



模块 5

简介：电池及电压调节



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教学目标：

测量 电池的电压、电流和能量

理解 机器人的电压调节

接口 这些电路需要用电池为机器人供电

需要预先学习的模块（模块 2）

- 电压、电流、能量、功率（模块 2）
- 电阻、电容（模块 2）

推荐阅读材料

- Volume 1 Section 1.1
Embedded Systems: Introduction to the MSP432 Microcontroller, ISBN: 978-1512185676, Jonathan Valvano, copyright © 2017

或

- Volume 2 Section 9.2
Embedded Systems: Real-Time Interfacing to the MSP432 Microcontroller, ISBN: 978-1514676585, Jonathan Valvano, copyright © 2017

每个嵌入式系统都需要电源来运行。能量的来源可能是

- 120 VAC 60hz，带交流到直流转换器
- 直流电源，如 USB +5V 或汽车+12V
- 电池
- 能源收集，如太阳能或电磁场拾取

调试 LaunchPad 时，通过 USB 线从 PC 上使用+5V。然而，要让机器人自主运行，它需要电池供电。电池电压不稳定，随年龄和使用而降低。因此，您将使用一个调节器提供一个恒定的电压来为机器人的大部分电子设备供电。在本模块中，我们将介绍两种类型的**调节器（regulator）**：线性调节器和开关调节器。在选择监管机构时有很多考虑，我们将讨论其中的一些考虑。

您可以直接从电池电压上给机器人电机供电。电池盒可以容纳 2 节 AA 电池。如果您使用镍氢电池（每个 3.7V），这将为机器人创建一个+7.2V 的电源。电机不需要恒定的电压就能运转，直接靠电池运行是最有效的能源利用方式。正如您可能想象的那样，电机使用了机器人所需的大部分能量。

机器人将采用电池+7.2V 输入，产生+5V 稳压电源。特别是，您将使用匠牛的电机驱动器和电源板。我们将在这个模块中解释电池和电压调节。您将连接+5V 稳压电源到 LaunchPad，LaunchPad 将使用自己的稳压电源创建一个+3.3V 电源。LaunchPad 用这个+3.3V 为 MSP432 提供动力。MSP432 本身在芯片内部有调节器。例如，VCORE 是处理器运行时的内部电压，通常为+1.2V。您可以直接从电池上给电机供电，一些外部设备是+5V，另一些是+3.3V。

存储在电池中的**能量（energy）**（E 单位是焦耳）可以通过电压（V 单位是伏特）、电流（I 单位是安培）和时间（t 单位是秒）来计算。能量既没有极性也没有方向。电池的能量额定值以安培-小时计算，因为假设电压是恒定的。实验材料清单（BOM）中列出的镍氢电池的额定功率为 450 mA-hr。这意味着电池可以提供 1 安培 0.45 小时。其中 2 个串联电池，在 1 安培的情况下可以提供 7.2V，持续 0.45 小时。

在与此模块相关的实验中，见图 1，您将研究电池，测量其能量存储。接下来，您将构建/接口所需的电路来为 LaunchPad 提供电池供电。将电机直接从电池上断开，一些外部设备使用+5V，另一些使用+3.3V。

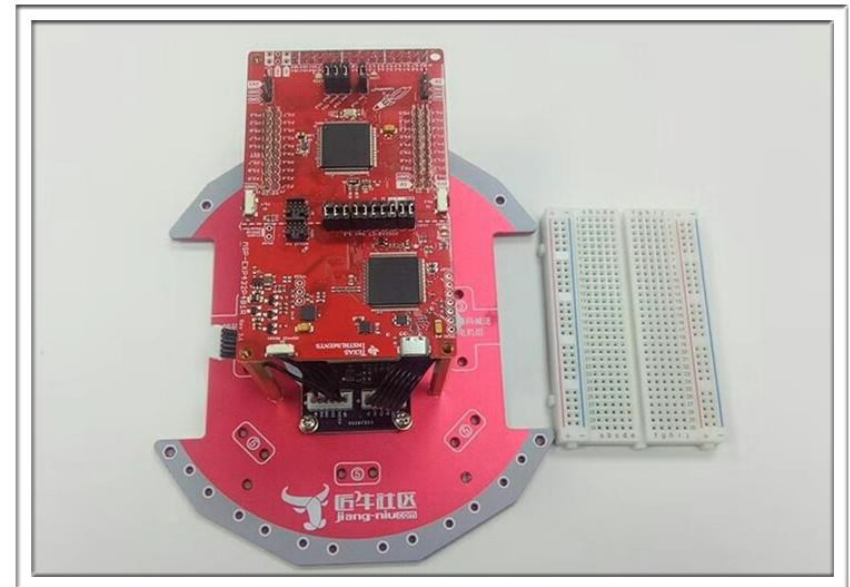


图 1 所示：匠牛底盘，电机驱动板和电源板，LaunchPad，和面包板。

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