Minimouse

K. X. García Alvarado, M. A. Noriega Vargas,
D. L. Ramírez Tejeida, C. D. Ruiz Guerrero,
A. Ruiz Medina, A. Rodríguez Buenrostro

Marzo-Junio 2019

Índice general

1. Introducción **2**

2. Objetivos **3**

3. Componentes del Carrito **4**
3.1. Tiva 4
3.2. Sensores Infrarrojos 5
3.3. Encoder(motores) 5
3.4. TB6612FNG Dual Motor Driver Carrier 6

4. Familiarización con la Tiva **7**

5. Desarrollo código **14**

6. Diseño de Placa **25**

Capítulo 1

Introducción

Como parte de la materia Programación, se les solicitó a los alumnos partipar en el concurso RoboUAQ en la categoría Minimouse. El desarrollo y presentación de este proyecto, a la vez contaría como proyecto final de la materia.

El desafío consistía en resolver un laberinto en el menor tiempo posible. Posteriromente, solo se pretendía que el carrito avanzara, sin chocar con las paredes.

Para la elaboración del carrito se utilizó un microcontrolador Tiva, el cual para su programación se utiliza el lenguaje de programación C. Se usaron dos motores para mover el carrito, cada uno con su encoder, y para poder manejarlos se utilizó un puente h (controlador). Para alimentar el carrito se utilizaron en total 6 pilas AAA, tres para alimentar a la Tiva y a los sensores, y 3 para los motores.

Para detectar las paredes del laberinto, primero se utilizaron sensores de luz y posteriormente estos se cambiaron a sensores infrarrojos por cuestiones practicidad.

La realización de este proyecto implicó el desarrollo de habilidades, como el pensamiento lógico, para programar, aprender el lenguaje C, además de la experiencia de participar en la competencia.

Capítulo 2

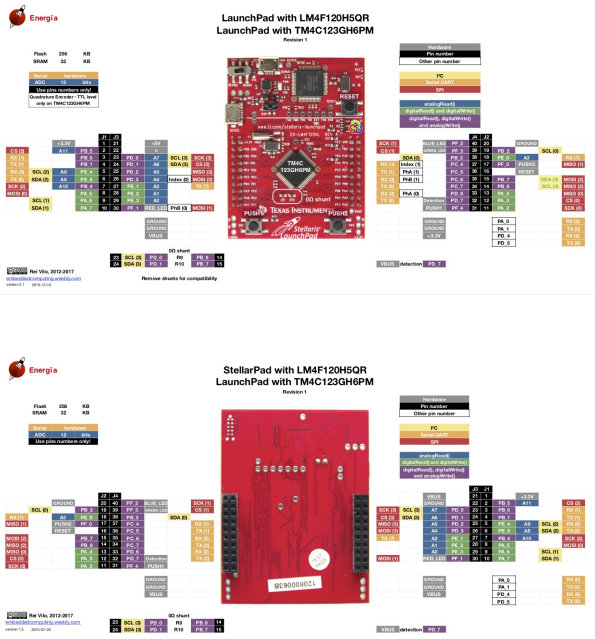
Objetivos

- Elaborar un carrito capaz de avanzar por un laberinto sin chocar con las paredes.
- Práctica del lenguaje C.
- Uso de funciones de alto nivel.
- Programar el microcontrolador de la Tiva, usando el programa Code Composer.

Capítulo 3

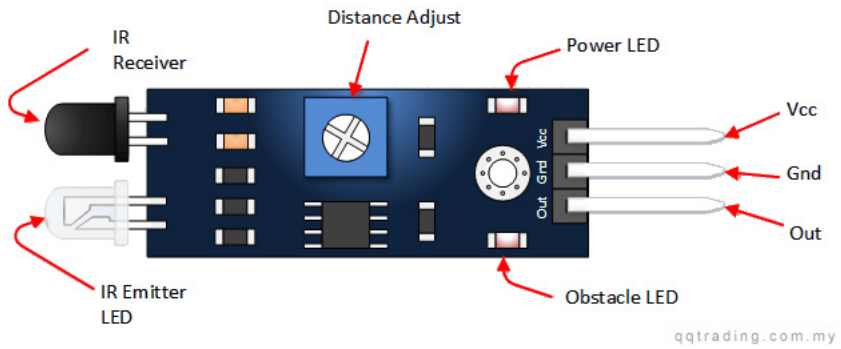
Componentes del Carrito

3.1. Tiva



Se utilizó la Tiva™ C Series TM4C123G LaunchPad Evaluation Board que incluye puertos tanto digitales como analógicos, dos botones (entradas), un LED y su característico microcontrolador.

3.2. Sensores Infrarrojos

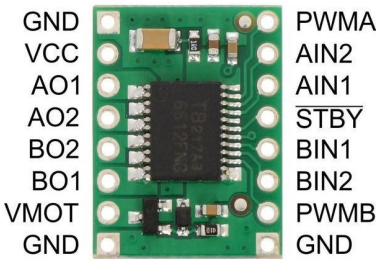


Se cambiaron los sensores por sensores infrarrojo emisor y receptor. Estos infrarrojos emiten señales a cierta frecuencia cuando se encuentra detección de algún obstáculo, captan la señal y es acondicionada mediante un circuito comparador. esto se ve reflejado mediante un LED indicador de color verde, en donde dependiendo de la configuración del usuario, podrá establecer niveles altos (1 lógico) y bajos (0 lógico) de tensión.

3.3. Encoder(motores)

Un encoder es un dispositivo de detección que proporciona una respuesta. Convierten el movimiento en una señal eléctrica que puede ser leída por algún tipo de dispositivo de control en un sistema de control de movimiento. En este caso, el propósito del Encoder en los motores era contar las revoluciones de las llantas y saber la dirección en la que iban.

3.4. TB6612FNG Dual Motor Driver Carrier

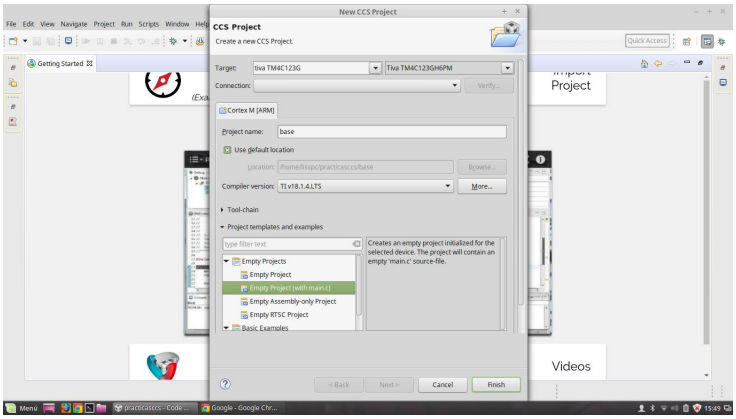


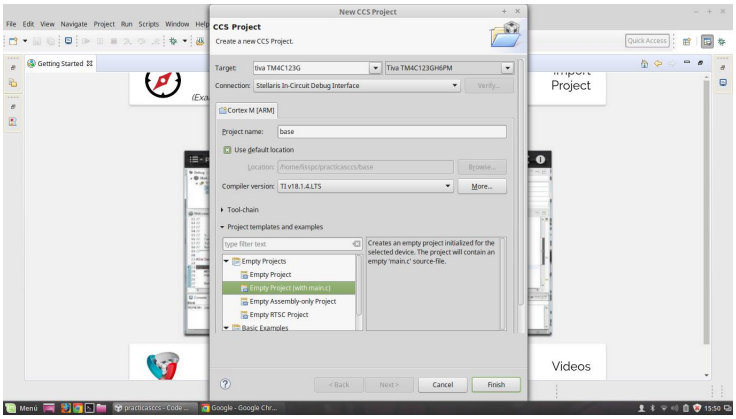
El Moto Driver o Puente h es una pequeña placa eque sirve como controlador de motor dual TB6612FNG de Toshiba, que puede controlar de forma independiente dos motores de CC bidireccionales o un motor paso a paso bipolar.

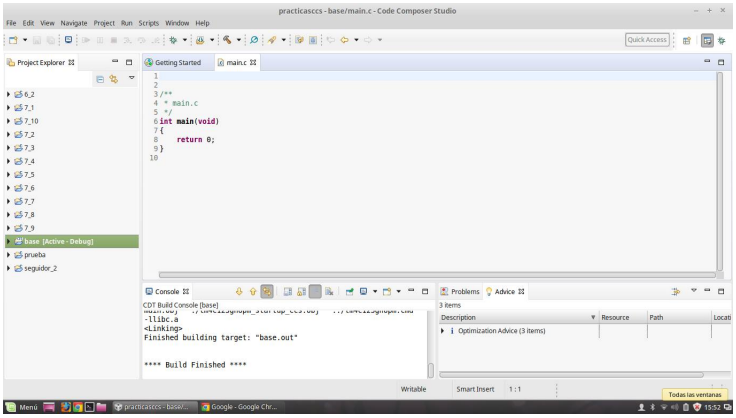
Capítulo 4

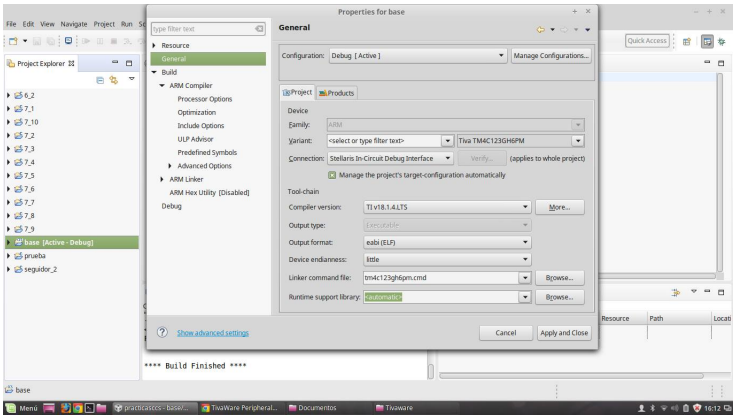
Familiarización con la Tiva

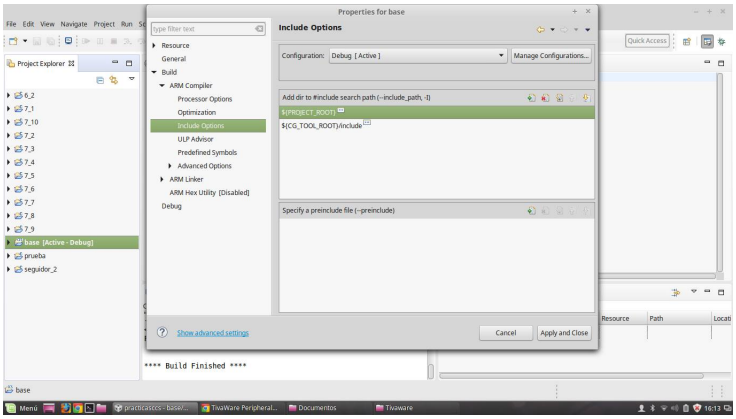
Con la intención de que los alumnos nos familiarizaramos con la Tiva, se realizó un programa sencillo para encender el LED RGB que ya incluye la Tiva.

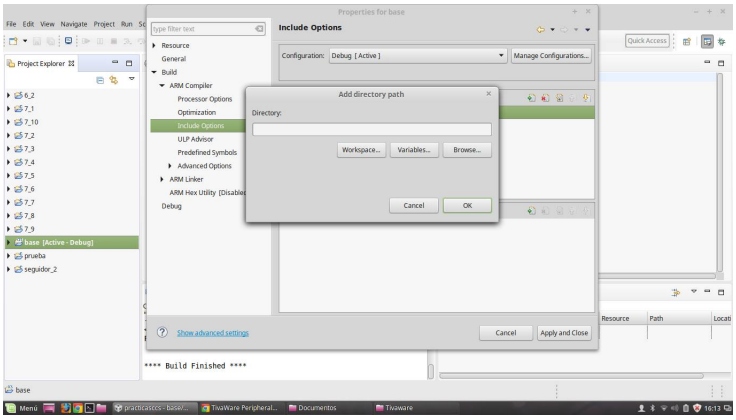


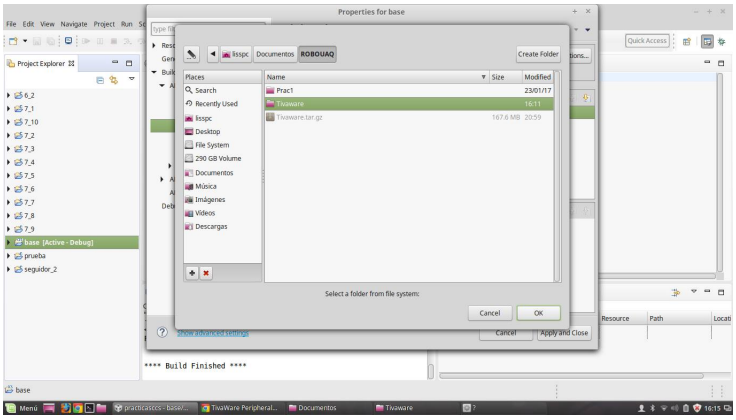

New CCS Project
CCS Project
Create a new CCS Project.
Target: tiva TM4C123G
Tiva TM4C123GH6PM
Connection: Stellaris In-Circuit Debug Interface
Cortex M [ARM]
Project name: base
Use default location
Location: /home/lisspc/practicasccs/base
Compiler version: TI v18.1.4.LTS
Tool-chain
Project templates and examples
Empty Projects
Empty Project
Empty Project (with main.c)
Empty Assembly-only Project
Empty RTSC Project
Basic Examples
Creates an empty project initialized for the selected device. The project will contain an empty 'main.c' source-file.
< Back
Next >
Cancel
Finish
Import Project
Videos

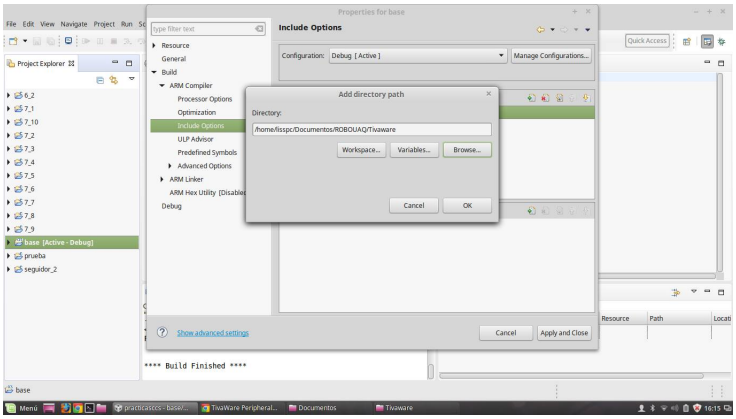

practicasccs - base/main.c - Code Composer Studio
Project Explorer
base [Active - Debug]
prueba
seguidor_2
main.c
int main(void)
{
return 0;
}
Console
CDT Build Console [base]
-llibc.a
<Linking>
Finished building target: "base.out"
**** Build Finished ****
Problems
Advice
Optimization Advice (3 items)

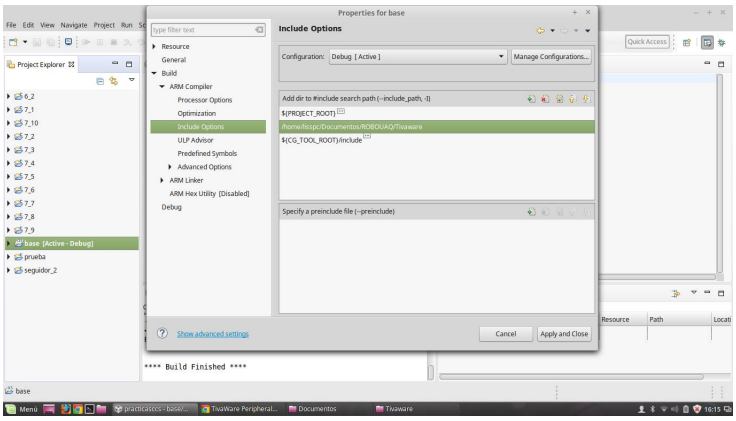

Properties for base
General
Configuration: Debug [Active]
Manage Configurations...
Project
Products
Device
Family: ARM
Variant: Tiva TM4C123GH6PM
Connection: Stellaris In-Circuit Debug Interface
Manage the project's target-configuration automatically
Tool-chain
Compiler version: TI v18.1.4.LTS
Output type: Executable
Output format: eabi (ELF)
Device endianness: little
Linker command file: tm4c123gh6pm.cmd
Runtime support library: <automatic>
Show advanced settings
Cancel
Apply and Close
**** Build Finished ****

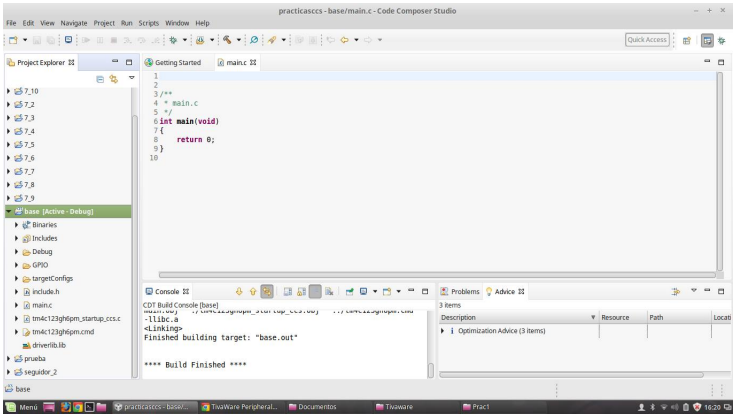

Properties for base
Include Options
Configuration: Debug [Active]
Manage Configurations...
Add dir to #include search path (--include_path, -I)
${PROJECT_ROOT}
${CG_TOOL_ROOT}/include
Specify a preinclude file (--preinclude)
Show advanced settings
Cancel
Apply and Close
**** Build Finished ****

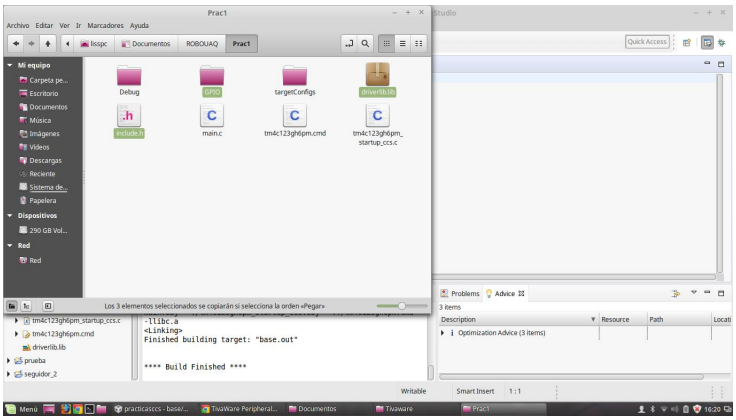

Properties for base
Include Options
Add directory path
Directory:
Workspace...
Variables...
Browse...
Cancel
OK
Show advanced settings
Apply and Close
**** Build Finished ****

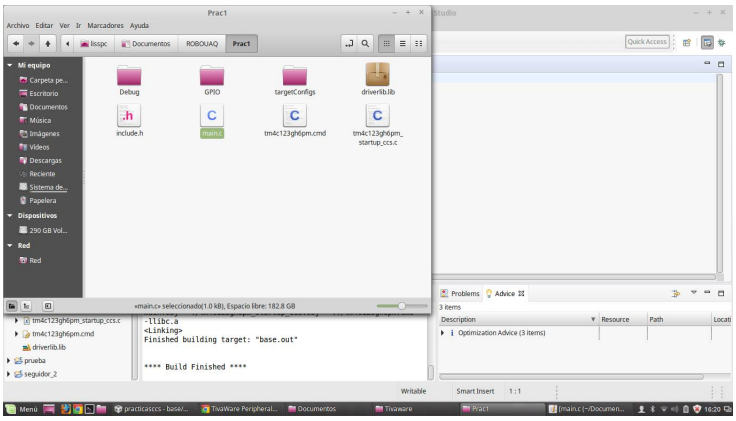

Properties for base
Create Folder
Places
Name
Size
Modified
Prac1
Tivaware
Tivaware.tar.gz
Select a folder from file system:
Cancel
OK
**** Build Finished ****

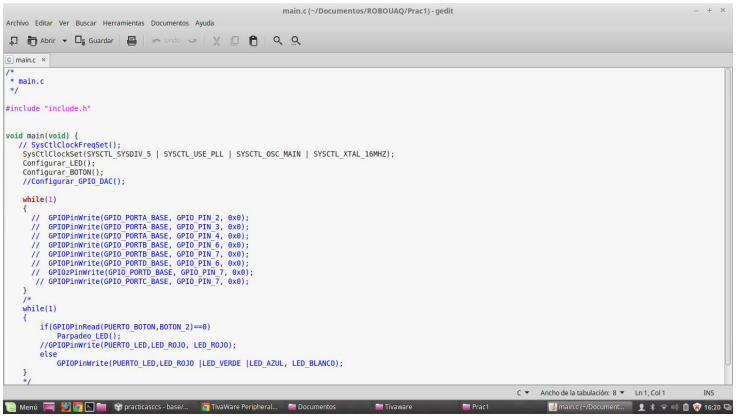

Properties for base
Include Options
Configuration: Debug [Active]
Manage Configurations...
Add directory path
Directory:
/home/fisspc/Documentos/ROBOUAQ/Tivaware
Workspace...
Variables...
Browse...
Cancel
OK
Show advanced settings
Apply and Close
**** Build Finished ****

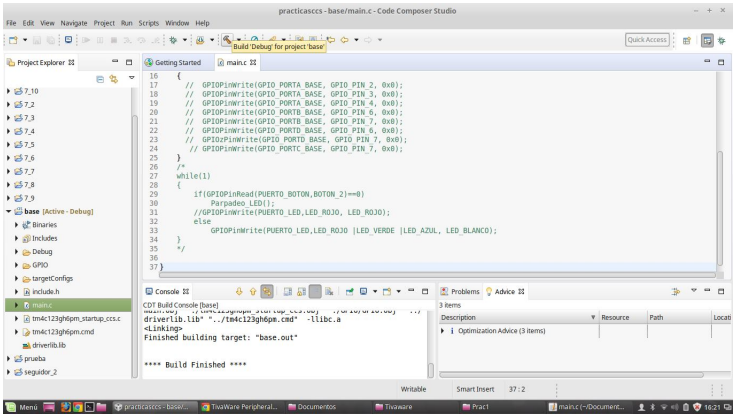

Properties for base
Include Options
Configuration: Debug [Active]
Manage Configurations...
Add dir to #include search path (--include_path, -I)
${PROJECT_ROOT}
/home/fisspc/Documentos/ROBOUAQ/Tivaware
${CG_TOOL_ROOT}/include
Specify a preinclude file (--preinclude)
Show advanced settings
Apply and Close
**** Build Finished ****

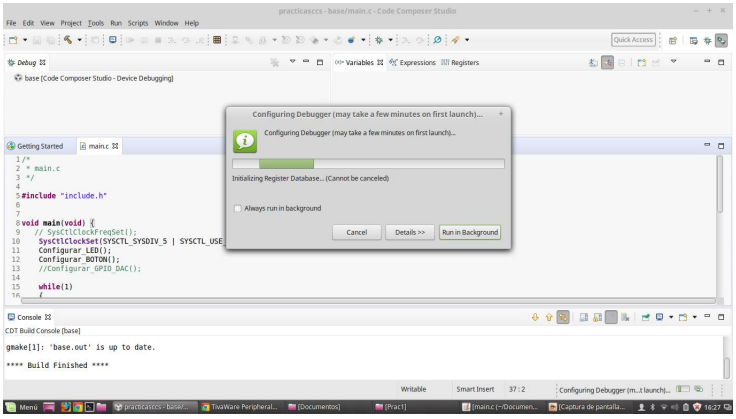

practicasccs - base/main.c - Code Composer Studio
/**
* main.c
*/
int main(void)
{
return 0;
}
-llibc.a
<Linking>
Finished building target: "base.out"
**** Build Finished ****

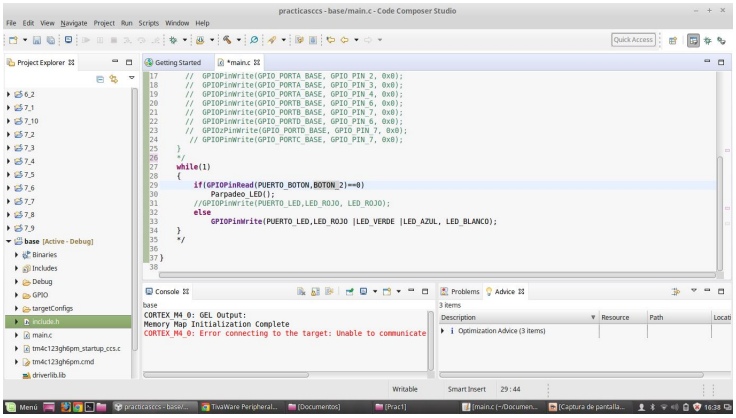

Prac1
Archivo Editar Ver Ir Marcadores Ayuda
Mi equipo
Debug
GPIO
targetConfigs
driverlib.lib
include.h
main.c
tm4c123gh6pm.cmd
tm4c123gh6pm_startup_ccs.c
Los 3 elementos seleccionados se copiarán si selecciona la orden «Pegar»
-llibc.a
<Linking>
Finished building target: "base.out"
**** Build Finished ****
Problems
Advice
Optimization Advice (3 items)

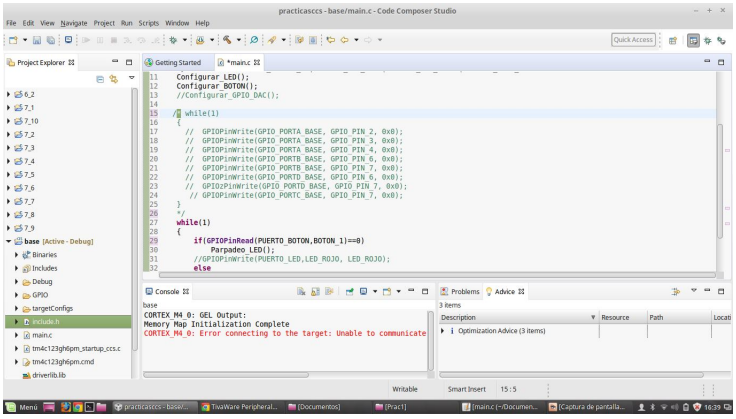

Prac1
Archivo Editar Ver Ir Marcadores Ayuda
Mi equipo
Debug
GPIO
targetConfigs
driverlib.lib
include.h
main.c
tm4c123gh6pm.cmd
tm4c123gh6pm_startup_ccs.c
«main.c» seleccionado(1.0 kB), Espacio libre: 182.8 GB
-llibc.a
<Linking>
Finished building target: "base.out"
**** Build Finished ****
Problems
Advice
Optimization Advice (3 items)


main.c (~/Documentos/ROBOUAQ/Prac1) - gedit
Archivo Editar Ver Buscar Herramientas Documentos Ayuda
Abrir
Guardar
main.c
/*
* main.c
*/
#include "include.h"
void main(void) {
// SysCtlClockFreqSet();
SysCtlClockSet(SYSCTL_SYSDIV_5 | SYSCTL_USE_PLL | SYSCTL_OSC_MAIN | SYSCTL_XTAL_16MHZ);
Configurar_LED();
Configurar_BOTON();
//Configurar_GPIO_DAC();
while(1)
{
// GPIOPinWrite(GPIO_PORTA_BASE, GPIO_PIN_2, 0x0);
// GPIOPinWrite(GPIO_PORTA_BASE, GPIO_PIN_3, 0x0);
// GPIOPinWrite(GPIO_PORTA_BASE, GPIO_PIN_4, 0x0);
// GPIOPinWrite(GPIO_PORTB_BASE, GPIO_PIN_6, 0x0);
// GPIOPinWrite(GPIO_PORTB_BASE, GPIO_PIN_7, 0x0);
// GPIOPinWrite(GPIO_PORTD_BASE, GPIO_PIN_6, 0x0);
// GPIO2PinWrite(GPIO_PORTD_BASE, GPIO_PIN_7, 0x0);
// GPIOPinWrite(GPIO_PORTC_BASE, GPIO_PIN_7, 0x0);
}
/*
while(1)
{
if(GPIOPinRead(PUERTO_BOTON,BOTON_2)==0)
Parpadeo_LED();
//GPIOPinWrite(PUERTO_LED,LED_ROJO, LED_ROJO);
else
GPIOPinWrite(PUERTO_LED,LED_ROJO |LED_VERDE |LED_AZUL, LED_BLANCO);
}
*/
Ancho de la tabulación: 8
Ln 1, Col 1
INS


practicasccs - base/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Build 'Debug' for project 'base'
Quick Access
Project Explorer
Getting Started
main.c
base [Active - Debug]
Binaries
Includes
Debug
GPIO
targetConfigs
include.h
main.c
tm4c123gh6pm_startup_ccs.c
tm4c123gh6pm.cmd
driverlib.lib
prueba
seguidor_2
Console
CDT Build Console [base]
driverlib.lib" "../tm4c123gh6pm.cmd" -llibc.a
<Linking>
Finished building target: "base.out"
**** Build Finished ****
Problems
Advice
3 items
Description
Resource
Path
Optimization Advice (3 items)
Writable
Smart Insert
37 : 2


practicasccs - base/main.c - Code Composer Studio
File Edit View Project Tools Run Scripts Window Help
Quick Access
Debug
base [Code Composer Studio - Device Debugging]
Variables
Expressions
Registers
Configuring Debugger (may take a few minutes on first launch)...
Initializing Register Database... (Cannot be canceled)
Always run in background
Cancel
Details >>
Run in Background
Getting Started
main.c
#include "include.h"
void main(void) {
// SysctlClockFreqSet();
SysCtlClockSet(SYSCTL_SYSDIV_5 | SYSCTL_USE
Configurar_LED();
Configurar_BOTON();
//Configurar_GPIO_DAC();
while(1)
Console
CDT Build Console [base]
gmake[1]: 'base.out' is up to date.
**** Build Finished ****
Writable
Smart Insert
37 : 2


practicasccs - base/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Quick Access
Project Explorer
Getting Started
*main.c
base [Active - Debug]
Binaries
Includes
Debug
GPIO
targetConfigs
include.h
main.c
tm4c123gh6pm_startup_ccs.c
tm4c123gh6pm.cmd
driverlib.lib
while(1)
if(GPIOPinRead(PUERTO_BOTON,BOTON_2)==0)
Parpadeo_LED();
//GPIOPinWrite(PUERTO_LED,LED_ROJO, LED_ROJO);
else
GPIOPinWrite(PUERTO_LED,LED_ROJO |LED_VERDE |LED_AZUL, LED_BLANCO);
Console
base
CORTEX_M4_0: GEL Output:
Memory Map Initialization Complete
CORTEX_M4_0: Error connecting to the target: Unable to communicate
Problems
Advice
3 items
Description
Resource
Path
Optimization Advice (3 items)
Writable
Smart Insert
29 : 44


practicasccs - base/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Quick Access
Project Explorer
Getting Started
*main.c
Configurar_LED();
Configurar_BOTON();
//Configurar_GPIO_DAC();
while(1)
{
// GPIOPinWrite(GPIO_PORTA_BASE, GPIO_PIN_2, 0x0);
// GPIOPinWrite(GPIO_PORTA_BASE, GPIO_PIN_3, 0x0);
// GPIOPinWrite(GPIO_PORTA_BASE, GPIO_PIN_4, 0x0);
// GPIOPinWrite(GPIO_PORTB_BASE, GPIO_PIN_6, 0x0);
// GPIOPinWrite(GPIO_PORTB_BASE, GPIO_PIN_7, 0x0);
// GPIOPinWrite(GPIO_PORTD_BASE, GPIO_PIN_6, 0x0);
// GPIO2PinWrite(GPIO_PORTD_BASE, GPIO_PIN_7, 0x0);
// GPIOPinWrite(GPIO_PORTC_BASE, GPIO_PIN_7, 0x0);
}
*/
while(1)
{
if(GPIOPinRead(PUERTO_BOTON,BOTON_1)==0)
Parpadeo_LED();
//GPIOPinWrite(PUERTO_LED,LED_ROJO, LED_ROJO);
else
6_2
7_1
7_10
7_2
7_3
7_4
7_5
7_6
7_7
7_8
7_9
base [Active - Debug]
Binaries
Includes
Debug
GPIO
targetConfigs
include.h
main.c
tm4c123gh6pm_startup_ccs.c
tm4c123gh6pm.cmd
driverlib.lib
Console
base
CORTEX_M4_0: GEL Output:
Memory Map Initialization Complete
CORTEX_M4_0: Error connecting to the target: Unable to communicate
Problems
Advice
3 items
Description
Resource
Path
Optimization Advice (3 items)
Writable
Smart Insert
15 : 5
Menú
practicasccs - base/...
TivaWare Peripheral...
[Documentos]
[Prac1]
[main.c (~/Documen...
[Captura de pantalla...
16:39

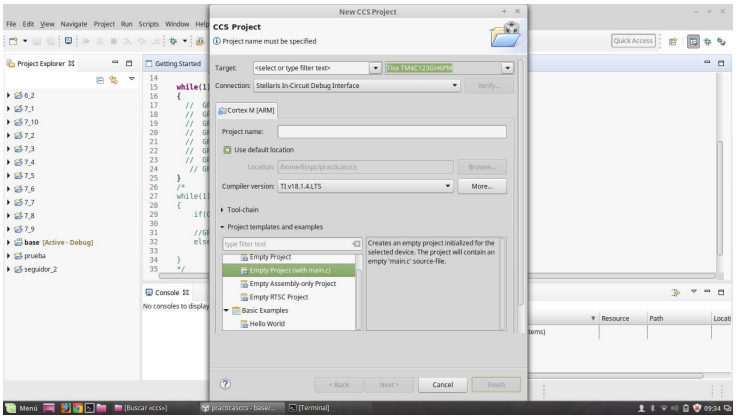
Capítulo 5

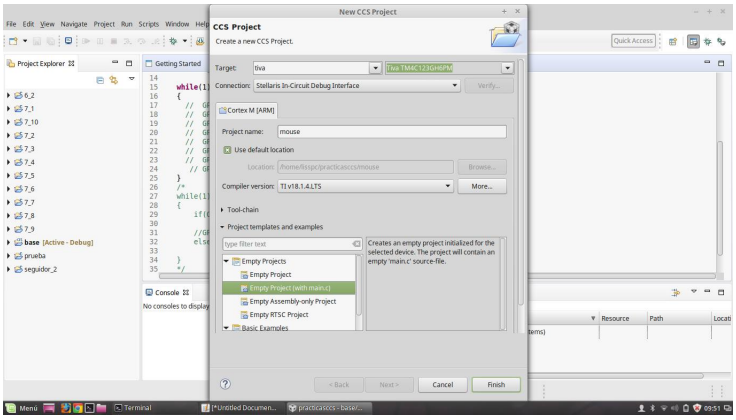
Desarrollo código

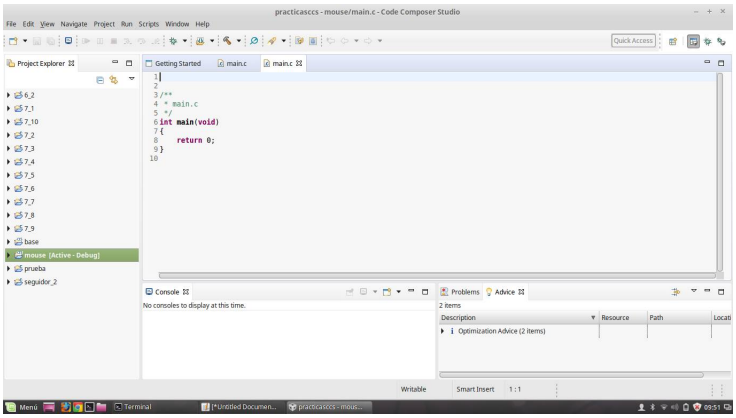
En Code Composer, abierto desde terminal, se creó un archivo nuevo, un CSS project con el título de *mouse*.
Se seleccionó como Target la Tiva C TM4C-123GH6PM (nombre del controlador a usar) y la conexión Stellaris In-Circuit Debug Interface.

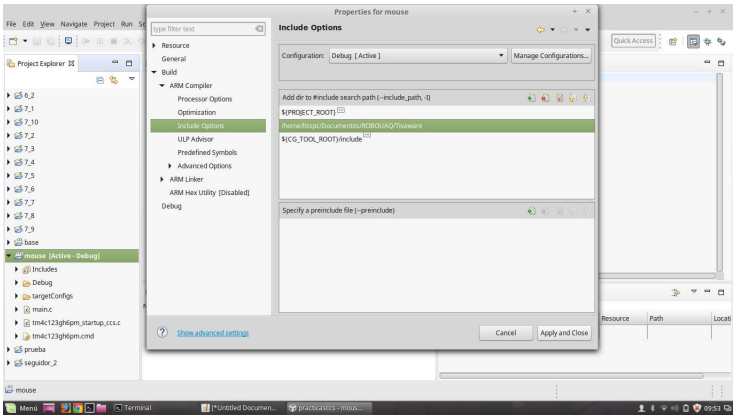
Se agregó la librería TivaWare, haciendo clic(k) derecho en Mouse, después, en el la lista que se ha desplegao, hacer click a Properties, Include Options>Browser>[Buscar Tiva Ware]

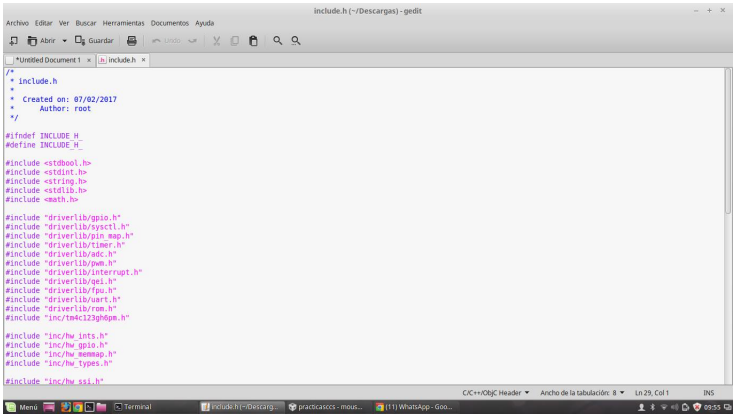
Se agregaron funciones de la libreria controladora de periféricos de la Tiva. estas se sacaron de: http://www.ti.com/lit/ug/spmu298d/spmu298d.pdf

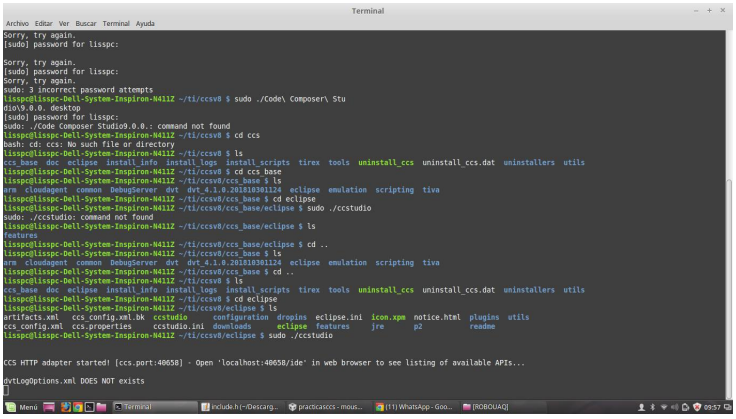


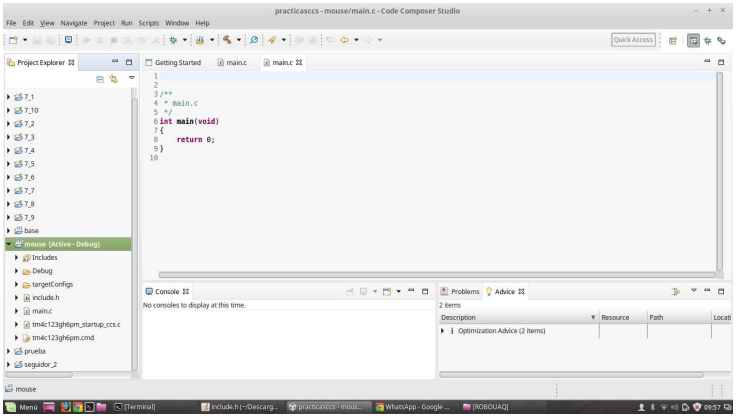

New CCS Project
CCS Project
Create a new CCS Project.
Target:
tiva
Tiva TM4C123GH6PM
Connection:
Stellaris In-Circuit Debug Interface
Cortex M [ARM]
Project name:
mouse
Use default location
Compiler version:
TI v18.1.4.LTS
More...
Tool-chain
Project templates and examples
Empty Projects
Empty Project
Empty Project (with main.c)
Empty Assembly-only Project
Empty RTSC Project
Basic Examples
Creates an empty project initialized for the selected device. The project will contain an empty 'main.c' source-file.
< Back
Next >
Cancel
Finish

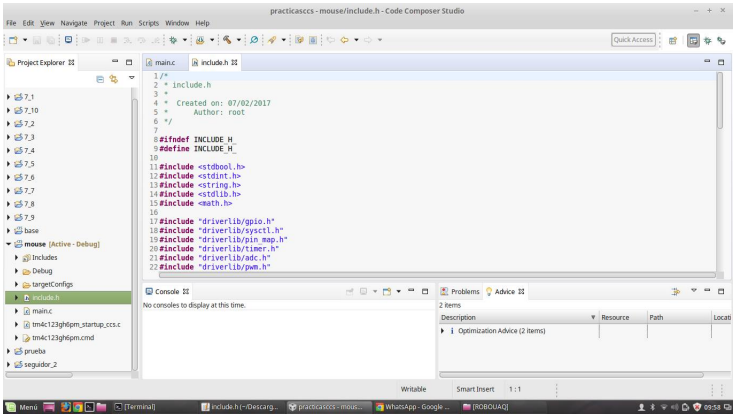

practicasccs - mouse/main.c - Code Composer Studio
main.c
/**
* main.c
*/
int main(void)
{
return 0;
}
mouse [Active - Debug]
No consoles to display at this time.
2 items
Optimization Advice (2 items)

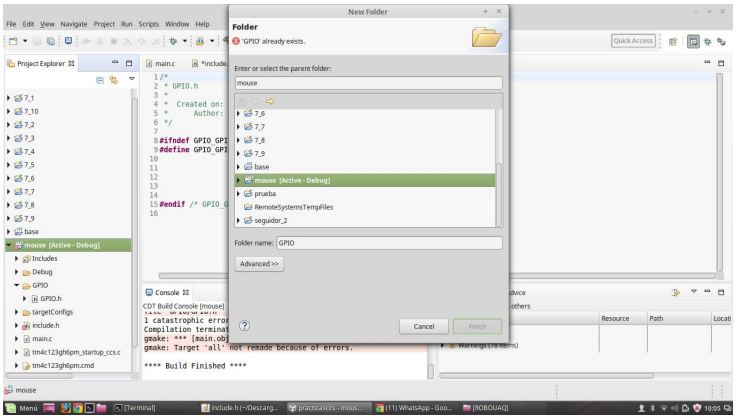

Properties for mouse
Include Options
Configuration: Debug [Active]
Manage Configurations...
Add dir to #include search path (--include_path, -I)
${PROJECT_ROOT}
/home/lisspc/Documentos/ROBOUAQ/Tivaware
${CG_TOOL_ROOT}/include
Specify a preinclude file (--preinclude)
Show advanced settings
Cancel
Apply and Close

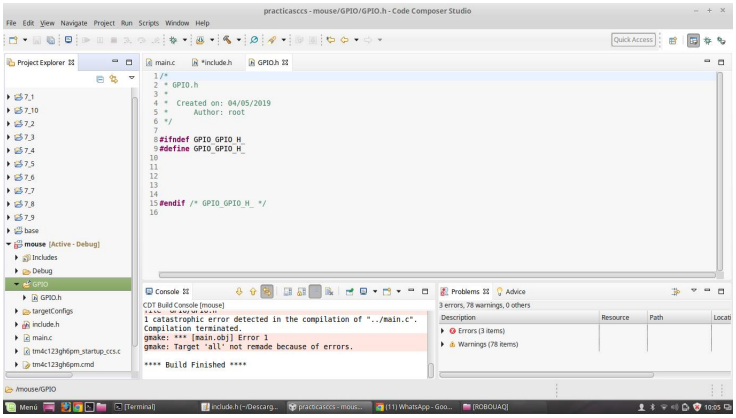

include.h (~/Descargas) - gedit
/*
* include.h
*
* Created on: 07/02/2017
* Author: root
*/
#ifndef INCLUDE_H_
#define INCLUDE_H_
#include <stdbool.h>
#include <stdint.h>
#include <string.h>
#include <stdlib.h>
#include <math.h>
#include "driverlib/gpio.h"
#include "driverlib/sysctl.h"
#include "driverlib/pin_map.h"
#include "driverlib/timer.h"
#include "driverlib/adc.h"
#include "driverlib/pwm.h"
#include "driverlib/interrupt.h"
#include "driverlib/qei.h"
#include "driverlib/fpu.h"
#include "driverlib/uart.h"
#include "driverlib/rom.h"
#include "inc/tm4c123ghdpm.h"
#include "inc/hw_ints.h"
#include "inc/hw_gpio.h"
#include "inc/hw_memmap.h"
#include "inc/hw_types.h"
#include "inc/hw_ssi.h"

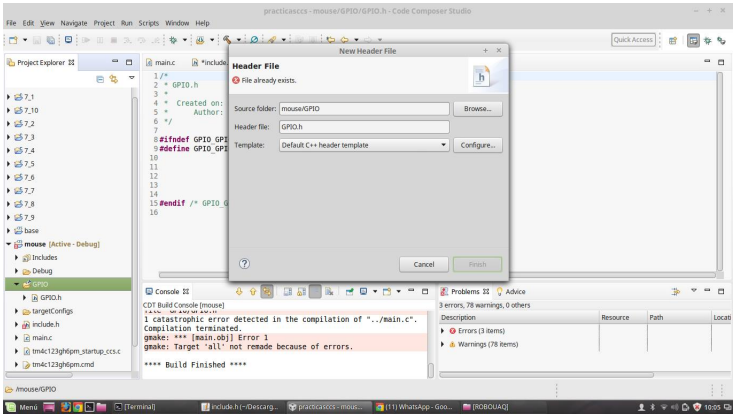

Terminal
Sorry, try again.
[sudo] password for lisspc:
Sorry, try again.
[sudo] password for lisspc:
Sorry, try again.
sudo: 3 incorrect password attempts
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8 $ sudo ./Code\ Composer\ Studio9.0.0. desktop
[sudo] password for lisspc:
sudo: ./Code Composer Studio9.0.0.: command not found
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8 $ cd ccs
bash: cd: ccs: No such file or directory
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8 $ ls
ccs_base doc eclipse install_info install_logs install_scripts tirex tools uninstall_ccs uninstall_ccs.dat uninstallers utils
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8 $ cd ccs_base
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/ccs_base $ ls
arm cloudagent common DebugServer dvt dvt_4.1.0.201810301124 eclipse emulation scripting tiva
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/ccs_base $ cd eclipse
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/ccs_base/eclipse $ sudo ./ccstudio
sudo: ./ccstudio: command not found
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/ccs_base/eclipse $ ls
features
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/ccs_base/eclipse $ cd ..
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/ccs_base $ ls
arm cloudagent common DebugServer dvt dvt_4.1.0.201810301124 eclipse emulation scripting tiva
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/ccs_base $ cd ..
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8 $ ls
ccs_base doc eclipse install_info install_logs install_scripts tirex tools uninstall_ccs uninstall_ccs.dat uninstallers utils
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8 $ cd eclipse
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/eclipse $ ls
artifacts.xml ccs_config.xml.bk ccstudio dropins eclipse.ini icon.xpm notice.html plugins utils
ccs_config.xml ccs.properties ccstudio.ini downloads eclipse features jre p2 readme
lisspc@lisspc-Dell-System-Inspiron-N411Z ~/ti/ccsv8/eclipse $ sudo ./ccstudio
CCS HTTP adapter started! [ccs.port:40658] - Open 'localhost:40658/ide' in web browser to see listing of available APIs...
dvtLogOptions.xml DOES NOT exists

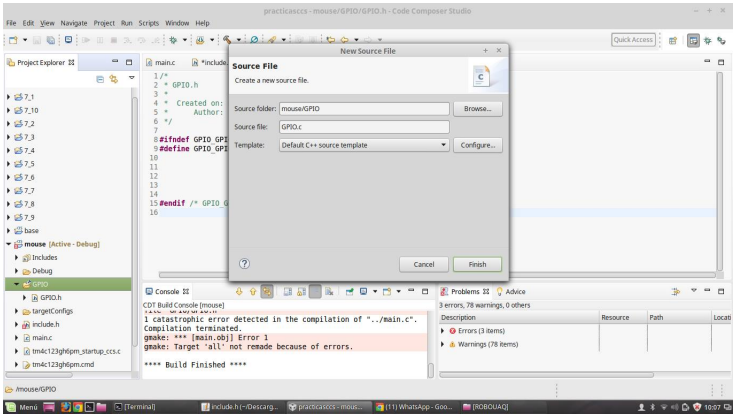

practicasccs - mouse/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
Getting Started
main.c
/**
* main.c
*/
int main(void)
{
return 0;
}
Console
No consoles to display at this time.
Problems
Advice
2 items
Optimization Advice (2 items)

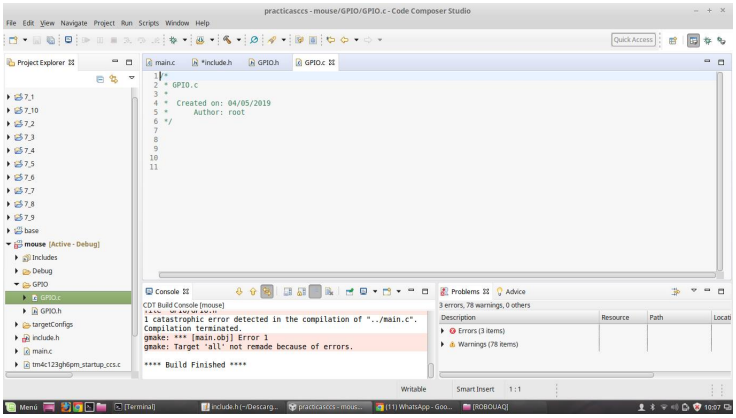

practicasccs - mouse/include.h - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
/*
* include.h
*
* Created on: 07/02/2017
* Author: root
*/
#ifndef INCLUDE_H
#define INCLUDE_H
#include <stdbool.h>
#include <stdint.h>
#include <string.h>
#include <stdlib.h>
#include <math.h>
#include "driverlib/gpio.h"
#include "driverlib/sysctl.h"
#include "driverlib/pin_map.h"
#include "driverlib/timer.h"
#include "driverlib/adc.h"
#include "driverlib/pwm.h"
Console
No consoles to display at this time.
Problems
Advice
2 items
Optimization Advice (2 items)
Writable
Smart Insert
1 : 1

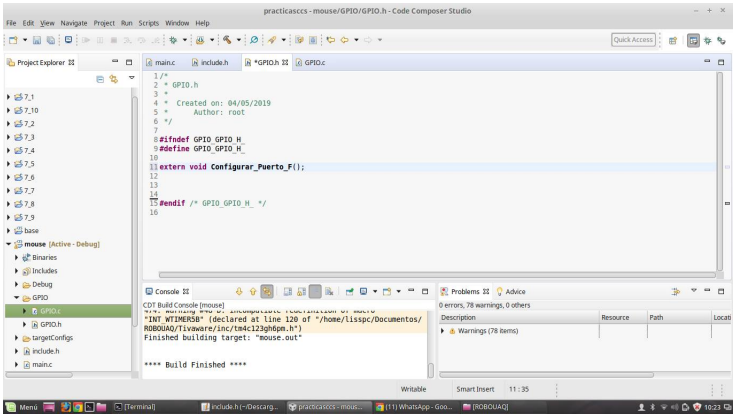

New Folder
Folder
'GPIO' already exists.
Enter or select the parent folder:
mouse
Folder name: GPIO
Advanced >>
Cancel
Finish
Project Explorer
main.c
GPIO.h
Console
CDT Build Console [mouse]
gmake: Target 'all' not remade because of errors.
**** Build Finished ****

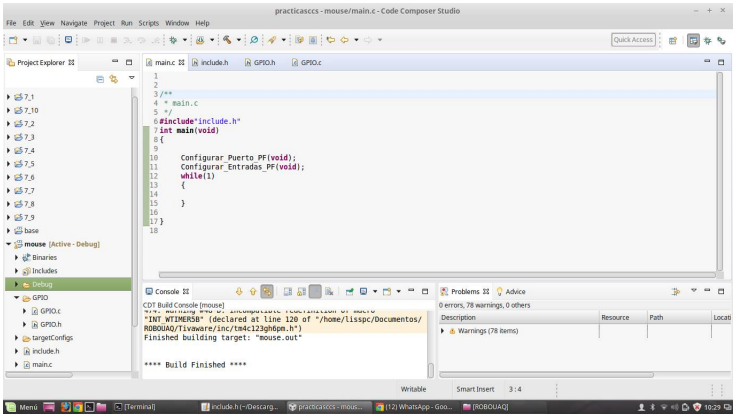

practicasccs - mouse/GPIO/GPIO.h - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
*include.h
GPIO.h
/*
* GPIO.h
*
* Created on: 04/05/2019
* Author: root
*/
#ifndef GPIO_GPIO_H_
#define GPIO_GPIO_H_
#endif /* GPIO_GPIO_H_ */
Console
CDT Build Console [mouse]
1 catastrophic error detected in the compilation of "../main.c".
Compilation terminated.
gmake: *** [main.obj] Error 1
gmake: Target 'all' not remade because of errors.
**** Build Finished ****
Problems
Advice
3 errors, 78 warnings, 0 others
Errors (3 items)
Warnings (78 items)
/mouse/GPIO

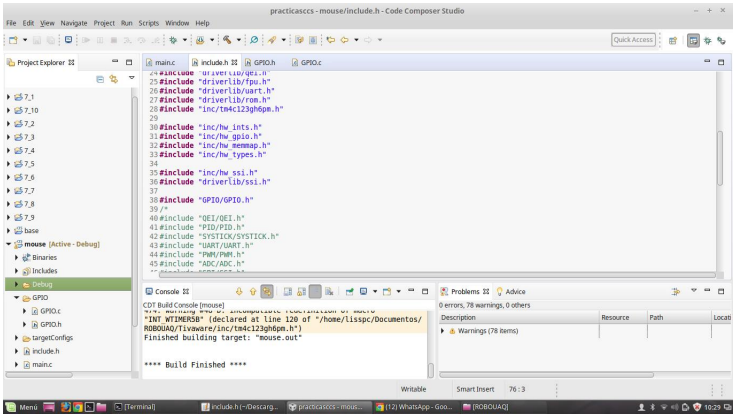

practicasccs - mouse/GPIO/GPIO.h - Code Composer Studio
New Header File
Header File
File already exists.
Source folder: mouse/GPIO
Header file: GPIO.h
Template: Default C++ header template
Browse...
Configure...
Cancel
Finish

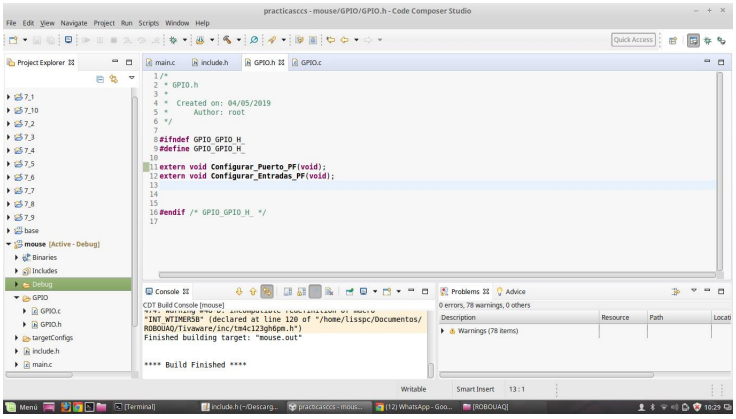

practicasccs - mouse/GPIO/GPIO.h - Code Composer Studio
New Source File
Source File
Create a new source file.
Source folder: mouse/GPIO
Source file: GPIO.c
Template: Default C++ source template
Browse...
Configure...
Cancel
Finish

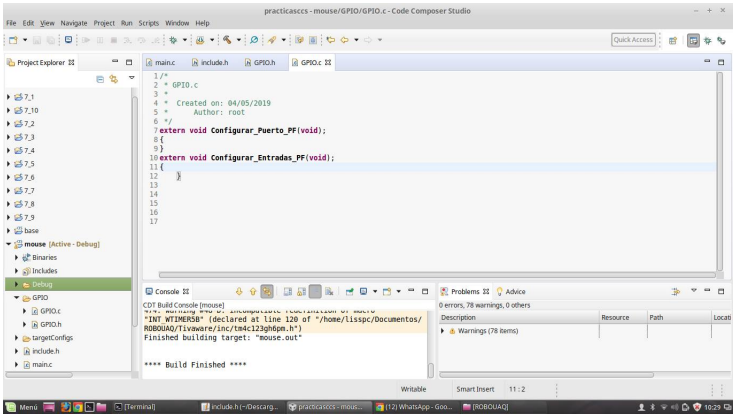

practicasccs - mouse/GPIO/GPIO.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
*include.h
GPIO.h
GPIO.c
/*
* GPIO.c
*
* Created on: 04/05/2019
* Author: root
*/
Console
CDT Build Console [mouse]
1 catastrophic error detected in the compilation of "../main.c".
Compilation terminated.
gmake: *** [main.obj] Error 1
gmake: Target 'all' not remade because of errors.
**** Build Finished ****
Problems
Advice
3 errors, 78 warnings, 0 others
Errors (3 items)
Warnings (78 items)

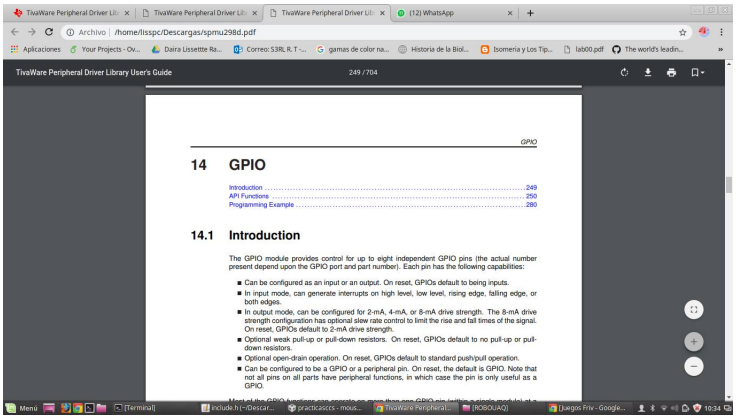

practicasccs - mouse/GPIO/GPIO.h - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
*GPIO.h
GPIO.c
/*
* GPIO.h
*
* Created on: 04/05/2019
* Author: root
*/
#ifndef GPIO_GPIO_H_
#define GPIO_GPIO_H_
extern void Configurar_Puerto_F();
#endif /* GPIO_GPIO_H_ */
Console
CDT Build Console [mouse]
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)


practicasccs - mouse/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
GPIO.c
/**
* main.c
*/
#include"include.h"
int main(void)
{
Configurar_Puerto_PF(void);
Configurar_Entradas_PF(void);
while(1)
{
}
}
Console
CDT Build Console [mouse]
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)


practicasccs - mouse/include.h - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
GPIO.c
#include "driverlib/fpu.h"
#include "driverlib/uart.h"
#include "driverlib/rom.h"
#include "inc/tm4c123gh6pm.h"
#include "inc/hw_ints.h"
#include "inc/hw_gpio.h"
#include "inc/hw_memmap.h"
#include "inc/hw_types.h"
#include "inc/hw_ssi.h"
#include "driverlib/ssi.h"
#include "GPIO/GPIO.h"
#include "QEI/QEI.h"
#include "PID/PID.h"
#include "SYSTICK/SYSTICK.h"
#include "UART/UART.h"
#include "PWM/PWM.h"
#include "ADC/ADC.h"
Console
CDT Build Console [mouse]
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)
Writable
Smart Insert
76 : 3


practicasccs - mouse/GPIO/GPIO.h - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
GPIO.c
/*
* GPIO.h
*
* Created on: 04/05/2019
* Author: root
*/
#ifndef GPIO_GPIO_H_
#define GPIO_GPIO_H_
extern void Configurar_Puerto_PF(void);
extern void Configurar_Entradas_PF(void);
#endif /* GPIO_GPIO_H_ */
Console
CDT Build Console [mouse]
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)
Writable
Smart Insert
13 : 1


practicasccs - mouse/GPIO/GPIO.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
GPIO.c
/*
* GPIO.c
*
* Created on: 04/05/2019
* Author: root
*/
extern void Configurar_Puerto_PF(void);
{
}
extern void Configurar_Entradas_PF(void);
{
}
Console
CDT Build Console [mouse]
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)
Writable
Smart Insert
11 : 2



TivaWare Peripheral Driver Library User's Guide 249 / 704

GPIO

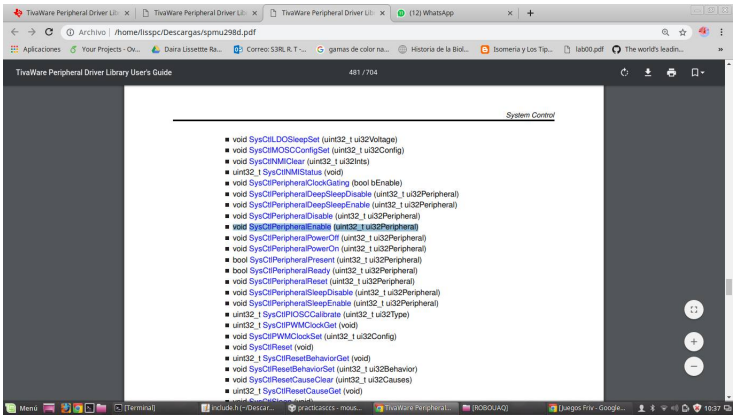
14 GPIO

Introduction 249
API Functions 250
Programming Example 280

14.1 Introduction

The GPIO module provides control for up to eight independent GPIO pins (the actual number present depend upon the GPIO port and part number). Each pin has the following capabilities:

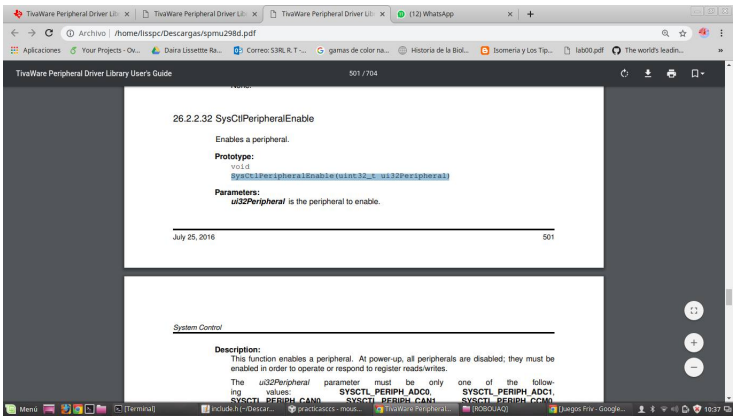
- Can be configured as an input or an output. On reset, GPIOs default to being inputs.
- In input mode, can generate interrupts on high level, low level, rising edge, falling edge, or both edges.
- In output mode, can be configured for 2-mA, 4-mA, or 8-mA drive strength. The 8-mA drive strength configuration has optional slew rate control to limit the rise and fall times of the signal. On reset, GPIOs default to 2-mA drive strength.
- Optional weak pull-up or pull-down resistors. On reset, GPIOs default to no pull-up or pull-down resistors.
- Optional open-drain operation. On reset, GPIOs default to standard push/pull operation.
- Can be configured to be a GPIO or a peripheral pin. On reset, the default is GPIO. Note that not all pins on all parts have peripheral functions, in which case the pin is only useful as a GPIO.



TivaWare Peripheral Driver Library User's Guide 481 / 704

System Control

- void SysCtlLDOSleepSet (uint32_t ui32Voltage)
- void SysCtlMOSCConfigSet (uint32_t ui32Config)
- void SysCtlNMIClear (uint32_t ui32Ints)
- uint32_t SysCtlNMIStatus (void)
- void SysCtlPeripheralClockGating (bool bEnable)
- void SysCtlPeripheralDeepSleepDisable (uint32_t ui32Peripheral)
- void SysCtlPeripheralDeepSleepEnable (uint32_t ui32Peripheral)
- void SysCtlPeripheralDisable (uint32_t ui32Peripheral)
- void SysCtlPeripheralEnable (uint32_t ui32Peripheral)
- void SysCtlPeripheralPowerOff (uint32_t ui32Peripheral)
- void SysCtlPeripheralPowerOn (uint32_t ui32Peripheral)
- bool SysCtlPeripheralPresent (uint32_t ui32Peripheral)
- bool SysCtlPeripheralReady (uint32_t ui32Peripheral)
- void SysCtlPeripheralReset (uint32_t ui32Peripheral)
- void SysCtlPeripheralSleepDisable (uint32_t ui32Peripheral)
- void SysCtlPeripheralSleepEnable (uint32_t ui32Peripheral)
- uint32_t SysCtlPIOSCCalibrate (uint32_t ui32Type)
- uint32_t SysCtlPWMClockGet (void)
- void SysCtlPWMClockSet (uint32_t ui32Config)
- void SysCtlReset (void)
- uint32_t SysCtlResetBehaviorGet (void)
- void SysCtlResetBehaviorSet (uint32_t ui32Behavior)
- void SysCtlResetCauseClear (uint32_t ui32Causes)
- uint32_t SysCtlResetCauseGet (void)



TivaWare Peripheral Driver Library User's Guide 501 / 704

26.2.2.32 SysCtlPeripheralEnable

Enables a peripheral.

Prototype:

```
void
SysCtlPeripheralEnable(uint32_t ui32Peripheral)
```

Parameters:

ui32Peripheral is the peripheral to enable.

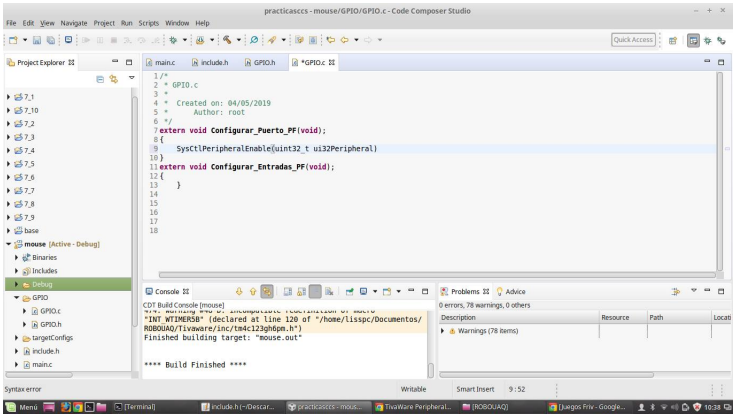
July 25, 2016 501

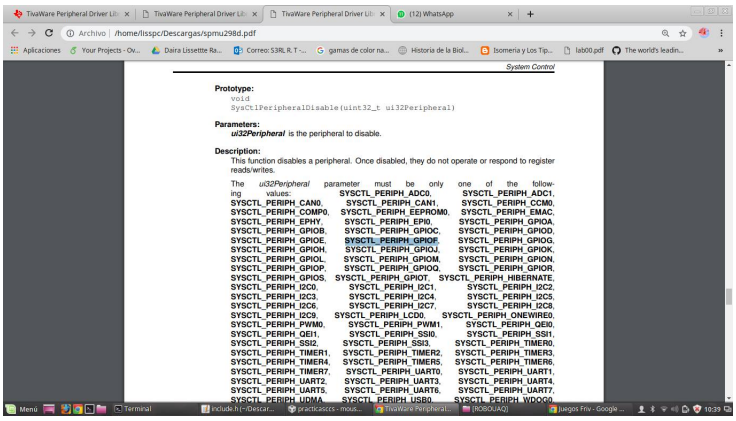
System Control

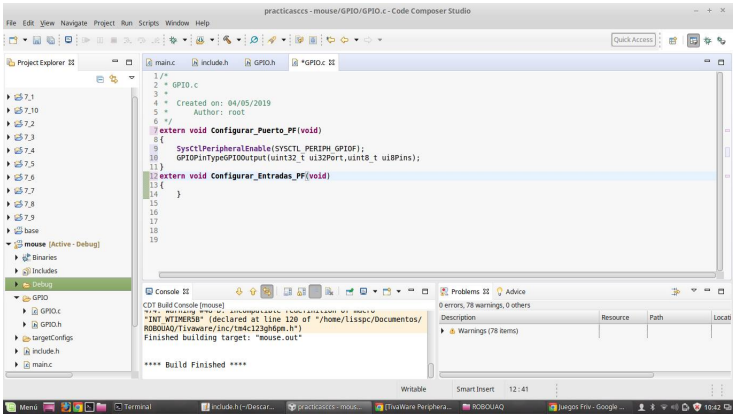
Description:

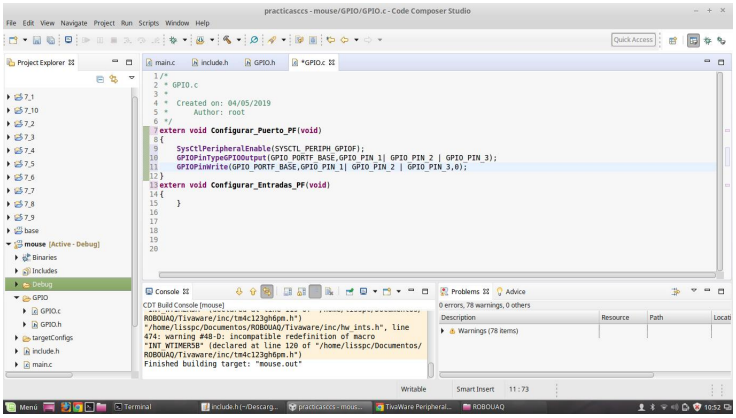
This function enables a peripheral. At power-up, all peripherals are disabled; they must be enabled in order to operate or respond to register reads/writes.

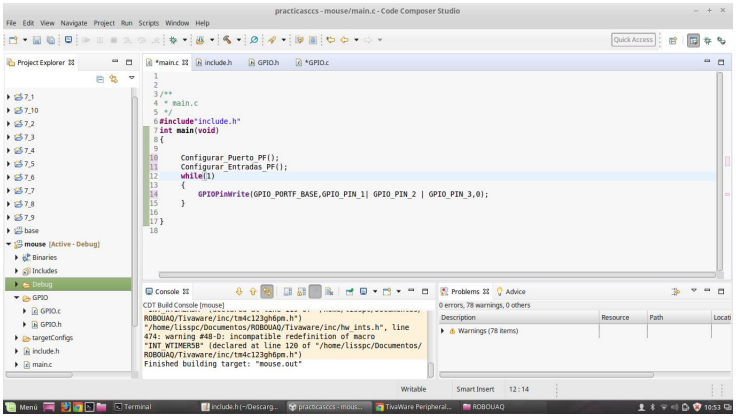
The *ui32Peripheral* parameter must be only one of the following values: **SYSCTL_PERIPH_ADC0**, **SYSCTL_PERIPH_ADC1**, **SYSCTL_PERIPH_CAN0**, **SYSCTL_PERIPH_CAN1**, **SYSCTL_PERIPH_COM0**,

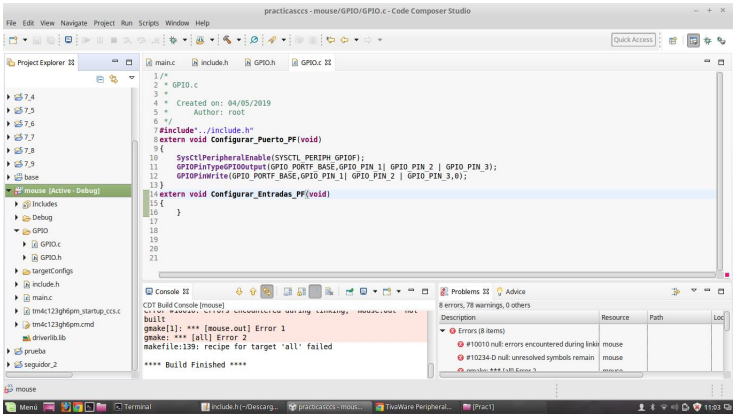

practicasccs - mouse/GPIO/GPIO.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
*GPIO.c
/*
* GPIO.c
*
* Created on: 04/05/2019
* Author: root
*/
extern void Configurar_Puerto_PF(void);
{
SysCtlPeripheralEnable(uint32_t ui32Peripheral)
}
extern void Configurar_Entradas_PF(void);
{
}
Console
CDT Build Console [mouse]
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)
Syntax error
Writable
Smart Insert
9 : 52

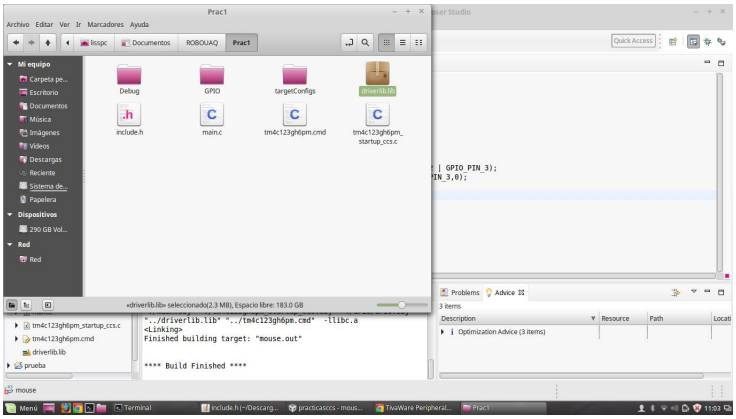

TivaWare Peripheral Driver Lib
(12) WhatsApp
Archivo | /home/lisspc/Descargas/spmu298d.pdf
System Control
Prototype:
void
SysCtlPeripheralDisable(uint32_t ui32Peripheral)
Parameters:
ui32Peripheral is the peripheral to disable.
Description:
This function disables a peripheral. Once disabled, they do not operate or respond to register reads/writes.
The ui32Peripheral parameter must be only one of the following values: SYSCTL_PERIPH_ADC0, SYSCTL_PERIPH_ADC1, SYSCTL_PERIPH_CAN0, SYSCTL_PERIPH_CAN1, SYSCTL_PERIPH_CCM0, SYSCTL_PERIPH_COMP0, SYSCTL_PERIPH_EEPROM0, SYSCTL_PERIPH_EMAC, SYSCTL_PERIPH_EPHY, SYSCTL_PERIPH_EPI0, SYSCTL_PERIPH_GPIOA, SYSCTL_PERIPH_GPIOB, SYSCTL_PERIPH_GPIOC, SYSCTL_PERIPH_GPIOD, SYSCTL_PERIPH_GPIOE, SYSCTL_PERIPH_GPIOF, SYSCTL_PERIPH_GPIOG, SYSCTL_PERIPH_GPIOH, SYSCTL_PERIPH_GPIOJ, SYSCTL_PERIPH_GPIOK, SYSCTL_PERIPH_GPIOL, SYSCTL_PERIPH_GPIOM, SYSCTL_PERIPH_GPION, SYSCTL_PERIPH_GPIOP, SYSCTL_PERIPH_GPIOQ, SYSCTL_PERIPH_GPIOR, SYSCTL_PERIPH_GPIOS, SYSCTL_PERIPH_GPIOT, SYSCTL_PERIPH_HIBERNATE, SYSCTL_PERIPH_I2C0, SYSCTL_PERIPH_I2C1, SYSCTL_PERIPH_I2C2, SYSCTL_PERIPH_I2C3, SYSCTL_PERIPH_I2C4, SYSCTL_PERIPH_I2C5, SYSCTL_PERIPH_I2C6, SYSCTL_PERIPH_I2C7, SYSCTL_PERIPH_I2C8, SYSCTL_PERIPH_I2C9, SYSCTL_PERIPH_LCD0, SYSCTL_PERIPH_ONEWIRE0, SYSCTL_PERIPH_PWM0, SYSCTL_PERIPH_PWM1, SYSCTL_PERIPH_QEI0, SYSCTL_PERIPH_QEI1, SYSCTL_PERIPH_SSI0, SYSCTL_PERIPH_SSI1, SYSCTL_PERIPH_SSI2, SYSCTL_PERIPH_SSI3, SYSCTL_PERIPH_TIMER0, SYSCTL_PERIPH_TIMER1, SYSCTL_PERIPH_TIMER2, SYSCTL_PERIPH_TIMER3, SYSCTL_PERIPH_TIMER4, SYSCTL_PERIPH_TIMER5, SYSCTL_PERIPH_TIMER6, SYSCTL_PERIPH_TIMER7, SYSCTL_PERIPH_UART0, SYSCTL_PERIPH_UART1, SYSCTL_PERIPH_UART2, SYSCTL_PERIPH_UART3, SYSCTL_PERIPH_UART4, SYSCTL_PERIPH_UART5, SYSCTL_PERIPH_UART6, SYSCTL_PERIPH_UART7, SYSCTL_PERIPH_UDMA, SYSCTL_PERIPH_USB0, SYSCTL_PERIPH_WDOG0,

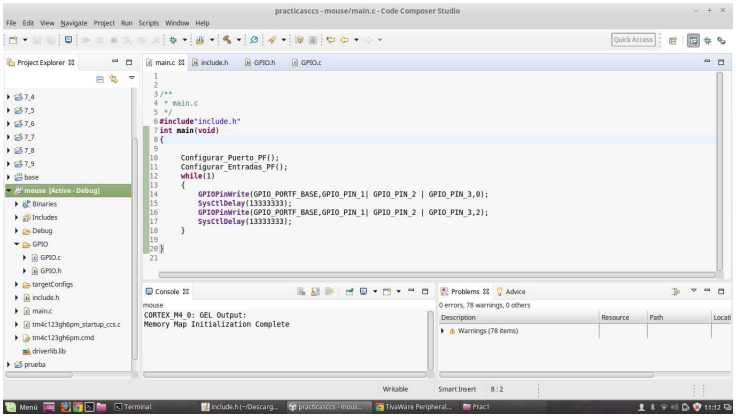

practicasccs - mouse/GPIO/GPIO.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
*GPIO.c
/*
* GPIO.c
*
* Created on: 04/05/2019
* Author: root
*/
extern void Configurar_Puerto_PF(void)
{
SysCtlPeripheralEnable(SYSCTL_PERIPH_GPIOF);
GPIOPinTypeGPIOOutput(uint32_t ui32Port,uint8_t ui8Pins);
}
extern void Configurar_Entradas_PF(void)
{
}
Console
CDT Build Console [mouse]
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)
Writable
Smart Insert
12 : 41

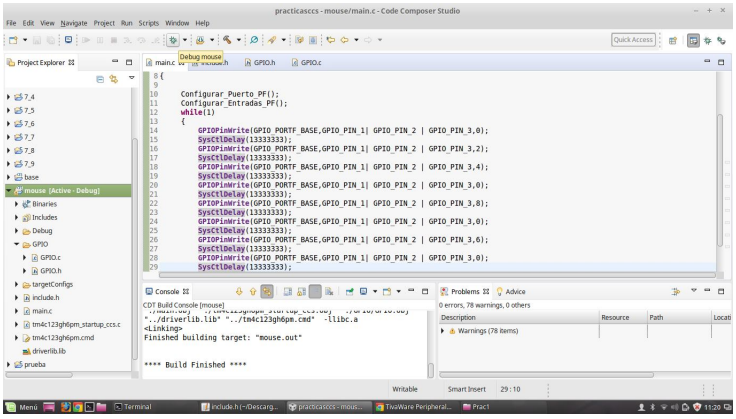

practicasccs - mouse/GPIO/GPIO.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
*GPIO.c
/*
* GPIO.c
*
* Created on: 04/05/2019
* Author: root
*/
extern void Configurar_Puerto_PF(void)
{
SysCtlPeripheralEnable(SYSCTL_PERIPH_GPIOF);
GPIOPinTypeGPIOOutput(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
}
extern void Configurar_Entradas_PF(void)
{
}
Console
CDT Build Console [mouse]
ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
"/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/hw_ints.h", line
474: warning #48-D: incompatible redefinition of macro
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/
ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
Problems
Advice
0 errors, 78 warnings, 0 others
Description
Resource
Path
Warnings (78 items)
Writable
Smart Insert
11 : 73


practicasccs - mouse/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
*main.c
include.h
GPIO.h
*GPIO.c
/**
* main.c
*/
#include"include.h"
int main(void)
{
Configurar_Puerto_PF();
Configurar_Entradas_PF();
while(1)
{
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
}
}
Console
CDT Build Console [mouse]
ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
"/home/lisspc/Documentos/ROBOUAQ/Tivaware/inc/hw_ints.h", line
474: warning #48-D: incompatible redefinition of macro
"INT_WTIMER5B" (declared at line 120 of "/home/lisspc/Documentos/
ROBOUAQ/Tivaware/inc/tm4c123gh6pm.h")
Finished building target: "mouse.out"
Problems
Advice
0 errors, 78 warnings, 0 others
Description
Resource
Path
Warnings (78 items)
Writable
Smart Insert
12 : 14


practicasccs - mouse/GPIO/GPIO.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
GPIO.c
/*
* GPIO.c
*
* Created on: 04/05/2019
* Author: root
*/
#include"../include.h"
extern void Configurar_Puerto_PF(void)
{
SysCtlPeripheralEnable(SYSCTL_PERIPH_GPIOF);
GPIOPinTypeGPIOOutput(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
}
extern void Configurar_Entradas_PF(void)
{
}
Console
CDT Build Console [mouse]
built
gmake[1]: *** [mouse.out] Error 1
gmake: *** [all] Error 2
makefile:139: recipe for target 'all' failed
**** Build Finished ****
Problems
Advice
8 errors, 78 warnings, 0 others
Description
Resource
Path
Errors (8 items)
#10010 null: errors encountered during linki
mouse
#10234-D null: unresolved symbols remain
mouse

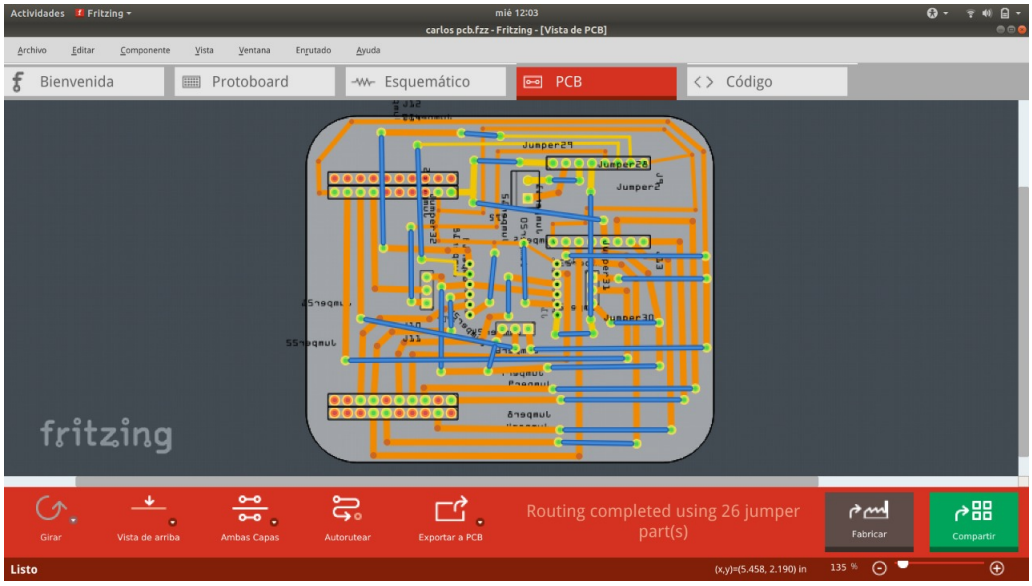

Prac1
Archivo Editar Ver Ir Marcadores Ayuda
Mi equipo
Dispositivos
Red
Debug
GPIO
targetConfigs
driverlib.lib
include.h
main.c
tm4c123gh6pm.cmd
tm4c123gh6pm_startup_ccs.c
«driverlib.lib» seleccionado(2.3 MB), Espacio libre: 183.0 GB
"../driverlib.lib" "../tm4c123gh6pm.cmd" -llibc.a
<Linking>
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
Optimization Advice (3 items)


practicasccs - mouse/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
main.c
include.h
GPIO.h
GPIO.c
/**
* main.c
*/
#include"include.h"
int main(void)
{
Configurar_Puerto_PF();
Configurar_Entradas_PF();
while(1)
{
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,2);
SysCtlDelay(13333333);
}
}
Console
CORTEX_M4_0: GEL Output:
Memory Map Initialization Complete
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)

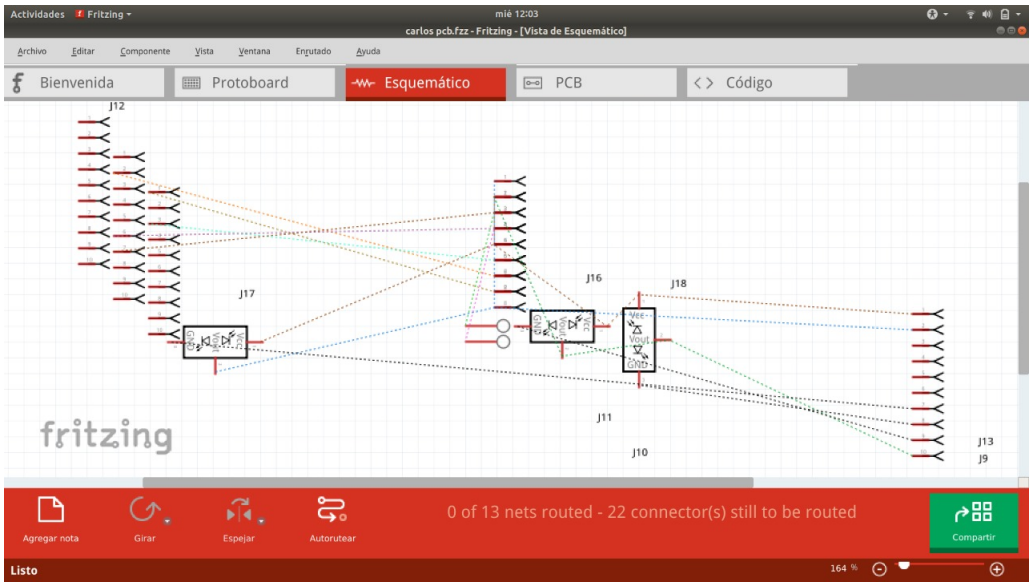

practicasccs - mouse/main.c - Code Composer Studio
File Edit View Navigate Project Run Scripts Window Help
Project Explorer
Debug mouse
GPIO.h
GPIO.c
{
Configurar_Puerto_PF();
Configurar_Entradas_PF();
while(1)
{
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,2);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,4);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,8);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,6);
SysCtlDelay(13333333);
GPIOPinWrite(GPIO_PORTF_BASE,GPIO_PIN_1| GPIO_PIN_2 | GPIO_PIN_3,0);
SysCtlDelay(13333333);
CDT Build Console [mouse]
"../driverlib.lib" "../tm4c123gh6pm.cmd" -llibc.a
<Linking>
Finished building target: "mouse.out"
**** Build Finished ****
Problems
Advice
0 errors, 78 warnings, 0 others
Warnings (78 items)

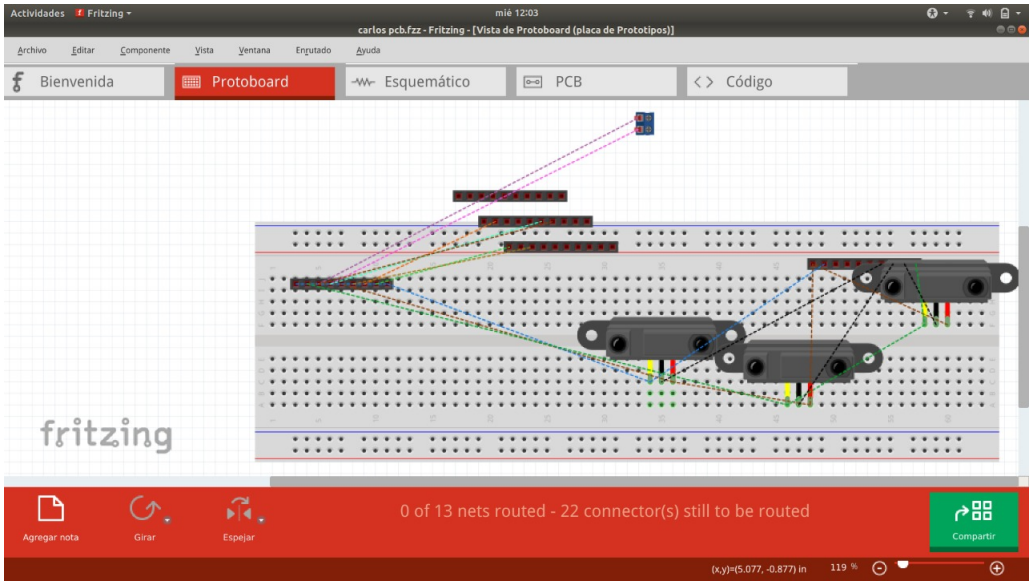
Capítulo 6

Diseño de Placa



Para optimizar el diseño y las conexiones del carrito, se diseñó una placa. Esto se realizó en el programa Fritzing .
Finalmente, por cuestiones de presupuesto y tiempo no se mandó a imprimir.


Actividades
Fritzing
mié 12:03
carlos pcb.fzz - Fritzing - [Vista de Esquemático]
Archivo
Editar
Componente
Vista
Ventana
Enrutado
Ayuda
Bienvenida
Protoboard
Esquemático
PCB
Código
J12
J17
J16
J18
J11
J10
J13
J9
fritzing
Agregar nota
Girar
Espejar
Autorutear
0 of 13 nets routed - 22 connector(s) still to be routed
Compartir
Listo
164 %


Actividades
Fritzing
mié 12:03
carlos pcb.fzz - Fritzing - [Vista de Protoboard (placa de Prototipos)]
Archivo
Editar
Componente
Vista
Ventana
Enrutado
Ayuda
Bienvenida
Protoboard
Esquemático
PCB
Código
fritzing
Agregar nota
Girar
Espejar
0 of 13 nets routed - 22 connector(s) still to be routed
Compartir
(x,y)=(5.077, -0.877) in
119 %