Arduino DCC Control

How do we use the Arduino Ecosystem for our DCC layouts

What Will be Covered

- Quick Arduino review
- DCC and DCC++ concepts
- Arduino Hardware for DCC++
- Arduino Software
- DCC++ demo
- Connecting Devices
- Speedometer Demo
- Automation Demo

Arduino Overview

- Arduino is an open source computer hardware and software company out of Italy
- Original product was developed for education by offering a low cost development product
- Rapidly grew into a DIY ecosystem with a large product range and following.

Arduino Overview

- "Arduino" commonly refers to the hardware and software platform
- The company also developed software to ease the development (programming) process
- There are many components or shields available to address many sensing and automation needs

DCC Concept

- Digital Command Control
- Originally Developed by Lenz in Germany
- NMRA Standard
- Standard consist of 2 parts
 - electrical
 - communication
- Many vendors have followed
- Most have stayed with the standards

DCC++ Concept

- Open Source software and hardware system
- Follows the NMRA standards and guidelines for DCC
- Hardware specific
- Runs on Arduino Uno or Mega
- Requires an Arduino Motor Shield
- Supports all gauges and handles about. 3 amp

DCC++ Hardware

DCC++ can use either an UNO or MEGA
We will use a Mega for our implementation



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DCC++ Hardware

- DCC++ requires a motor shield to drive the rail power
- There are two types of shields available
- Arduino Motor Shield R3
- Pololu Dual MC33926 Motor Shield
- We will use the Arduino Motor Shield for our implementation

Arduino Motor Shield



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Motor Shield Modification



DCC++ Software

- The software is Open Source
- The design concept consists of 2 modules
- DCC++ Base Station
- DCC++ Controller
- The DCC++ Base Station is a combination of the hardware and the software loaded on the Arduino
- The DCC++ design uses software rather than a throttle to control the Base Station

DCC++ Software

- The developers provide a controller package that is very fundamental but requires lots of modifications since it is intended for the developers layout
- JMRI is also supported and that is what we will be using in our demo
- The demo keeps it simple by using the USB port to access the Base Station. Other connection options are available.

DCC++ Demo

Connecting Devices



Pin Assignment

- 1 = Ground (black)
- 2 = VCC (5 volt positive) (red)
- 3 = Signal (white or Yellow)

Signal Type

Push Button= Digital (on or off)Variable Resistor= AnalogueSensor= Digital or Analogue depending on sensor type

TCRT5000 Photoelectric Switch





- Infrared Sensor
- Readily Available
- Allows for Analogue and Digital feedback
- Adjustable Reflective trigger depth
- Reliable but has issues with pure black
- Sensor bulky and hard to conceal
- Separating sensor and module helps

Introduction to Speed Calculation

- In our case it is really scale speed calculation
- For prototypical representation speed is critical
- Speed matching is important for consisting
- Speed calculation is based on
 - Start point
 - Distance
 - Time
 - End point

Speed Calculation Continued

- So we can base the speed calculation on the following
 - Speed = (Distance * Time) / Scale
- In order to calculate Speed to MPH we need other variables

Speed Calculation Continued

- L = length of travel in inches
- F = scale factor
- T = time in seconds for locomotive to travel length.

Scale MPH = ((L x F/12)/5280) x 3600/T

Speedometer Demo



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Comparative Photo Sensor



- Uses 2 photo sensors
- Compares T1 with T2
- if T1 is less than T2 than something is covering T1
- Very compact and reliable
- Originally designed by Geoff Bunza self modified
- Assembly Required

Comparative Photo Sensor



- Designed to replace ties
- Can be painted as long as the lenses are clear
- Can be buried or hidden in other ways
- Solid state so long life span

Arduino Demo



Where to Buy

- Arduino
- SparkFun
- Adafruit
- Amazon
- ebay

http://www.arduino.cc http://www.sparkfun.com http://www.adafruit.com http://www.amazon.com http://www.ebay.com

or you can order them from me

Thank You for your time

If you have any further questions you can reach me at

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