Virtual Railroading

Computer Based Operations Using Railroading Simulators

Rich Blake
slugsmasher@oakharbor.net
www.steammachine.com/slugsmasher
Overview

• Track planning methods for OPS
• Rail simulators history and overview
• “Trainz Railroad Simulator” and practical application to model railroading
• Prototype/layout study and OPS development
• NMRA requirements towards Chief Dispatcher AP using virtual railroading
Track Planning for Operations

• Traditional methods, prototype study
• Resources
  – John Armstrong, Tony Koester, OPSIG, LDSIG
  – MR Mags/Books/Prototype
  – Layout Design Elements
• Scenery and/or Operations
• Computer Aids
  – Static – 2d CAD diagrams
  – Dynamic – 3d CAD diagrams, simulators and operations

• Experience using other people’s layouts.
Track Planning for OPS

Traditional example using pencil and paper, very time consuming and sometimes not accurate
Old School 2D and 3D

Ops planning is going to be limited to what you can imagine in your head.
Typical computer based CAD track planning software allows a bit more fidelity with OPS mode but still limited to simply running consists in circles.
Planning for Operations - Goals

- Bridge the gap between prototype and model
- Timetable development
- How long do those “extras” really take?
- Industrial switching development
- Yard management
- Model railroad operations in it’s most basic definition is essentially a game

- *Rail simulators support all these points and can be used as a tool to enhance our model railroading experience*
Railroad Simulators For Operations

It’s not just video games for kids.
Simulators Definition

• Commercial Simulators
  – Used for training and qualification of actual railway personnel. Focus on functionality with various levels of quality in graphics and interfaces. Not normally available to public.
Simulators Definition

• PC Simulators
  – Personal use. Glorified computer games with the “serious enthusiast” in mind. Mimics actual operations in the simulated environment. High graphics and physics performance with many “bells and whistles” (features) to enhance experience.
Simulators and Model Railroading

• Pros
  – Freeworld environments
  – No limits to space or detail
  – Easy to build layouts
  – Prototype route study, operations study
  – Be the engineer
  – Caters to many different interests
  – Several types of equipment, structures, routes
  – Unlimited potential (content creation)
  – Can be used in many ways like an actual model layout
  – It’s FUN
Simulators and Model Railroading

• Cons
  – Track placement not as accurate as CAD for LD
  – No benchwork or model railroad space specific tools
  – Requires steep learning curve to create AI based scenarios and custom content
  – Limited multiplayer options
  – Computer requirements for performance
  – Can be time consuming
  – Resistance to embrace this type of virtual model railroading due to the perception that it is just a video game for kids
History of PC Train Sims

Train sims have been around as long as computers. Most were either small switching exercises or railroad empire strategy/management. Some notable releases:

1983 “Trains” Commodore 64
1990 Sid Meier’s “Railroad Tycoon” PC DOS
2001 Microsoft Train Simulator
2002 Auran’s “Trainz Railroad Simulator” (TRS) – (active)
2009 Railworks/Railroad Simulator (“Train Simulator 2015”) – (active)
2012 RUN 8 Train Simulator – (active)
Commercial Train Simulators
Practical Application – Trainz (TRS)
Surveyor Mode

- Route building
- Track laying, grades, turnouts
- Measuring tools
- Topography tools
- Prototype routes
- Camera views
- Operation sessions building
Digital Elevation Model

DEM import function allows use of spacial imaging data to create terrain in Trainz. Exact duplicates of actual prototype track layouts with topographical features can then be created in the virtual world. DEM data is available from the USGS.
Driver Mode

- Drive trains
- Switching cars
- View/Cam options
- Operations
- Rules for automated (AI) trains
- Signaling
DriverMode

Environment

- Control mode: CAB Mode
- Weather type: Clear
- Weather mode: No change
- Time setup: Apply new time
- Garage rate: Time Rate is 4x
- Unit mode: Imperial mode
- Derailment mode: No derailment
Track Planning and Operations

- Experimenting with scenery
- Fly bys on prototype routes
- Layout design element testing
- Try out switching moves
- Develop operational scenarios
- Signal placement and testing
- Practice driving with momentum
- Develop time tables
- Test car forwarding with car cards, switchlists or JMRI
Track Planning and Operations

- BNSF Edmonds layout post ops study

How to go from butt kicking to massively efficient switching master
Track Planning and Operations

- BNSF Edmonds
Track Planning and Operations

- BNSF Edmonds
Track Planning and Operations

- BNSF Edmonds
Hull Oakes Case Study

- Using the prototype to create a layout design element
- Building and operating in TRS
Hull Oakes

Prototype
Hull Oakes

N-scale Layout real example
Maybe you would like to make this but want to test it out first before committing the time, effort and materials.
Build a sim layout and run it all you want
Hull Oakes

Trainz layout (time to build this was about 4 hours)
Prototype Study

• Many routes are available that are near exact duplicates of the prototype in distance, trackage, scenery and topography making them a very valuable resource for layout and ops development

• Experience different physics characteristics of locomotives and train types, electric, diesel, steam, international, narrow gauge, etc.

• Time distances for layout time table application

• View and study signalling, speed limits, passing sidings, crossings, etc

• Practice and study realistic times for switching, brake checks and grade speeds (yes you can use dynamic brakes)

• The more you practice the better you will be prepared not only on your own layout but on OTHER people’s layouts. Nobody wants to be “that guy”.

• Practice, study, become a RR expert in several prototype areas without endless book study and internet surfing. Learn by doing or just do some railfanning.
Prototype – Tehachapi Loop
Prototype – Tehachapi Loop
Prototype – Tehachapi Loop
Prototype – Stevens Pass
Prototype – BNSF Mukilteo
Virtual OPS for NMRA AP Steps

- Prepare a schematic drawing
- Develop a time table
- Develop an operating train chart
- Develop a system of operations
  - Car forwarding method
  - TTTO, TWC, CTC
  - JMRI integration
Virtual OPS for NMRA AP

• For an NMRA Chief DS AP we actually have three options for the final requirements:
  – Your own operating layout
    • Requires years of prep
  – Somebody else’s operating layout
    • Requires friends
  – Railroad Simulator Layout
    • Requires a computer which saves lots of time
GTW Holly Sub Project

- Prototype selection based on ready route availability within the retail TRS package and ample reference material on the internet.
Developing the Schematic

TRS Route Modifications

- Named additional locations as required.
- Added staging areas.

Then used TRS included map view to draw out rough schematic in pencil on graph paper.
Developing the Schematic

Also during the pencil drawing stage, the TRS route spurs and yard trackage were measured using TRS layout building tools to gain reference information to be used on the final schematic for the DS and in JMRI to build locations accurately for car movements.
Developing the Schematic

For the final schematic, JMRI Panel Editor was used since it is fairly simple to use and was good practice for using some of JMRI’s other features besides just programming decoders.
Building the Timetable

- Prototype timetables were used for passenger train movements.
- Speed limits were set according to Employee Time Tables within TRS using speed limit trackside objects to control AI train speed. This allowed passenger trains to run an automated schedule while testing freight train movements and determining transit times and train meet locations.
- A DS train movement sheet was created in MS Excel to provide a method to log and track all train movements.
Building the Timetable

- Speed signs control AI speeds
- Track markers provide AI routing
- AI will control turnouts/signals as required
Building the Timetable

• Test scheduled trains were ran across the route using a 4:1 fast clock setting in TRS and times recorded for reference on the DS train movement sheet.
• Roster and locations were built in JMRI with routes created in JMRI with industry switching for the extras. This generated trains and car movements that were further used to create an accurate train movement time for each train.
Building the Timetable

- Since all trains other than passenger are extras, a legacy type TTTO timetable is not used but the reference times are all recorded for subsequent stringline trainchart build.
- A traditional passenger timetable is used and a small reference sheet was created in Excel to be posted as needed.
Trainchart (Stringline) Build

- Using time tests as previously described, a stringline is easily generated.
- Excel again is used to generate the stringline with a time table and a line chart.
- Meets and times required for switching were calculated and recorded during time testing.
Trainchart (Stringline) Build

Location keys added and red line indicates separation point between single and double track mainline. This Excel sheet format was obtained from the OPSIG Yahoo Group.
System of Operations

- Track Warrant Control (TWC) was the selected method of operations since it followed the prototype. TW forms were created in Word and a TWC Log spreadsheet for the DS created in Excel.
System of Operations

- All train movements and car forwarding uses the JMRI Operations module.
- All locations, rosters and train routes were generated using the TRS route and car inventory as the reference for building the JMRI ops portion.
System of Operations

- JMRI provides switchlists and job sheets for train movements.
- Further advanced operations modes can be tested with JMRI using loads and schedules and applying the physical tests to the TRS layout.
Virtual RR OPS

- Simulators are a tool to enhance model railroading
- Provide a means to study track plans
- Develop LDE scenes
- Develop and test operational scenarios
- Practice running/switching
- Educational and provides a realistic experience on prototype routes for railfans
Questions

Rich Blake
slugsmasher@oakharbor.net
www.steammachine.com/slugsmasher
Virtual RR OPS

• Trainz Railroad Simulator (TRS)
  – www.trainzportal.com
  – Easier to manipulate, build routes
  – Lot of free content

• Train Simulator (Railworks)
  – www.railsimulator.com
  – More complete prototype routes
  – High intensity graphics and shadowing effects

• Run8
  – www.run8studios.com
  – Real time multiplayer simulator with dispatching via internet
  – Limited content and routes
Bonus Material
Russian Narrow Gauge (600mm)
Digital Elevation Model – MicroDEM
WSLC – DEM import
West Side Lumber Co.
3D CG CAD Projects
MILW Avery - Drexel
MILW Avery - Drexel
Evansville Western
EMD GP-38
Virtual OPS screens

JMRI Roster build from Trainz Inventory
JMRI Roster build from Trainz Inventory

Trainz Content Manager Inventory screen with selected rolling stock items for export to text file.
Importing space delimited text file into Excel. Columns will populate with Trainz default items. You may have to manually input some items depending on the import and where the space delimiting is formatted.
JMRI Roster build from Trainz Inventory

JMRI requires the above format in text for import.
Once all the imported columns are built in Excel you can copy and paste required column data to a new worksheet in order to format for JMRI. The column format is “road number”, “road name”, “type”, “length”. Do not use column headers.
JMRI Roster build from Trainz Inventory

After formatting complete, select File and Save As type: Text (tab delimited). Excel will save only the worksheet you are on as a text file.
Now you may goto JMRI operations and the “Cars” selection to import your text file. This will populate the cars inventory in JMRI. Any new car types will also be added.
If successful, your JMRI roster will now contain all your rolling stock. You may from this point modify each car as necessary for JMRI specific features or simply start adding them to locations and trains.
Leisure Activity Changes

<table>
<thead>
<tr>
<th>1960’s Baby Boomers</th>
<th>2010’s The Millennials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports</td>
<td>Smart Phone/Selfies</td>
</tr>
<tr>
<td>TV/Movies</td>
<td>Social Media/Facebook/Twitter/Blogs</td>
</tr>
<tr>
<td>Hobbies/Crafts</td>
<td>Video Games</td>
</tr>
<tr>
<td>Radio</td>
<td>WIFI/Internet/Starbucks</td>
</tr>
<tr>
<td>Cars</td>
<td>Computers/Tablets/Online reading</td>
</tr>
<tr>
<td></td>
<td>HDMI TV</td>
</tr>
<tr>
<td></td>
<td>Sports</td>
</tr>
<tr>
<td></td>
<td>Cars</td>
</tr>
<tr>
<td></td>
<td>Hobbies?</td>
</tr>
</tbody>
</table>

Too much media, not enough time
Technology is a major pathway to influence the next generation