

Industrial Placement Presentation

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The ARM logo is displayed in a large, bold, teal-colored font. It consists of the letters 'A', 'R', and 'M' in a sans-serif typeface, followed by a registered trademark symbol (®) in a small circle.

Presentation Outline

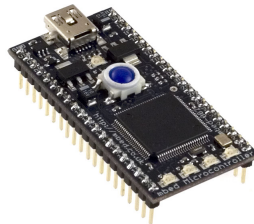
- 1 Introduction
- 2 Project
- 3 Conclusions
- 4 Questions

The Company

- Founded in 1990 by Acorn Computers (BBC Micro), Apple Computer (Apple Inc) and VLSI Technology
- 15+ billion ARM based chips shipped to date
- ARM based chips found in devices such as the Nintendo DS, Kindle and HTC Desire
- Licenses technology as Intellectual Property (IP); licensees manufacture the chips

My Role

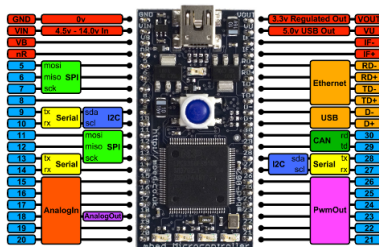
- Worked as part of the mbed team in the System Design Division (SDD)
- Designed as a low entry barrier tool for embedded systems, rapid prototyping and ARM architecture (LPC1768 version features ARM Cortex-M3)



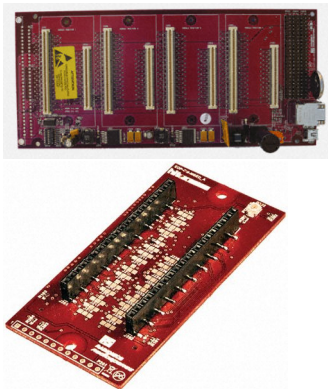
mbed

Key Features

- Online compiler with C/C++ IDE
- 40-pin 0.1" pitch form-factor
- mbed core library (UART, SPI, I2C, Interrupts etc.)
- Cookbook wiki and community driven support



The Project



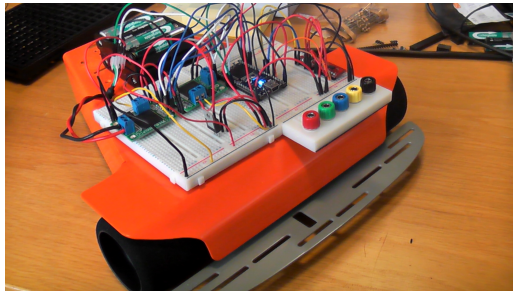
- Reference Design for client company RS Components
- Using their Embedded Development Platform (EDP) which featured an mbed carrier module
- Involved meeting the client, taking on board feedback from alpha/beta releases and writing documentation for the final release

Motor Control Reference Design

- Use the EDP Motor Control application modules to create a wheeled robot that could accept Logo-like commands
- Quadrature encoders, H-bridges and Proportional-Integral-Derivative controllers for accurate movement and motor control
- Inertial sensors and attitude control filters for accurate turns and orientation sensing

mbed Rover

- Written up as a series of blog posts on client's website
- Mentioned on hackaday!
- Generic libraries put on the mbed cookbook; used by others for different applications
- Accepts simple commands like "move forward 2[metres]" and "turn right 90[degrees]"



Other Work

- Software to allow the mbed to program AVR chips
- Libraries for various inertial sensors and components not used in the final mbed Rover design
- Cookbook [wiki] pages for the all the libraries

Experience

Experience Gained

- Confidence with C/C++
- Improved understanding of microprocessors and processors in general
- Solid foundation of practical robotics
- Electronics and hardware appreciation and how to hand solder packages that look impossible...

Lessons Learnt

- Doing seemingly "simple" things in robotics isn't trivial
- Learning something new and implementing it takes longer than you think

Useful Degree Knowledge

Courses

- Operating Systems: interrupts, buffers, shared resources, ...
- Architecture: pipelines, clock cycles, optimisations, ...
- Hardware: digital circuits, registers, memory, ...
- (Object Oriented) Programming: classes, code re-use, structure, abstraction, ...
- Linux Lab: C experience

Questions

Any Questions?