

Tech Brief

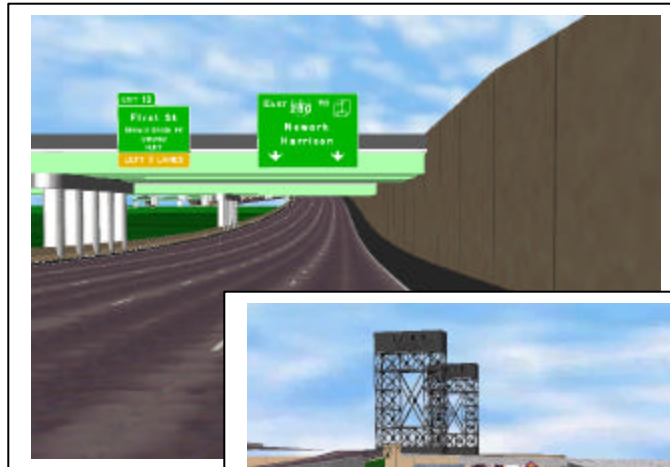
4-D Drive-Through Visualization of I-280 for Reviews of Proposed Signing

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HERE'S THE PROBLEM

Reviewers at the New Jersey Department of Transportation needed to evaluate proposed signing from the point of view of a driver traveling along the Route I-280 in Newark, NJ., at normal traffic speeds. This could be achieved through a combination of 3D geometry rendering with driver motion and simulated drive-through. 4D visualization could identify the potential problems regarding excessive density of signing, inadequate sight distances for signing, etc. prior to installation of the signs.



AND, HERE'S THE SOLUTION

The research built a 3D model based on available data, such as construction drawings, GPS, and video log information provided by NJDOT. This information would be inserted into the visualization. Production and running of MPEG and AVI movies would entail the NJDOT traffic engineers to review the proposed signing.

BUT HOW CAN IT BE DONE?

The project involves a lot of complexities since the 3D modeling must be reliant on the construction drawings and available GPS data. After constructing the 3D roadway model, the signs have to be integrated into the 3D model. This will be followed by rendering and, finally, converting the frame data into 4D drive-through.

THESE ARE OBJECTIVES...

- To produce a simulated 4D drive-through of a portion of highway for which proposed traffic-generator signing had to be reviewed.
- To create a visualization Interstate-280 in Newark.

HERE IS WHAT WE DID...

In order to generate a 4D drive-through visualization of the section of I-280, a 3D geometrical model of the roadway, shoulders, intersecting bridge structures, and other objects of significance had to be constructed. GPS data was collected from NJDOT, which consisted of latitude, longitude and elevation data from an instrumented ARAN van that was driven along the segment of roadway of interest.

After having generated a preliminary 3D roadway model, the visualization package could be used to render the roadway at particular locations, to either verify the vertical alignment of the roadway or to adjust it.

The next step was to obtain 3D alignment data for the Route 21 ramp, and to position various roadside features near the Route 21 ramp. After having done this, we used 3D reference lines to complete the 3D models of I-280, for which a special semi-manual "meshing" program was written that would create meshes of objects and position them at specified locations relative to the reference line.

Once the 3D geometrical model was created, the proposed signing was merged with the 3D roadway models. Then, the I-280 sign faces were obtained from NJDOT in CAD format and converted for use in the drive-through visualization.

Rendering the 3D models and generating the frame data followed this. Also, the drive-through visualization had to move the viewer through the scene at proper driving speeds, so that the engineers reviewing the visualization would see the signing in the same way that an actual driver would. Therefore, the size of the shifts that were used to move the viewers along the roadway had been computed to produce the correct rate of movement through the model in the final 4D drive-through.

The last and the final step was the conversion of the frame data into 4D drive-through views and produce MPEG and AVI movies. This allowed for the entire animation to be viewed by the NJDOT engineers, thus providing them with the ability to make recommendations based on their views.

WHAT IS THE NEXT STEP?

Since this visualization proved to be a great success, it demonstrated the potential of this type of presentation tool for public hearings and similar presentation scenarios. The visualization process, software tools, and simulations developed during this project have validated the feasibility of using this type of visualization for pre-construction evaluation of signing projects to avoid costly design changes later during the construction process. However, better 3D model development software tools must be developed that are able to create rendered visualizations with a minimum of time and effort.

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A final report is available online at <http://www.state.nj.us/transportation/research/research.html>

If you would like a copy of the full report, please FAX the NJDOT, Bureau of Research, Technology Transfer Group at (609) 530-3722 or send an e-mail to Research.Bureau@dot.state.nj.us and ask for:

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