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#!/usr/bin/python
#
# HD44780 LCD Test Script for
# Raspberry Pi
#
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#
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#
# The wiring for the LCD is as follows:
# 1 : GND
# 2 : 5V
# 3 : Contrast (0-5V)*
# 4 : RS (Register Select)
# 5 : R/W (Read Write)       - GROUND THIS PIN
# 6 : Enable or Strobe
# 7 : Data Bit 0             - NOT USED
# 8 : Data Bit 1             - NOT USED
# 9 : Data Bit 2             - NOT USED
# 10: Data Bit 3             - NOT USED
# 11: Data Bit 4
# 12: Data Bit 5
# 13: Data Bit 6
# 14: Data Bit 7
# 15: LCD Backlight +5V**
# 16: LCD Backlight GND
import
import RPi.GPIO as GPIO
import time
# Define GPIO to LCD mapping
LCD_RS = 26
LCD_E  = 19
LCD_D4 = 13
LCD_D5 = 6
LCD_D6 = 5
LCD_D7 = 11
LED_ON = 15
# Define some device constants
LCD_WIDTH = 16      # Maximum characters per line
LCD_CHR = True
LCD_CMD = False
LCD_LINE_1 = 0x80 # LCD RAM address for the 1st line
LCD_LINE_2 = 0xC0 # LCD RAM address for the 2nd line
# Timing constants
E_PULSE = 0.00005
E_DELAY = 0.00005
def main():
    # Main program block
    # Initialise display
    lcd_init()
    # Toggle backlight on-off-on
    GPIO.output(LED_ON, True)
    time.sleep(1)
    GPIO.output(LED_ON, False)
    time.sleep(1)
    GPIO.output(LED_ON, True)
    time.sleep(1)
    # Send some centred test
    lcd_byte(LCD_LINE_1, LCD_CMD)
    lcd_string("Raspberry Pi",2)
    lcd_byte(LCD_LINE_2, LCD_CMD)
    lcd_string("Model B",2)
    time.sleep(3) # 3 second delay
    # Send some left justified text
    lcd_byte(LCD_LINE_1, LCD_CMD)
    lcd_string("1234567890123456",1)
    lcd_byte(LCD_LINE_2, LCD_CMD)
    lcd_string("abcdefghijklmnop",1)
    time.sleep(3) # 3 second delay
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# Send some right justified text
lcd_byte(LCD_LINE_1, LCD_CMD)
lcd_string("Raspberrypi-spy",3)
lcd_byte(LCD_LINE_2, LCD_CMD)
lcd_string(".co.uk",3)
time.sleep(30)
# Turn off backlight
GPIO.output(LED_ON, False)
def lcd_init():
    GPIO.setmode(GPIO.BCM)      # Use BCM GPIO numbers
    GPIO.setup(LCD_E, GPIO.OUT) # E
    GPIO.setup(LCD_RS, GPIO.OUT) # RS
    GPIO.setup(LCD_D4, GPIO.OUT) # DB4
    GPIO.setup(LCD_D5, GPIO.OUT) # DB5
    GPIO.setup(LCD_D6, GPIO.OUT) # DB6
    GPIO.setup(LCD_D7, GPIO.OUT) # DB7
    GPIO.setup(LED_ON, GPIO.OUT) # Backlight enable
    # Initialise display
    lcd_byte(0x33,LCD_CMD)
    lcd_byte(0x32,LCD_CMD)
    lcd_byte(0x28,LCD_CMD)
    lcd_byte(0x0C,LCD_CMD)
    lcd_byte(0x06,LCD_CMD)
    lcd_byte(0x01,LCD_CMD)
def lcd_string(message,style):
    # Send string to display
    # style=1 Left justified
    # style=2 Centred
    # style=3 Right justified
    if style==1:
        message = message.ljust(LCD_WIDTH," ")
    elif style==2:
        message = message.center(LCD_WIDTH," ")
    elif style==3:
        message = message.rjust(LCD_WIDTH," ")
    for i in range(LCD_WIDTH):
        lcd_byte(ord(message[i]),LCD_CHR)
def lcd_byte(bits, mode):
    # Send byte to data pins
    # bits = data
    # mode = True  for character
    #        False for command
    GPIO.output(LCD_RS, mode) # RS
    # High bits
    GPIO.output(LCD_D4, False)
    GPIO.output(LCD_D5, False)
    GPIO.output(LCD_D6, False)
    GPIO.output(LCD_D7, False)
    if bits&0x10==0x10:
        GPIO.output(LCD_D4, True)
    if bits&0x20==0x20:
        GPIO.output(LCD_D5, True)
    if bits&0x40==0x40:
        GPIO.output(LCD_D6, True)
    if bits&0x80==0x80:
        GPIO.output(LCD_D7, True)
    # Toggle 'Enable' pin
    time.sleep(E_DELAY)
    GPIO.output(LCD_E, True)
    time.sleep(E_PULSE)
    GPIO.output(LCD_E, False)
    time.sleep(E_DELAY)
    # Low bits
    GPIO.output(LCD_D4, False)
    GPIO.output(LCD_D5, False)
    GPIO.output(LCD_D6, False)
    GPIO.output(LCD_D7, False)
    if bits&0x01==0x01:
        GPIO.output(LCD_D4, True)
    if bits&0x02==0x02:
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GPIO.output(LCD_D5, True)
if bits&0x04==0x04:
    GPIO.output(LCD_D6, True)
if bits&0x08==0x08:
    GPIO.output(LCD_D7, True)
# Toggle 'Enable' pin
time.sleep(E_DELAY)
GPIO.output(LCD_E, True)
time.sleep(E_PULSE)
GPIO.output(LCD_E, False)
time.sleep(E_DELAY)
if __name__ == '__main__':
    main()
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