1**;**

eeprom short barra2**;**

int rand**;**

int cont1**,**cont2**;**

int puntos1**,**puntos2**;**

int i**,**j**;**

int x**,**y**;**

int direccion**,** dsplz**,** stay**,** cols**,** inst**,** win**,** rapidez**;**

const char tabla7segmentos**[**2**][**10**]={**

**{**0x40**,**0x79**,**0x24**,**0x30**,**0x19**,**0x12**,**0x02**,**0x78**,**0x00**,**0x10**},**

**{**0xc0**,**0xcf**,**0xa4**,**0x86**,**0x8b**,**0x92**,**0x90**,**0xc7**,**0x80**,**0x82**}**

**};**

void main**(**void**)**

**{**

// Declare your local variables here

// Input/Output Ports initialization

// Port A initialization

// Func7=Out Func6=Out Func5=Out Func4=Out Func3=Out Func2=Out Func1=Out Func0=Out

// State7=0 State6=1 State5=0 State4=0 State3=0 State2=0 State1=0 State0=0

PORTA**=**0x40**;**

DDRA**=**0xFF**;**

// Port B initialization

// Func7=Out Func6=In Func5=In Func4=In Func3=In Func2=In Func1=In Func0=Out

// State7=1 State6=P State5=P State4=P State3=P State2=P State1=P State0=1

PORTB**=**0xFF**;**

DDRB**=**0x81**;**

// Port C initialization

// Func7=Out Func6=Out Func5=Out Func4=Out Func3=Out Func2=Out Func1=Out Func0=Out

// State7=0 State6=1 State5=1 State4=0 State3=0 State2=0 State1=0 State0=0

PORTC**=**0x60**;**

DDRC**=**0xFF**;**

// Port D initialization

// Func7=Out Func6=Out Func5=Out Func4=Out Func3=Out Func2=In Func1=Out Func0=Out

// State7=1 State6=1 State5=1 State4=1 State3=1 State2=P State1=1 State0=1

PORTD**=**0xFF**;**

DDRD**=**0xFB**;**

// Timer/Counter 0 initialization

// Clock source: System Clock

// Clock value: Timer 0 Stopped

// Mode: Normal top=0xFF

// OC0 output: Disconnected

TCCR0**=**0x00**;**

TCNT0**=**0x00**;**

OCR0**=**0x00**;**

// Timer/Counter 1 initialization

// Clock source: System Clock

// Clock value: Timer1 Stopped

// Mode: Normal top=0xFFFF

// OC1A output: Discon.

// OC1B output: Discon.

// Noise Canceler: Off

// Input Capture on Falling Edge

// Timer1 Overflow Interrupt: Off

// Input Capture Interrupt: Off

// Compare A Match Interrupt: Off

// Compare B Match Interrupt: Off

TCCR1A**=**0x00**;**

TCCR1B**=**0x00**;**

TCNT1H**=**0x00**;**

TCNT1L**=**0x00**;**

ICR1H**=**0x00**;**

ICR1L**=**0x00**;**

OCR1AH**=**0x00**;**

OCR1AL**=**0x00**;**

OCR1BH**=**0x00**;**

OCR1BL**=**0x00**;**

// Timer/Counter 2 initialization

// Clock source: System Clock

// Clock value: Timer2 Stopped

// Mode: Normal top=0xFF

// OC2 output: Disconnected

ASSR**=**0x00**;**

TCCR2**=**0x00**;**

TCNT2**=**0x00**;**

OCR2**=**0x00**;**

// External Interrupt(s) initialization

// INT0: On

// INT0 Mode: Falling Edge

// INT1: Off

// INT2: On

// INT2 Mode: Falling Edge

GICR**|=**0x60**;**

MCUCR**=**0x02**;**

MCUCSR**=**0x00**;**

GIFR**=**0x60**;**

// Timer(s)/Counter(s) Interrupt(s) initialization

TIMSK**=**0x00**;**

// USART initialization

// USART disabled

UCSRB**=**0x00**;**

// Analog Comparator initialization

// Analog Comparator: Off

// Analog Comparator Input Capture by Timer/Counter 1: Off

ACSR**=**0x80**;**

SFIOR**=**0x00**;**

// ADC initialization

// ADC disabled

ADCSRA**=**0x00**;**

// SPI initialization

// SPI disabled

SPCR**=**0x00**;**

// TWI initialization

// TWI disabled

TWCR**=**0x00**;**

// Global enable interrupts

#asm("sei")

**if(**random**<**1**){**

random**=**1**;**

**}**

//multiplicar por numero primo

random**=(**random**\***7**)+**2**;**

random**=**random**%**17**;**

//definir direccion

rand**=(**int**)**random**;**

rand**\*=**7**;**

direccion**=**rand**%**4**;**

//definir x

x**=**2**;**

//definir y

y**=**3**;**

barra1**=**0**;**

barra2**=**3**;**

cont1**=**0**;**

cont2**=**0**;**

i**=**j**=**0**;**

dsplz**=**0**;**

stay**=**0**;**

cols**=**0**;**

puntos1**=**0**;**

puntos2**=**0**;**

rapidez**=**99**;**

inst**=**0**;**

win**=**0**;**

**while** **(**1**)**

**{**

**if(!**win**){**

delay\_ms**(**1**);**

cols**++;**

**if(**cols**>**4**){**

cols**=**0**;**

**}**

PORTA **&=**0x7f**;**

PORTC **&=**0x7f**;**

PORTB **|=**0x81**;**

PORTC **|=**0x60**;**

inst**++;**

**if(**inst**>**1**){**

inst**=**0**;**

**}**

//Muestra de el puntaje

**if(**inst**){**

PORTA **=**tabla7segmentos**[**inst**][**puntos2**];**

PORTC **&=**0xbf**;**

PORTB **&=**0x7f**;**

**}else{**

PORTA **=**tabla7segmentos**[**inst**][**puntos1**];**

PORTC **|=**0x80**;**

PORTC **&=**0xdf**;**

PORTB **&=**0xfe**;**

**}**

//Movimiento de barras

**if(**derecha1**==**0**){**

barra1**++;**

**if(**barra1**>**3**){**

barra1**=**3**;**

**}**

delay\_ms**(**200**);**

**}**

**if(**izquierda1**==**0**){**

barra1**--;**

**if(**barra1**<**0**){**

barra1**=**0**;**

**}**

delay\_ms**(**200**);**

**}**

**if(**derecha2**==**0**){**

barra2**++;**

**if(**barra2**>**3**){**

barra2**=**3**;**

**}**

delay\_ms**(**200**);**

**}**

**if(**izquierda2**==**0**){**

barra2**--;**

**if(**barra2**<**0**){**

barra2**=**0**;**

**}**

delay\_ms**(**200**);**

**}**

//Matriz de LEDs

**if(**dsplz**>**rapidez**){**

dsplz**=**0**;**

**if(!**stay**){**

stay**=**1**;**

**}else{**

stay**=**0**;**

//Validaciones y definici󮠤e nuea direcci󮠤e pelota

**switch(**direccion**){**

**case** 0**:** //noroeste

**if((**x**-**1**)<**0**){**

**if(**y**==**1**){**

**if(**barra2**==**0 **||** barra2**==**1**){**

direccion**=**2**;**

**}else{**

direccion**=**1**;**

**}**

**}else** **if(**y**>=**2**){**

direccion**=**1**;**

**}**

**}else{**

**if(**y**==**1**){**

**if(**barra2**==**0**){**

**if(**x**==**1**){**

direccion**=**3**;**

**}**

**if(**x**==**2**){**

direccion**=**2**;**

**}**

**}else** **if(**barra2**==**1**){**

**if(**x**==**2**){**

direccion**=**3**;**

**}**

**if(**x**==**3**){**

direccion**=**2**;**

**}**

**}else** **if(**barra2**==**2**){**

**if(**x**==**3**){**

direccion**=**3**;**

**}**

**}**

**}else** **if(**y**<=**2**){**

//direccion=0;

**}**

**}**

**break;**

**case** 1**:** //noreste

**if((**x**+**1**)>**4**){**

**if(**y**==**1**){**

**if(**barra2**==**2 **||** barra2**==**3**){**

direccion**=**3**;**

**}else{**

direccion**=**0**;**

**}**

**}else** **if(**y**>=**2**){**

direccion**=**0**;**

**}**

**}else{**

**if(**y**==**1**){**

**if(**barra2**==**1**){**

**if(**x**==**1**){**

direccion**=**2**;**

**}**

**}else** **if(**barra2**==**2**){**

**if(**x**==**2**){**

direccion**=**2**;**

**}**

**if(**x**==**1**){**

direccion**=**3**;**

**}**

**}else** **if** **(**barra2**==**3**){**

**if(**x**==**3**){**

direccion**=**2**;**

**}**

**if(**x**==**2**){**

direccion**=**3**;**

**}**

**}**

**}else** **if(**y**>=**2**){**

//direccion=1;

**}**

**}**

**break;**

**case** 2**:** //sureste

**if((**x**+**1**)>**4**){**

**if(**y**==**5**){**

**if(**barra1**==**2 **||** barra1**==**3**){**

direccion**=**0**;**

**}else{**

direccion**=**3**;**

**}**

**}else** **if(**y**<=**4**){**

direccion**=**3**;**

**}**

**}else{**

**if(**y**==**5**){**

**if(**barra1**==**1**){**

**if(**x**==**1**){**

direccion**=**1**;**

**}**

**}else** **if(**barra1**==**2**){**

**if(**x**==**2**){**

direccion**=**1**;**

**}**

**if(**x**==**1**){**

direccion**=**0**;**

**}**

**}else** **if** **(**barra1**==**3**){**

**if(**x**==**3**){**

direccion**=**1**;**

**}**

**if(**x**==**2**){**

direccion**=**0**;**

**}**

**}**

**}else** **if(**y**<=**4**){**

//direccion=2;

**}**

**}**

**break;**

**case** 3**:** //suroeste

**if((**x**-**1**)<**0**){**

**if(**y**==**5**){**

**if(**barra1**==**0 **||** barra1**==**1**){**

direccion**=**1**;**

**}else{**

direccion**=**2**;**

**}**

**}else** **if(**y**<=**4**){**

direccion**=**2**;**

**}**

**}else{**

**if(**y**==**5**){**

**if(**barra1**==**0**){**

**if(**x**==**1**){**

direccion**=**0**;**

**}**

**if(**x**==**2**){**

direccion**=**1**;**

**}**

**}else** **if(**barra1**==**1**){**

**if(**x**==**2**){**

direccion**=**0**;**

**}**

**if(**x**==**3**){**

direccion**=**1**;**

**}**

**}else** **if(**barra1**==**2**){**

**if(**x**==**3**){**

direccion**=**0**;**

**}**

**}**

**}else** **if(**y**<=**4**){**

//direccion=3;

**}**

**}**

**break;**

**default:**

**break;**

**}**

//Redireccionamiento de pelota

**switch(**direccion**){**

**case** 0**:** //noroeste

x**--;**

y**--;**

**break;**

**case** 1**:** //noreste

x**++;**

y**--;**

**break;**

**case** 2**:** //sureste

x**++;**

y**++;**

**break;**

**case** 3**:** //suroeste

x**--;**

y**++;**

**break;**

**default:**

**break;**

**}**

**}**

**}else{**

dsplz**++;**

**}**

//Barrido para la pelotita

PORTD **|=**0xfb**;**

PORTC **&=**0xe0**;**

**if((**cols**%**5**)==**x**){**

**switch(**y**){**

**case** 0**:**

PORTD **&=**0x7f**;**

**break;**

**case** 1**:**

PORTD **&=**0xbf**;**

**break;**

**case** 2**:**

PORTD **&=**0xdf**;**

**break;**

**case** 3**:**

PORTD **&=**0xef**;**

**break;**

**case** 4**:**

PORTD **&=**0xf7**;**

**break;**

**case** 5**:**

PORTD **&=**0xfd**;**

**break;**

**case** 6**:**

PORTD **&=**0xfe**;**

**break;**

**default:**

**break;**

**}**

**}**

//Barrido para las barras

**switch((**cols**%**5**)){**

**case** 0**:**

**if(**barra1**==**0**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**0**){**

PORTD **&=**0x7f**;**

**}**

PORTC **|=**0x01**;**

**break;**

**case** 1**:**

**if(**barra1**==**0**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**0**){**

PORTD **&=**0x7f**;**

**}**

**if(**barra1**==**1**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**1**){**

PORTD **&=**0x7f**;**

**}**

PORTC **|=**0x02**;**

**break;**

**case** 2**:**

**if(**barra1**==**1**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**1**){**

PORTD **&=**0x7f**;**

**}**

**if(**barra1**==**2**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**2**){**

PORTD **&=**0x7f**;**

**}**

PORTC **|=**0x04**;**

**break;**

**case** 3**:**

**if(**barra1**==**2**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**2**){**

PORTD **&=**0x7f**;**

**}**

**if(**barra1**==**3**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**3**){**

PORTD **&=**0x7f**;**

**}**

PORTC **|=**0x08**;**

**break;**

**case** 4**:**

**if(**barra1**==**3**){**

PORTD **&=**0xfe**;**

**}**

**if(**barra2**==**3**){**

PORTD **&=**0x7f**;**

**}**

PORTC **|=**0x10**;**

**break;**

**default:**

**break;**

**}**

//Anotaci󮠤e un punto

**if(**y**<**0 **||** y**>**6**){**

PORTD **|=**0xfb**;**

PORTC **&=**0xe0**;**

**if(**y**>**6**){**

puntos2**++;**

**if(**puntos2**>**9**){**

win**=**1**;**

**}**

//redefinir direccion

rand**\*=**7**;**

rand**=**rand**%**11**;**

direccion**=**rand**%**2**;**

**}**

**if(**y**<**0**){**

puntos1**++;**

**if(**puntos1**>**9**){**

win**=**1**;**

**}**

//redefinir direccion

rand**\*=**7**;**

rand**=**rand**%**11**;**

direccion**=(**rand**%**2**)+**2**;**

**}**

//redefinir x

rand**\*=**19**;**

rand**+=**7**;**

x**=**1**+(**rand**%**3**);**

//redefinir y

y**=**3**;**

delay\_ms**(**200**);**

**}**

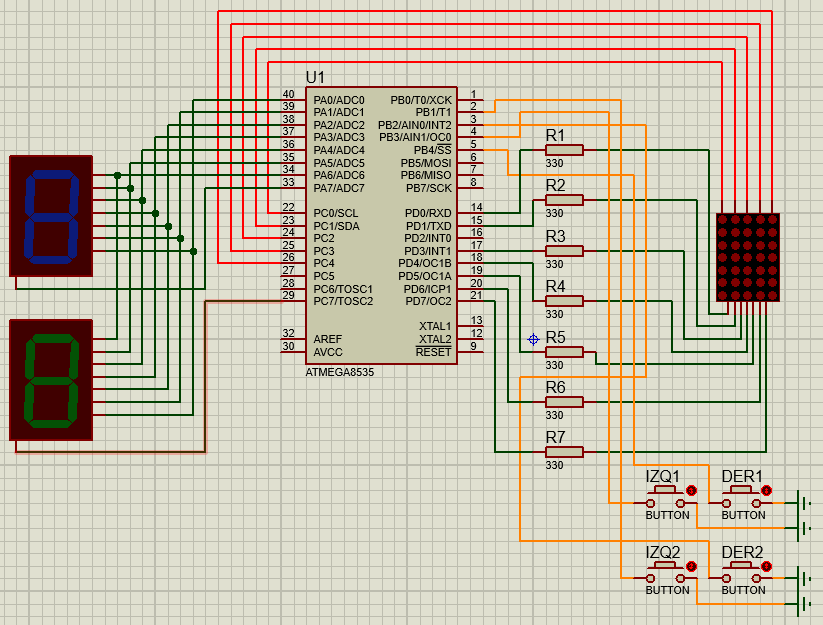
**}**

**}**

**}**

*2. Desarrollo experimental de la práctica*

**2.2 Simulación**



*3. Conclusiones Individuales*

**3.1 Martínez Ortega Juan Yael**

**3.2 Sampayo Hernández Mauro**

*4. Anexos*

1. **Hoja de especificaciones del Microcontrolador ATMega8535**

