FORUM8 Design Solution
VR / FEM / CAD / Web
Engineering-Services

August, 2009
FORUM8
FORUM8 Co., Ltd.

FORUM 8 Company profile
Established: May 1987
Capital stock: 50 Million JPY
Activities: Civil engineering software design and support
Staff: 134 people (June 2008)

- Established as a developer and distributor of package software to support civil design on PCs with the commencement of development of UC-1 in 1981
- Number of clients: 12,465 (19/2/2008), top class share in civil engineering software.
- Clients: 60% are construction consultants, the remainder include government administration offices, as well as construction, university, automobile and a variety of other research institutes
- Company advisors: Professors from Kansai University, Arizona State University, Seika University and Gunma University
- Offices: 5 in Japan, of which 4 handle sales & support, as well as 5 overseas, with experience exporting UC-win/Road and other software packages.
- Commenced user support in China with a subsidiary in Shanghai – FORUM8 Technology Development (Shanghai) Co., Ltd.
- Increased sales for the last 5 fiscal years and increased profits for the last 3 fiscal years
- Registered construction consultant (2 analysis departments)

"Practical IT Business Theory Course (Kansai Graduate School Lecture Materials)"

FORUM8 (China) Shanghai China
FORUM8 (NZ) New Zealand
FORUM8 representative offices
London office Beijing New Delhi
Thailand New Cebu
FORUM8 AZ (Arizona) New

CALS/CAD
Design
Customised Development
GIS / GSS
Analysis support service
Construction Consultants
Web

UC-win/Road
VR Data Service
System Development Service
FRAMES3D / Foundation
Dynamic Non-linear Analysis / Foundation Analysis

VR Design
UC-1 Design / CAD / GIS

Web Infrastructure Technology
Customized Development
FORUM8 Solution

3D Real time Virtual Reality
UC-win/Road

3D VR Solution and examples of advanced usage

Contents

Micro simulation player   OpenMicroSim

Function to replay the animation of various types of simulations expressed by movement of 3D models

Object:
- Replay results from other AP in VR
- Customizing available to express in VR environment

Simulation sample:
- All kinds of traffic simulation
- 4D planning software
- Movement of the object in a factory
- Operation of the heavy industrial machine in engineering work
- Application which needs other VR expressions

Format is open to public as "OpenMicroSim". http://openmicrosim.org/
Example of micro simulation player used

VR modeling

VR simulation

Data Exchange with Road CAD
Data link by UC-win/Road for Civil 3D Plug-in

[Autocad Civil 3D®] [UC-win/Road for Civil 3D]

COM—API

Data Compatible with Civil 3D 2007 & 2008 via COM-API

Link to OHPASS* Data

Optimum road alignment search by GA (genetic algorithm) program
The road structures and terrain data resulting from the search are linked with UC-win/Road data

[OHPASS] [UC-win/Road]

* Optimal Highway Path Automatic Search System
developed by NEXCO (Nihon Expressway) Research Institute, Inc.
Development of Data Exchange by UC-win/Road SDK

Data Exchange with Road CAD

UC-win/Road for Virtual - Construction Project Manager

Tees Side Introduction
Eco-Drive Plug-in

Based on the driving log from UC-win/Road, this plug-in will support the calculation and creation of graphs that detail fuel consumption and discharge amounts of CO₂. It can be used for an ecological driving practice with a driving simulator or ITS study.

*The discharge amount of CO₂ has been known as being in proportion to fuel consumption, so it will be quantified by three factors: Travelling time (T), Travel distance (D) and Variability characteristic of vehicle speed.

\[ E = K_c (0.37T + 0.028D + 0.056 \sum_{k} (V_k - V_{k-1})) \]

E: Discharge amount of CO₂ for travel time (kg-C)
T: Travel time (sec)
D: Travel distance (m)
K: The number of speed measurement point
δk: when a speed is higher than at the previous point; 1
Other case; 0
vk: Running speed at "k" point (m/sec)
Kc: Emission factor CO₂ 0.00231kg-C/ petro cc

Ministry of Environment, 1999

T.Oguchi, M.Ktakura and M.Taniguchi “Carbon dioxide emission model in actual urban road vehicular traffic conditions”, Journal of Infrastructure Planning and Management (JSCE), No.695/IV-54, pp.125-136

### Validation example

Validated the relationship between operating condition and discharge amount of CO₂ based on the study involving driving through an ordinary city made with UC-win/Road.

1. Run the same course (travel distance: 1km)
2. Must stop at intersections
3. No speed limit
4. The result under the conditions which run various cases such as Rough driving, gentle driving and so on.

<table>
<thead>
<tr>
<th>Case</th>
<th>Travel distance (km)</th>
<th>Fuel consumption (L)</th>
<th>Discharge amount of CO₂ (kg-C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST-1</td>
<td>1.018</td>
<td>0.18</td>
<td>0.415</td>
</tr>
<tr>
<td>TEST-2</td>
<td>1.018</td>
<td>0.147</td>
<td>0.339</td>
</tr>
<tr>
<td>TEST-3</td>
<td>1.025</td>
<td>0.102</td>
<td>0.237</td>
</tr>
<tr>
<td>TEST-4</td>
<td>1.020</td>
<td>0.098</td>
<td>0.226</td>
</tr>
</tbody>
</table>

Speculation: The driving behavior which limits vehicle speed such as sudden starting, sudden stop and so on is expected to reduce the discharge amount of CO₂.

ECO Drive Plug-in

Customizing example:

Users can customize display of report and logic used for specific needs.

Can log results for evaluation by analysis and research.
Possible to use SDK(System Development kit)

Test result by Professor ECO
Possible to customize characters, style and logos. Available to service for examinees can take out printed document.

The 10th UC-win/Road Conference / VR-Studio™ Conference

Main Session: Stream-1

"New Developments with VR and DS" Special Lecture 2

"Advanced Road Design using VR and DS"

Mr. Seiya Tazawa, Survey and Environment Group 1 Manager, Bureau of Construction, Metropolitan expressway Company Limited

Metropolitan expressway Company Limited is performing an experiment with the Driving Simulator to check the effectiveness of driving support and traffic safety measures of the Ohashi junction which connects Central Circular Route Shinjuku and Shinagawa Line to Route 3 Shibuya Line. Ohashi junction, four-leg intersection constructed in limited site and space, is connected with two-loops in the tunnel, whose difference of elevation is 70 meters. To feedback the experiment results to road marking or traffic sign planning, the Ohashi junction has been reproduced in VR space, the experiment with the UC-win/Road Drive Simulator has been carried out and then the effectiveness and ineffectiveness of drivers' behavior and psychological state have been evaluated and reviewed.

Presentation Materials
Example use of UC-win/Road Trial Simulator

**TOYOTA** exhibited at the ITS-New York
“Vehicle-infrastructure Cooperative Systems supporting safer driving”

Customizing Trial Simulator for SUBARU type
Corresponding 6-axis motion platform

Features
1. 1.3 Overz - improvement in representing
   Overlooking the driving environment around an intersection
2. Vehicle-infrastructure Cooperative
   Expression of the system currently under development
   for commercial production in the near future
   Support to prevent overlooking traffic lights (road-to-vehicle)
   System to detect vehicles approaches etc. (vehicle-to-vehicle).
3. Improving the Driving Environment
   More realistic visualization of the area (Nagoya station to Toyota city)
   Inclusion of various accident scenarios
4. Vehicle Motion Model – Implementation of high-precision CARSIM

Reference AVI (Test Driving): TOYOTA052.wmv

Toyota Motor Corporation introduced in the user introduction in our journal Up & Coming
Prevention of missed stop signs

Prevention of accidents with unseen pedestrians at right-hand turns

Experience Simulator
Application Representations with UC-win/Road

Provision of rear-end collision prevention information

8DOF Simulator by UC-win/Road

★Motion Image AVI

VR-Studio

3D Stereo View
Multi User
Large Scale
Multiple Realities

Multi Core / CPU
Enhanced Traffic simulation
Advanced Shading Lighting
Multi Modal Editors
3D Stereo View

The 3D stereo view function allows us to view VR data from UC-win/Road in 3D. After the creation of the 3D stereo function, we foresee an increase in the use of this function for the creation of VR contents, driving simulation, researches, developments etc.

The example of a systems configuration of 3D stereo view

Illustration of polarization projection (passive system) installation
1. 2 sets of projectors can be stacked and displayed.
2. Projection is done through a polarizing filter.
3. Setting up the viewing distance and focal length as a part of UC-win/Road stereo option.
4. Data is projected on a silver screen and 3D Stereo picture can be visualized using polarization glasses.

VR-Studio

Multi-user editing
- Single user / Team user version
- Allow different users to edit different parts of a project at the same time.
- Lock based system to central server
- Road split into multiple sections
- Full history of changes

AVI sample
- Teamwork computing
VR-Studio

Large and flexible terrain / space
- Terrain becomes collection of points and contours
- Arbitrary shape (no longer based on 50m grid)
- Initially a single collection, can be sub-divided to allow multi-user editing
- Terrain easily expandable

Support for terrain LOD (Load of Detail)

Multi-reality (Expanded Before-After)

Before-Now-After function
Switch between multiple designs for 3D models, 3D trees, buildings, traffic signs and so on

Instantly display changes to multiple designs for models including roads and terrain

Multi-reality

Multi-processor Multi-core CPU

Massive reduction of VR data creation time Improvement in traffic simulation abilities

The advancement of traffic simulation
- Improved driver behaviour
- More configurable parameters for drivers
- Traffic generators / sinks / sources defined per lane
- Two-way roads (on a single carriageway)
The 10th UC-win/Road Conference
May 20th, 2009 (Wed) 11:00-17:00

FORUM8 Design Festival 2009
November 18th-20th, 2009
18th (Wed): the 3rd FORUM8 Design Conference
19th (Thu): the 3rd International VR Symposium
20th (Fri): the 8th 3D VR simulation contest
Tokyo Conference Center in Shinagawa Hall A & B

Thank you very much for your attention!

UC-win/UC-1
Design·Analysis·CAD·VR

FORUM8 Co., Ltd.