Module 1

Introduction: Running code on the LaunchPad using CCS

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Educational Objectives:

REVIEW Software development methodology
UNDERSTAND How to set up an Integrated Development Environment
EXPLORE The out of box examples
LEARN How to import and export CCS projects
DESIGN, BUILD & TEST A SYSTEM
Understand the debug tools and plug-ins

Prerequisites (None)
- None

Recommended reading materials for students:
- MSP432P401R SimpleLink™ Microcontroller LaunchPad™ Development Kit (MSP‑EXP432P401R) User Guide (SLAU597)
- MSP-EXP432P401R Quick Start Guide (SLAU596)
- MSP432P4xx Technical Reference Manual (SLAU356)
- MSP432P401Rx Datasheet (SLAS826)
- TI Resource Explorer (MSP432 SimpleLink SDK)
- TI SimpleLink Academy (http://dev.ti.com/MSP432-Simplelink-Academy)

Introduction to the curriculum

In the following modules you will learn about the concepts of robotics in the context of embedded systems. The most important part of the robot will be the main processor or “brain” of the system. The processor will manage the programmable logic of the system and interface with the peripherals for inputs such as sensors and outputs such as motors.

To prepare us to build the robotic system, we will first learn how to master the processor by setting up our hardware development kit and the software development environment used to write the software to control our system.

Software Development

The first step to any embedded development is to set up the software development environment we plan to use once the hardware has been chosen. It is often popular and wise to choose an Integrated Development Environment (IDE). An IDE can have a list of features that aid in the ease or speed of software development. In the hardware context, this could include providing critical debugging information needed to understand the memory usage and performance of the software on the processor.

Code Composer Studio (CCS) is an industry-ready IDE option that is provided by Texas Instruments for use with TI microcontrollers and embedded processors. CCS has many features that make it very capable for professional engineers to develop firmware for real products. It comprises a suite of tools (optimizing C/C++ compiler, source code editor, project build environment, debugger, profiler) used to develop and debug embedded applications. Because it can do so much, it can also be a lot to learn for beginners, but don’t get discouraged as this module will direct you on how to set up CCS so you can go through exercises smoothly as you build your robotic system.

Your code is stored inside of a CCS project. A project can contain many items including your code files, configurations, and other relevant files.

The Project Explorer in CCS shows us the various components used for each project. A **linker** builds a single software system by connecting (linking) software components. In CCS, the **build** command performs both a compilation and a linking.

In an embedded system, the **loader** will program object code into flash on the microcontroller. We place object code in flash ROM because flash is retains its information if power is removed and restored. In CCS, the **Debug** command performs a load operation and starts the debugger.

A **debugger** is a set of hardware and software tools we use to verify system is operating correctly. The two important aspects of a good debugger are control and observability.

A logic analyzer is a tool that will help you debug your circuit. You can view in real time the signals that are being generated on the pins. In this course we will make use of the TExaSdisplay logic analyzer. This is a free tool that works within the MSP432 LaunchPad and uses your PC for display.

In the lab associated with this module, you will install your copy of Code Composer Studio and test some code examples that are provided for your LaunchPad as a getting started exercise. This will be a good starting point as we familiarize ourselves with the main digital control unit of the explorer robot.

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