



模块 1

简介：使用 **CCS** 在 **LaunchPad** 上进行编程



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教学目标：

回顾 软件开发方法

理解 如何配置集成开发环境

探索 开箱例程

学习 如何导入和导出 CCS 工程

设计、构建和测试系统

了解调试工具和插件

需要预先学习的模块（无）

- 无

推荐阅读材料：

- 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>)

课程内容介绍

在本模块中您将学习如何从嵌入式系统的角度出发，来理解机器人的概念。机器人上最重要的部分就是它的“大脑”，即主处理器。主处理器负责通过程序来控制系统的逻辑，并与其他外围设备进行交互，例如从传感器获取输入信号，或者为电机提供输出信号。

为了给将来自己搭建机器人系统做好准备，我们需要先学会搭建机器人套件的硬件，以及配置软件开发环境以便于后续软件开发工作。

软件开发

对于任何嵌入式开发，当硬件确定之后，第一件事情就是配置软件开发环境。通常来说使用集成开发环境（IDE）是一个明智的选择。IDE 中一般会有很多功能可以帮助我们简化开发难度，或者加快开发速度。比如说 IDE 可以提供关键的调试信息，以帮助我们了解存储空间的使用情况，以及软件在处理器中执行的性能。

Code Composer Studio（CCS）是由德州仪器（TI）推出的一款 IDE，它可以支持 TI 的微控制器及嵌入式处理器开发。CCS 拥有许多强大的功能，使它能够用于帮助工程师进行针对真实产品的软件开发。它包含一系列嵌入式软件开发和调试所需的工具，包括优化型 C/C++ 编译器、代码编辑器、工程编译环境、调试工具和代码剖析工具。正因为 CCS 的功能如此强大，所以对于初学者来说可能需要一些时间来掌握。不过请不用担心，本章节的目的就是指引您学会如何使用 CCS，从而为后面章节的学习，以及开发自己的机器人系统打好基础。

在 CCS 中，您的代码都保存在一个工程（project）当中。一个工程下面可以包含很多内容，包括代码文件、配置文件、以及其他相关文件。

CCS 中的工程浏览器（Project Explorer）用于浏览工程中的所有文件。**链接器（linker）** 用于将所有这些文件连接起来，生成一个软件系统。在 CCS 中，执行 **build** 命令会同时完成编译和链接工作。

在嵌入式系统中，**加载器（loader）** 会将程序烧写到微控制器的 flash 存储器中。之所以要将程序烧写到 flash 当中，是因为 flash 中的内容在掉电之后不会消失。在 CCS 中，**Debug** 命令可以完成代码烧写的过程，并同时打开调试器。

调试器（debugger） 包含一系列硬件和软件工具，我们可以用这些工具来验证系统是否正常运行。一个合格的调试器应当具备的两个重要功能是控制程序执行和观察运行结果。

逻辑分析仪可以帮助您调试您的电路。通过逻辑分析仪您可以看到处理器引脚上的实时波形。在本课程中，我们将使用一个免费的逻辑分析仪工具，它叫做 TExaSdisPlay。它可以在 MSP432 LaunchPad 上运行，并通过电脑屏幕显示结果。

在本章节的实验环节中，您将安装 CCS 开发环境，并在 LaunchPad 上运行几个例程作为起点。这将帮助我们熟悉机器人的数字控制单元。

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