## 杭州电子科技大学创新实践实验报告

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| 学院 | 计算机学院 | 班级 |  | 学号 |  |
| 姓名 |  | 日期 | 2024.3.25 | 成绩 |  |
| 实验题目 | 红外对管原理学习 | | | | |
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| 实验目的 | 1、学习网站上模块6的视频部分，https://edu.21ic.com/lesson/1969  2、下载“Leture”pdf，重点学习第14-19页  3、每组同学互相解说红外对管的原理，对照第19页  4、学习maze代码中的Lab06\_GPIO  报告中描述学习的内容，讲解红外对管原理，给Reflectance\_Init和Reflectance\_Read函数添加注释 | | | | |
| 硬件原理 | 红外对管原理：  首先将引脚5.3的方向设置为输出端，先输出高电平，让发光二极管工作，然后让引脚7.0设置为输出端，输出高电平给电容器充电，等待10 微秒后，然后将8个引脚设置回输入方向。等一毫秒之后读取它。起初如果传感器下面是白色胶带，光从LED输出端出来，反射到接收端，接收端会非常快速地放电，因此在充电后的一毫秒内，电容器会一直放电，得到的数字信号是0，表示底下是白色胶带。但如果线路传感器在黑色胶带上，则该光会被黑色胶带吸收，而不会反射掉，并且电容器会缓慢放电，此时得到的数字信号就是1，代表底下是黑色胶带。 | | | | |
| 关键代码及注释 | // Lab06\_GPIOmain.c  // Runs on MSP432  // Solution to GPIO lab  // Daniel and Jonathan Valvano  // May 21, 2017  // Provide test main program for QTR-8RC reflectance sensor array  // Pololu part number 961.  /\* This example accompanies the books  "Embedded Systems: Introduction to the MSP432 Microcontroller",  ISBN: 978-1512185676, Jonathan Valvano, copyright (c) 2017  "Embedded Systems: Real-Time Interfacing to the MSP432 Microcontroller",  ISBN: 978-1514676585, Jonathan Valvano, copyright (c) 2017  "Embedded Systems: Real-Time Operating Systems for ARM Cortex-M Microcontrollers",  ISBN: 978-1466468863, , Jonathan Valvano, copyright (c) 2017  For more information about my classes, my research, and my books, see  http://users.ece.utexas.edu/~valvano/  Simplified BSD License (FreeBSD License)  Copyright (c) 2017, Jonathan Valvano, All rights reserved.  Redistribution and use in source and binary forms, with or without modification,  are permitted provided that the following conditions are met:  1. Redistributions of source code must retain the above copyright notice,  this list of conditions and the following disclaimer.  2. Redistributions in binary form must reproduce the above copyright notice,  this list of conditions and the following disclaimer in the documentation  and/or other materials provided with the distribution.  THIS SOFTWARE IS PROVIDED BY THE COPYRIGHT HOLDERS AND CONTRIBUTORS "AS IS"  AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT LIMITED TO, THE  IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE  ARE DISCLAIMED. IN NO EVENT SHALL THE COPYRIGHT OWNER OR CONTRIBUTORS BE  LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL  DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES;  LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED  AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY,  OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE  USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.  The views and conclusions contained in the software and documentation are  those of the authors and should not be interpreted as representing official  policies, either expressed or implied, of the FreeBSD Project.  \*/  // reflectance LED illuminate connected to P5.3  // reflectance sensor 1 connected to P7.0 (robot's right, robot off road to left)  // reflectance sensor 2 connected to P7.1  // reflectance sensor 3 connected to P7.2  // reflectance sensor 4 connected to P7.3 center  // reflectance sensor 5 connected to P7.4 center  // reflectance sensor 6 connected to P7.5  // reflectance sensor 7 connected to P7.6  // reflectance sensor 8 connected to P7.7 (robot's left, robot off road to right)  **#include** <stdint.h>  **#include** "msp.h"  **#include** "..\inc\Reflectance.h"  **#include** "..\inc\Clock.h"  **#include** "..\inc\TExaS.h"  uint8\_t Data; // QTR-8RC  // Test main for section 6.4.3  **int** **Program6\_1**(**void**){  Clock\_Init48MHz();  Reflectance\_Init(); // your initialization  TExaS\_Init(*LOGICANALYZER\_P7*);  **while**(1){  Data = Reflectance\_Read(1000); // your measurement  Clock\_Delay1ms(10);  }  }  int32\_t Position; // 332 is right, and -332 is left of center  **int** **main**(**void**){  Clock\_Init48MHz();  Reflectance\_Init();//初始化P5为GPIO，然后设置方向为输出方向，P7为GPIO，设置方向为输入方向  TExaS\_Init(*LOGICANALYZER\_P7*);  **while**(1){  Data = Reflectance\_Read(1000);//将P5.3设为高电平，P7全设为高电平，等待10us，P7全部设为输入，等待1ms，然后读取P7，把P5.3设为低电平，返回结果  Position = Reflectance\_Position(Data);  Clock\_Delay1ms(10);  }  }  **int** **main2**(**void**){ // main2(void){  int32\_t i;  Clock\_Init48MHz();  Reflectance\_Init();  P4->SEL0 &= ~0x01;  P4->SEL1 &= ~0x01; // P4.0 as GPIO  P4->DIR |= 0x01; // make P4.0 out  TExaS\_Init(*LOGICANALYZER\_P7*);  **while**(1){  P5->OUT |= 0x08; // turn on 8 IR LEDs  P7->DIR = 0xFF; // make P7.7-P7.0 out  P7->OUT = 0xFF; // prime for measurement  Clock\_Delay1us(10); // wait 10 us  P7->DIR = 0x00; // make P7.7-P7.0 in  **for**(i=0;i<10000;i++){  P4->OUT = P7->IN&0x01; // convert input to digital  }  P5->OUT &= ~0x08; // turn off 8 IR LEDs  Clock\_Delay1ms(10);  }  } | | | | |
| 实验步骤 | 学习maze代码中的Lab06\_GPIO，根据视频内容了解红外对管原理，将Reflectance\_Init和Reflectance\_Read代码补充完整，运行代码。用手遮挡小车底部的传感器，在程序中的Expression一栏中查看Data变量，每遮挡一次小车就刷新Expression，观察Data的变化是否正确 | | | | |
| 实验结果 | 改变遮挡传感器的方式，发现Data的值有不同变化 | | | | |
| 思考与反馈 | 红外对管原理主要是根据不同颜色对光的吸收率不同，从而改变电容器充放电的进程快慢来实现的 | | | | |