PSoC 4 BLE : Accelerometer Controlled CAR

Objective

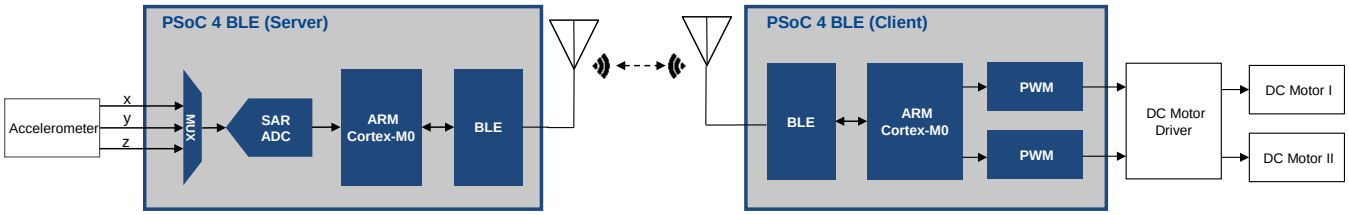
This example demonstrates how to control a Car using an accelerometer with PSoC 4 BLE device.

Overview

This example is demonstrated using two projects, one which acts as a server and provides an interface to the accelerometer. This device measures the X, Y and Z information from an accelerometer and sends this information to the BLE Client, which controls the DC motor. Figure 1 shows the block diagram for this application.

The overall block-diagram of this design in shown in Figure 1:

Figure 1: BLE Accelerometer Controlled CAR Overall Block Diagram



Requirements

Tool: PSoC Creator 3.1 SP2

Programming Language: C (GCC 4.8.4 – included with PSoC Creator)

Associated Devices: All PSoC 4 BLE devices

Related Hardware:

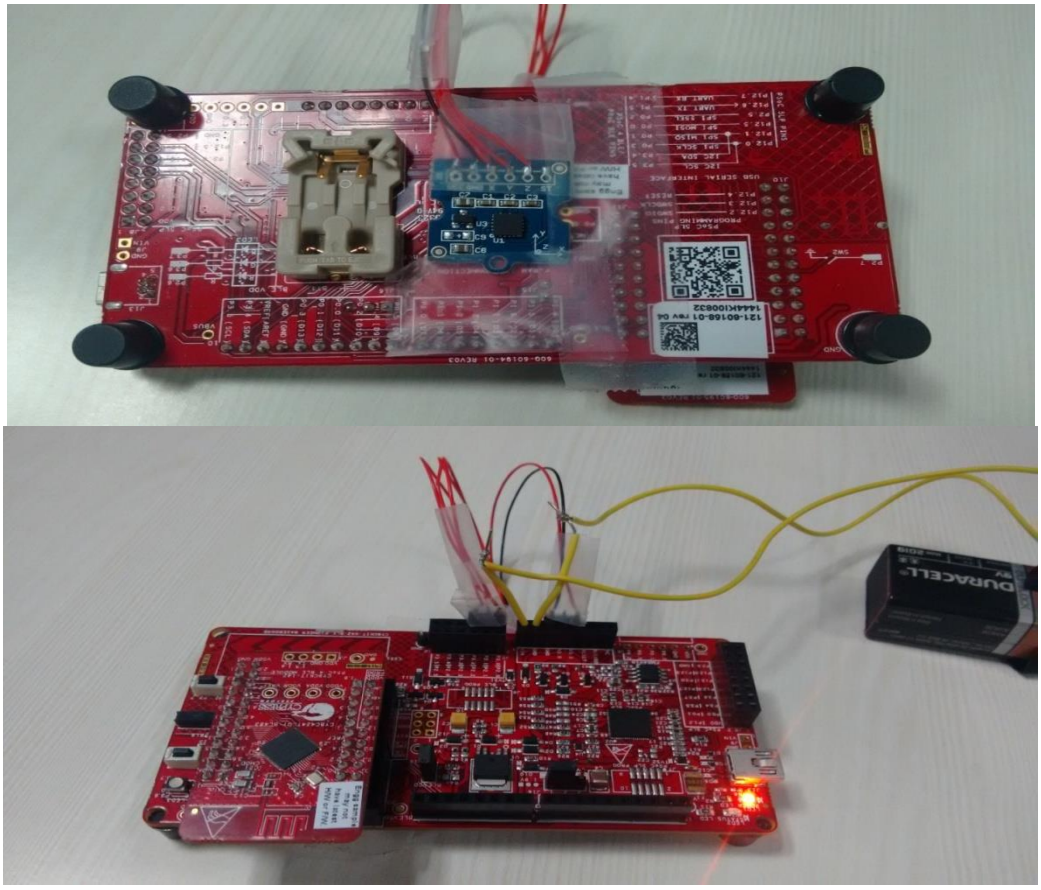
- 2x CY8CKIT-042-BLE Pioneer Kit
- ADXL335 Accelerometer module
- 9-12 V Battery
- L293D Motor Driver Board
- 2x D-C Motor
- 2x Wheels

Hardware Setup

To work with this example, you need the hardware listed under **Requirements**.

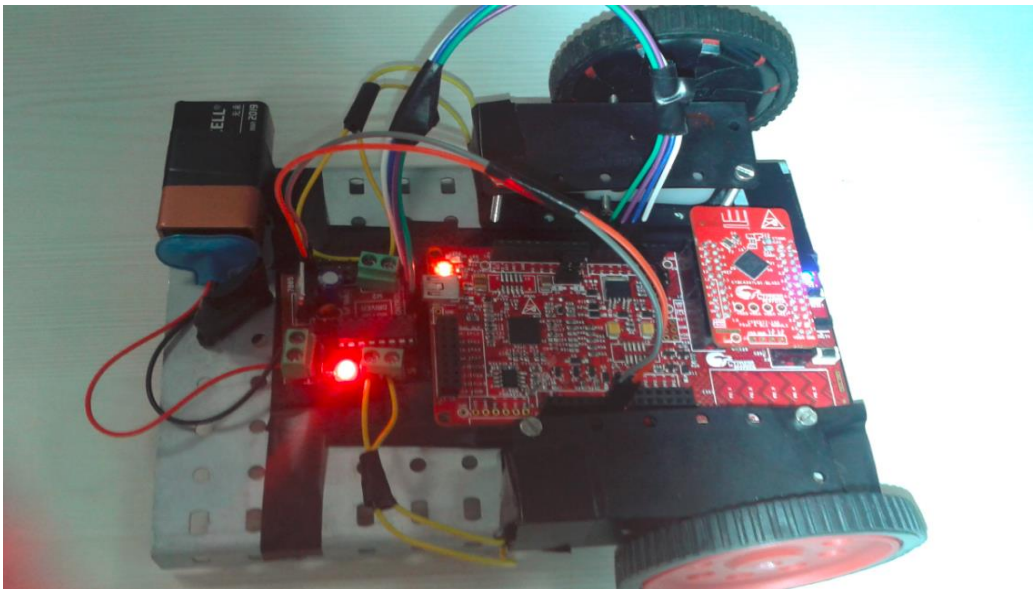
BLE Server Project (Accelerometer): The accelerometer X, Y and Z voltages are respectively fed to the pins P3.0, P3.1 and P3.2 (J2, Pin 1, 3 and 5 respectively) of the Pioneer Board. The accelerometer Pioneer Board can be powered using a 5 V Battery by connecting the positive terminal of the battery to the VIN Pin of the Pioneer Board (J1, Pin 1). The necessary connections are shown in Figure 2.

Figure 2: Accelerometer Connection Diagram



BLE Client Project (Motor Control): We can directly use the L293D Motor Driver Board for the design. We need to power this board with a 9-12 V battery. This board also has 5V Regulator which can be used to power the Pioneer Board by connecting the regulator output to VIN Pin of the Pioneer Board (J1, Pin 1). Make necessary connections from this board to the DC Motors. Also make four connections from the Pioneer Board to the 4 Control Signals available on the Motor Driver Board. These signals would control the motor. In this design, we use the Pins P1.0, P1.1, P1.2 and P1.3 as the control signals (J4, Pins 8, 7, 6 and 5 respectively). The necessary connections are shown in Figure 3.

Figure 3: Motor Control: Connection Diagram



PSoC Creator Schematic

Figure 4 and Figure 5 shows the PSoC Creator Schematic of the BLE Server and the BLE Client Project respectively.

Figure 4: PSoC Creator Schematic (Accelerometer, BLE Server)

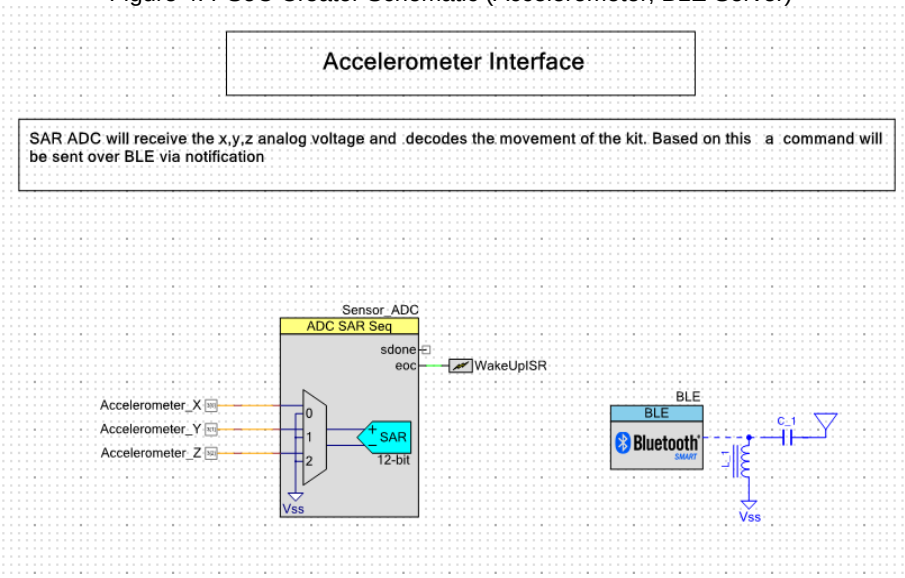
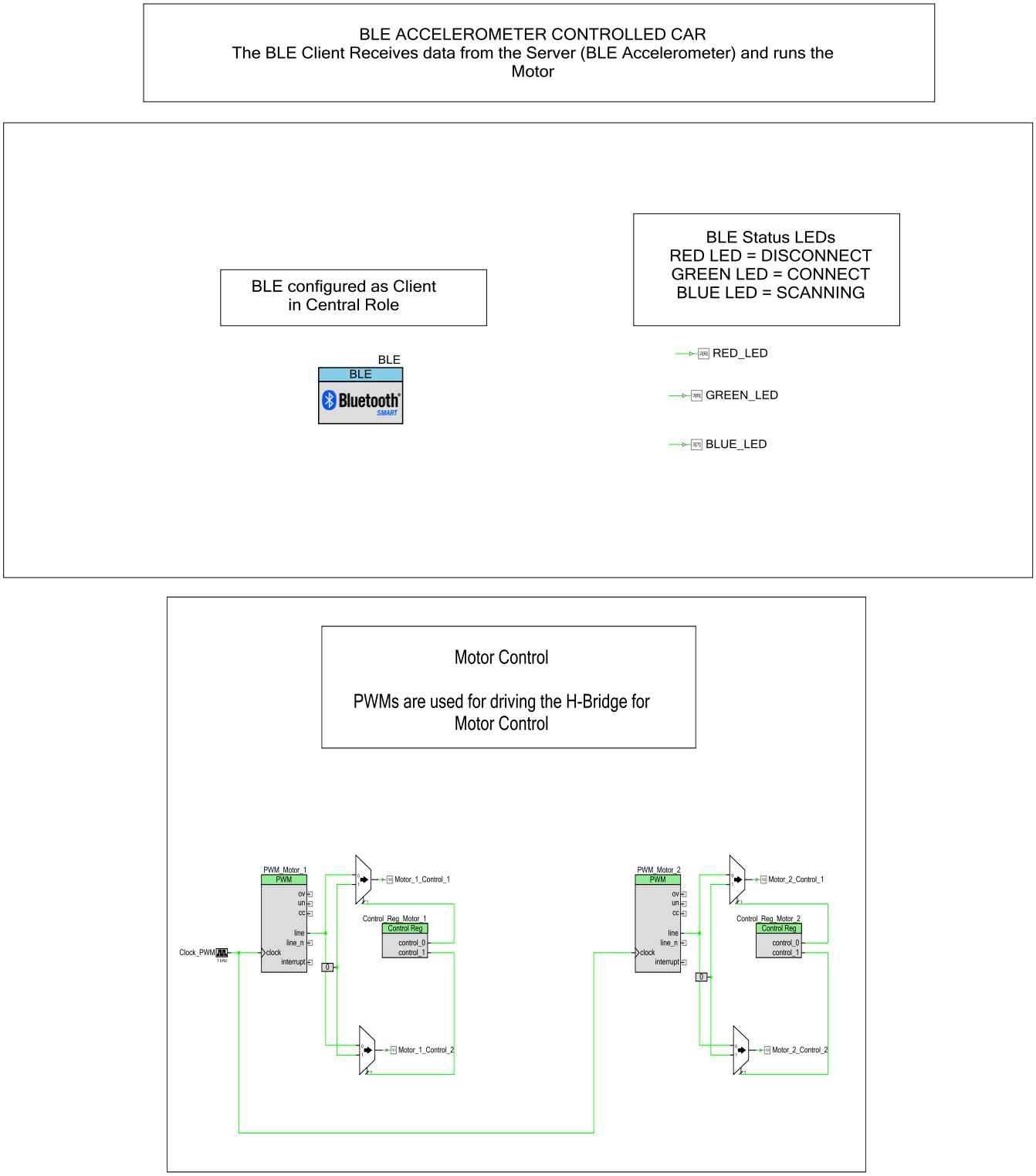


Figure 5: PSoC Creator Schematic (Motor Control, BLE Client)



Project Description

The server project which is configured as a peripheral consists of PSoC4-BLE Pioneer kit interfaced with an analog accelerometer. The accelerometer will give three analog voltages x, y, z based on the x, y, z coordinates. The SAR ADC available in the PSoC4-BLE will read the coordinates and understand the gesture. Based on this, a command will be send to the client. The commands can be “Left”, “Right”, “Forward”, ”Backward” or “Stop”. The kit is powered by a 5V battery for portability. For better power performance, the PSoC4-BLE is kept in low power modes during idle time.

The BLE component uses a custom profile for sending the data. The data is sent to the Client over notification. The data will be a 1 byte value corresponding to the command. The Client will decode the command from the value sent.

The BLE Client Project is configured in Central Role. This project also uses a Custom Profile. The commands received from the Server are used to control 2 PWMs which in turn would control the Motor.

Testing

Program the Accelerometer project to One Pioneer Board and the Motor Control Project to another Pioneer Board. Make the necessary hardware connections in both the projects.

The two kits would connect automatically. The Green LED in the Client Board would glow indicating that the two devices are connected. Now, you can control the Accelerometer board (Server) by moving it front, back, left and right. You can then see the car moving in the corresponding direction. When the accelerometer is brought to the rest position, the car would also stop.

Related Documents

Application Notes		
AN91267	Getting Started with PSoC® 4 BLE	AN91267 introduces you to PSoC® 4 BLE, an ARM® Cortex™-M0 based Programmable System-on-Chip (PSoC) that integrates a Bluetooth Low Energy (BLE) radio system. This application note helps you explore the PSoC 4 BLE architecture and development tools and shows how easily you can create a BLE design using PSoC Creator
AN91162	Creating a BLE Custom Profile	AN91162 describes the methodology for developing a Bluetooth® Low Energy (BLE) application with PSoC 4 BLE or PRoC BLE devices using a custom BLE profile. It provides an overview of custom profiles and services and the procedure to build an application with PSoC 4 BLE using RGB LED control as an example.
AN92584	Designing for Low Power and Estimating Battery Life for BLE Applications	AN92584 teaches you how to design low-power applications with PSoC 4/PRoC™ BLE devices. It also guides you on how to compute the current consumption and battery life for a BLE application and provides tips and tricks to minimize the current consumption to increase battery life.