Laboratory 07 – Area of Interest

PIR MOTION SENSOR

CpE 185 / EEE 174 Lab Section 02

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INTRODUCTION

This laboratory will show the information and functionality of the PIR motion sensor. The student will use all the knowledge learned from previous laboratory. This laboratory is divided into three sections. The first section will be understanding the motion sensor by looking for resources and the website where the student purchased it. The next section will be testing the motion sensor if its working. The last section will be using the motion sensor into the STM32 and using a UART to output motion detection.

DESCRIPTION

The PIR motion sensor allows to detect any motion whether a human has moved in or out of the sensors range. PIRs are basically made of a pyroelectric sensor, which can detect levels of infrared radiation. An example of PIR motion sensor is shown in the picture below.

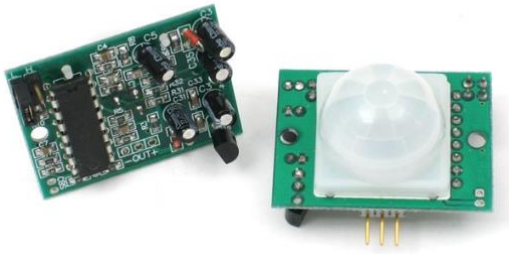

Figure 1. PIR Motion Sensor

On the other hand, here is the description of the content of the motion sensor shown below. We can see that there are adjustable settings which is very essential on adjusting time and sensitivity. The way these adjustments do is clockwise when you increase the delay time or sensitivity and counterclockwise when you decrease delay time or sensitivity.

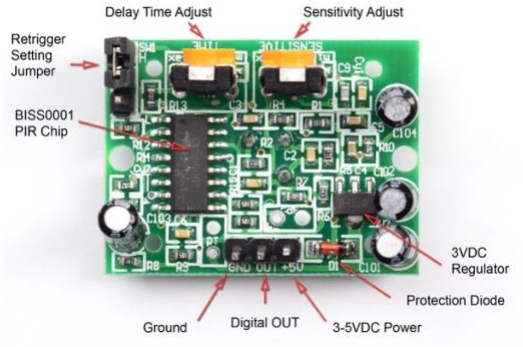

Figure 2. Parts description of PIR Motion Sensor

TESTING

Before everything, we need to test the PIR motion sensor if its working. A simple test that the student found on the internet shown below.

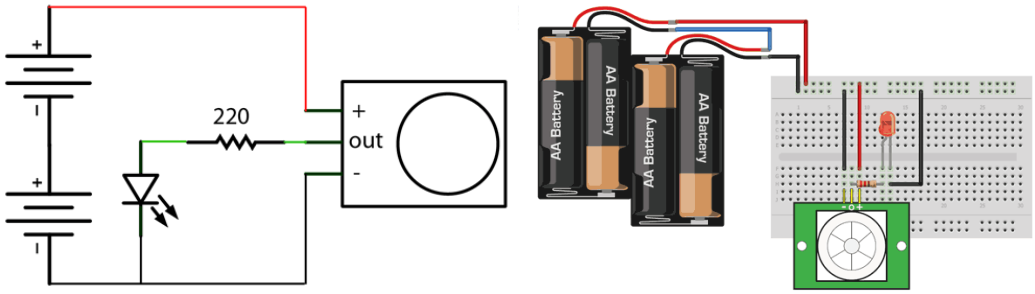

Figure 3. Simple test for the PIR motion sensor

On the other hand, the student used the STM32 board as the power source to test the PIR motion sensor. Below is the full setup in breadboard for testing the PIR motion sensor. The student hooked up the VCC to the 5V and the ground to the STM32 board. The Red LED is the indication for any movement. If there is a movement, the Red LED will light up.

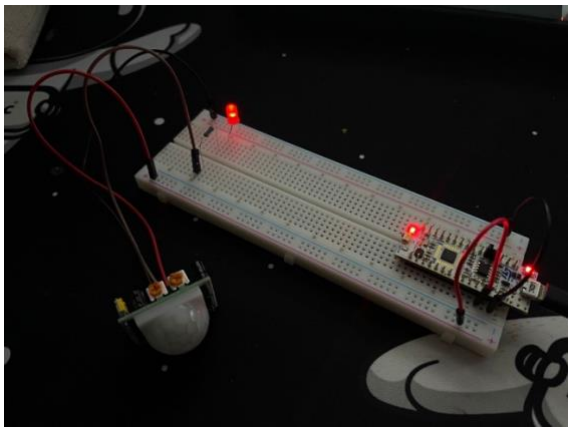

Figure 4. PIR Motion Sensor test setup

After confirming that the PIR Motion Sensor is working, the student then moves to the STM32 IDE to setup UART for this laboratory. The STM32 board that the student using is NUCLEO-L432KC for this laboratory. The student setup the pinout for the motion sensor and the LED shown in figure 5.

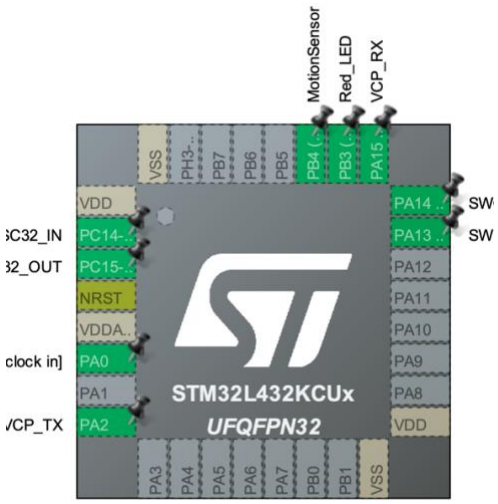

Figure 5. STM32 IDE Pinout layout

After, the student checked the Baud Rate which is 115200 Bits/s. Then, the student generated the code and went to main.c to add additional code. Below is the full modified code.

```
  /* Initialize all configured peripherals */
  MX_GPIO_Init();
  MX_USART2_UART_Init();
  /* USER CODE BEGIN 2 */
  char msg[128];

  /* USER CODE END 2 */

  /* Infinite loop */
  /* USER CODE BEGIN WHILE */
  while (1)
  {
    /* USER CODE END WHILE */

    /* USER CODE BEGIN 3 */
      if(HAL_GPIO_ReadPin(GPIOB, MotionSensor_Pin)) {
          HAL_GPIO_WritePin(GPIOB, Red_LED_Pin, GPIO_PIN_SET);
          sprintf(msg, "WARNING! MOTION DETECTED!\r\n");
          HAL_UART_Transmit(&huart2, (uint8_t*) msg, strlen(msg), HAL_MAX_DELAY);
          HAL_Delay(500);
      }
      else {
          HAL_GPIO_WritePin(GPIOB, Red_LED_Pin, GPIO_PIN_RESET);
          sprintf(msg, "NO MOTION\r\n");
          HAL_UART_Transmit(&huart2, (uint8_t*) msg, strlen(msg), HAL_MAX_DELAY);
          HAL_Delay(500);
      }

  }
  /* USER CODE END 3 */
}
```

Figure 6. STM32 IDE modified code

After that, the student then setup the actual board and connect it. Below is the full setup of the board.

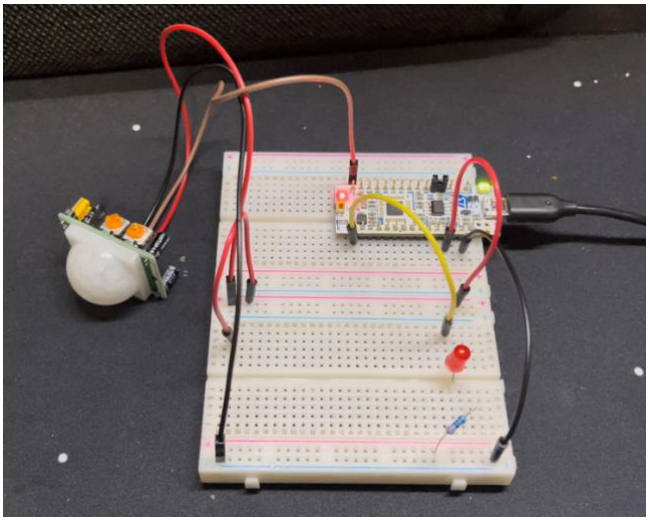

Figure 7. STM32 full setup for Motion Sensor

After connecting, the student then debugs the program and then setup the serial port for output by going to terminal if using mac. Then, the student input the corresponding serial port with the baud rate we obtained earlier. The output sample output is below.

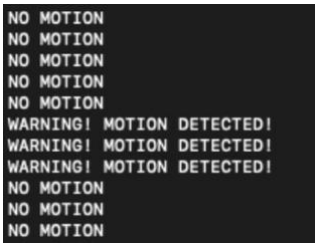

Figure 8. Terminal output

For the full demonstration, here is the video link: https://youtu.be/SVd2kT9HhAg

CONCLUSION

This laboratory focuses on the PIR motion sensor and its functionality. The student was able to learn about the motion sensor by doing research about the sensor and the knowledge learned from laboratory 2 which is STM32 setup and laboratory 5 using the UART. The student learned the importance of step-by-step procedure. It is important to research about the sensor description and layout before anything else so we can identify the parts and the use of it. Also, it is important to check the sensor if its working such as the sensitivity and the delay time. After that, we can now use motion sensor in any project that we can work on.

SOURCE

https://learn.adafruit.com/pir-passive-infrared-proximity-motion-sensor