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ENGR 1242, Engineering Fundamentals, Project Report 2

1. **Functional Objectives:**
   1. **The robot should be programmable**
      1. **Constraints**
         1. **Layout**

The PIC must be mounted on a small breadboard.

* + - 1. **Components**

The PIC must receive its power from a 8 V Power Supply.

* + - 1. **Time**

The project must be completed by 5:20PM on Jan 11th.

* + 1. **Test Plan 1 and results**
       1. **Setup**

Connect the PIC Kit 2 and program the PIC.

* + - 1. **Test**

Open the UART Tool and press the reset button.

* + - 1. **Results**

“ECE Rules!” was displayed on the UART Tool.

* + 1. **Statement of success**

The project is successful after the objectives have been met within the constraints.

* 1. **The robot should be programmable and communicate with user.**
     1. **Constraints**
        1. **Layout**

An LED on left and right on their own pins.

* + - 1. **Components**

The PIC must receive its power from a 8 V Power Supply.

* + - 1. **Time**

The project must be demo’d by 5:20PM on Jan 18th.

* + - 1. **Operation**

LEDs should turn on and off independently and the UART should indicate light on or off.

* + 1. **Test Plan 2 and results**
       1. **Setup**

Hook up power (8V to bread board)

Hook up PICKIT

Open UART

* + - 1. **Test**

Press the reset button.

5x-The robot should turn on the left LED then off.

5x-The robot should turn on the right LED then off.

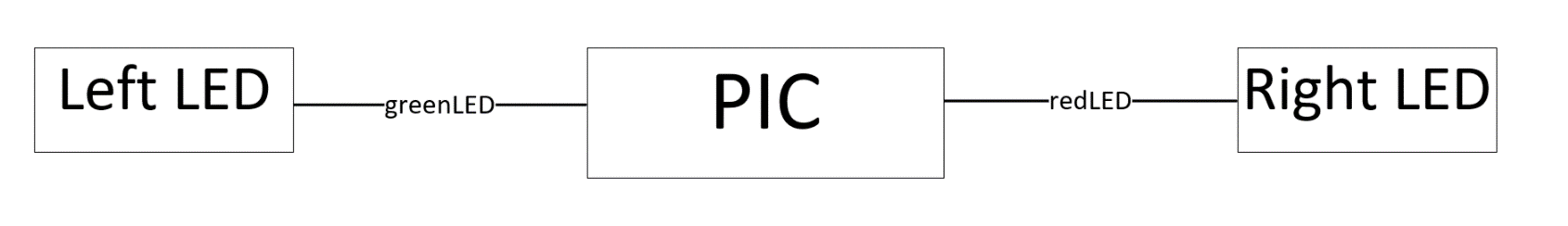
* + - 1. **Results**

“ECE Rules!” was displayed on the UART Tool.

* + 1. **Statement of success**

The project is successful after the objectives have been met within the constraints. Completed at 3:22PM Jan 18th.

1. **Hardware Design:**
   1. **Hardware System Overview**
      1. **System Block Diagram**



* + 1. **Subsystem Descriptions**
       1. PIC: main microcontroller with OS.
       2. Left LED: led on the left which the pic controls.
       3. Right LED: led on the right which the pic controls.
    2. **Signal Descriptions** 
       1. redLED: turns it on or off.

|  |  |
| --- | --- |
| **redLED** | **result** |
| **0** | **Off** |
| **1** | **On** |

* + - 1. greenLED: turns it on or off.

|  |  |
| --- | --- |
| **greenLED** | **Result** |
| **0** | **Off** |
| **1** | **On** |

* 1. **Circuit Diagrams**
     1. **Power System**



* + 1. **PIC Configuration**



* + 1. **Pinouts**
       1. **Voltage Regulator**



* + - 1. **MOSFET**
      2. **BJT**
      3. **NOR Gate**
    1. **LED Circuits**
       1. **redLED**



* + - 1. **greenLED**



* + 1. **Test Pins**
    2. **Motor Drivers**
    3. **Bumper System**
    4. **Light Detection System**

1. **Software Design**
   1. **Software System Overview:**
      1. **High-Level Description**

The software turns LED’s on and off and prints text in the debug console.

* + 1. **Pin Definitions**

|  |  |  |
| --- | --- | --- |
| **PIC Pin** | **Variable name** | **Description** |
| 5 | redLED | This is a red LED |
| 6 | greenLED | This is a green LED |

* + 1. **Code Listing of definitions.h**

|  |
| --- |
| 1 /\*  2 \* definitions.h  3 \*  4 \*/  5 #ifndef DEFINITIONS\_H\_  6 #define DEFINITIONS\_H\_  7  8 /\*\*  9 \* constants  10 \* -- NOTICE - DO NOT END THESE STATEMENTS WITH SEMICOLONS  11 \*/  12 #define ON 1  13 #define OFF 0  14  15 #define redLED digOutput5  16 #define greenLED digOutput6  17 /\*  18 \* function definitions  19 \*/  20 void setupPins();  21 void turngreenLEDOn();  22 void turngreenLEDOff();  23 void turnRedLEDOn();  24 void turnRedLEDOFF();  25 void runRobotOS();  26 #endif // DEFINITIONS\_H\_ |

* + 1. **Detailed Function Descriptions**

|  |  |
| --- | --- |
| Name: | Main() |
| Purpose: | Start program and decide whether to run the test suite or the operating system. |
| Calls: | initializeUART()  setupPins()  runRobotOS(); |
| Code: | /\* initialize the ability to send messages to the  \* PICKit 2 using printf. \*/  initializeUART();  setupPins();  runRobotOS();  // put code here!  printf("ECE Rules!");  halt();  return(0); |
| Flowchart: |  |

|  |  |
| --- | --- |
| Name: | setupPins() |
| Purpose: | Define the pins to a signal type and direction. |
| Calls: | None. |
| Code: | //Define pin 5 to control the red LED  pin5Direction = OUTPUT;  pin5Type = DIGITAL;    //Define pin 6 to control the green LED  pin6Direction = OUTPUT;  pin6Type = DIGITAL; |
| Flowchart: |  |

|  |  |
| --- | --- |
| Name: | runRobotOS() |
| Purpose: | Run the robot operating system, instead of the test suite. |
| Calls: | turnRedLEDOn()  turnRedLEDOff()  turnGreenLEDOn()  turnGreenLEDOff()  halt() |
| Code: | printf("The robot is up and running!!\n");  turnRedLEDOn();  pause(1000);  turnRedLEDOff();  pause(250);  turnRedLEDOn();  pause(1000);  turnRedLEDOff();  pause(250);  turnRedLEDOn();  pause(1000);  turnRedLEDOff();  pause(250);  turnRedLEDOn();  pause(1000);  turnRedLEDOff();  pause(250);  turnRedLEDOn();  pause(1000);  turnRedLEDOff();  pause(250);  turnGreenLEDOn();  pause(1000);  turnGreenLEDOff();  pause(250);  turnGreenLEDOn();  pause(1000);  turnGreenLEDOff();  pause(250);  turnGreenLEDOn();  pause(1000);  turnGreenLEDOff();  pause(250);  turnGreenLEDOn();  pause(1000);  turnGreenLEDOff();  pause(250);  turnGreenLEDOn();  pause(1000);  turnGreenLEDOff();  pause(250);  printf("Robot will shut down... \n");  halt(); |
| Flowchart: | No loops. |

|  |  |
| --- | --- |
| Name: | turnRedLEDOn() |
| Purpose: | Turns the red led on. |
| Calls: | None. |
| Code: | printf("The red LED is on.\n");  redLED = ON; |
| Flowchart: |  |

|  |  |
| --- | --- |
| Name: | turnRedLEDOff() |
| Purpose: | Turns the red led off. |
| Calls: | None. |
| Code: | printf("The red LED is off.\n");  redLED = OFF; |
| Flowchart: |  |

|  |  |
| --- | --- |
| Name: | turnGreenLEDOn() |
| Purpose: | Turns the green led on. |
| Calls: | None. |
| Code: | printf("The green LED is on.\n");  greenLED = ON; |
| Flowchart: |  |

|  |  |
| --- | --- |
| Name: | turnGreenLEDOff() |
| Purpose: | Turns the green led off. |
| Calls: | None. |
| Code: | printf("The green LED is off.\n");  greenLED = OFF; |
| Flowchart: |  |