

# UC-win/Road Ver.5.0

## Realtime 3D Virtual Reality



### New functions in UC-win/Road Ver 5.0

#### 1. FBX file compatibility

Enhanced file support by UC-win/Road. UC-win/Road can import FBX files which can cover various kinds of models.

#### 2. LOD function

By lowering the resolution of smaller elements, the processing time can be reduced without badly affecting the quality of the visualization. LOD elements include MD3 characters, shadows, lakes and ponds, and 3D trees.

#### 3. Creating rivers

River creation is improved in UC-win/Road version 5 - just like with roads, planar and longitudinal linear alignment is now possible.

#### 4. Improvement in road section edit

Improvement in road section editor: road sections can be created in independent blocks.

#### 5. Vehicle dynamics model

Improved immersion feeling, accuracy and the linkage with motion platform.

#### 6. Navigation function

Simple viewpoint operation is independent from movement mode. Viewpoint can be operated in navigation movement mode.

#### 7. Improved audio

By employing OpenAL, a variety of surrounding sound and the car's engine sound are included.

#### 8. 2D/3D text

3D text can be generated and placed inside the 3D environment easily.

#### 9. Video wall function

Animation video display (including cylindrical screen) can be made as a 3D object.

#### 10. Special weather function

The simulation of rain and snow was enhanced. Fog and thunder for a limited area can be defined.

#### 11. Tsunami function

Tsunami function is added in UC-win/Road. Data can be shared with xpswmm.

#### 12. UC-win/Road for SaaS Plugin

For the web publication of UC-win/Road. Interactive operation on client's browser

#### 13. Point cloud data modeling Plugin

Included in Advanced license. For point cloud data-imported VR modeling  
Number of point cloud 32bit: less than 16 million 64bit: more than 25 million

**Shadow** : Elements to be used for shadows can now be selected to optimize the display speed of shadows. The texture size for shadow generation can also be altered, enabling the adjustment of the resolution of the shadows.

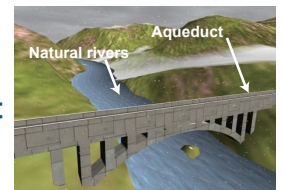
**Lake and Pond** : To visualize the reflections on the lakes, images in the 3D environment have to be generated twice. However, since the quality of the images on the lake surfaces is unimportant in most cases, the resolution of the reflection on the lake surfaces can now be lowered.

**3D trees** : More phases of LOD are now available in UC-win/Road version 5. There are four phases of LOD in total for 3D trees.

- First Phase: Maximum LOD display
- Second Phase: Static 3D trees - unaffected by the wind
- Third Phase: 3D tree displayed on 4 intersecting panes
- Fourth Phase: 3D tree displayed on 2 intersecting panes

### 3. Creating rivers

The cross-section of waterways can now be edited to create rivers, canals, and aqueducts.



▲ Sample river model

### 4. Improvement in road section edit

Road section editor has been improved as follows:

- Road sections can be created in independent blocks
- Water surface definition can be edited
- Roads can be created without carriageways (thus, disabling vehicles from following lanes on road)

### 5. Vehicle dynamics model

#### Suspension

In previous versions, the tilt of the vehicle reflected the inclination of the road. In version 5, the addition of suspension to the vehicle dynamics enables the dynamic simulation of the pitch and roll movements. Each wheel responds to the texture of the road, thus, movement along rough roads is simulated realistically. Also, the tilting of the vehicle in response to the yaw, forward and backward acceleration can be simulated also.

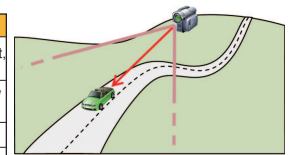
#### Tire models

The acceleration and angular acceleration is calculated from the force that is applied to each wheel. With consideration to the friction coefficient between the road surface and the tire, the effects of slippage, under-steering and over-steering can be simulated.

### 6. Navigation function

The navigation feature was revised extensively to improve the movement of camera inside the UC-win/Road VR environment. Movement modes were devised to clearly demarcate actual movement and change in viewpoint, which is now changed inside various movement modes.

Movement mode	Available viewpoint operations
Free movement	Roll, forwards and backwards, right -left, up-down, fly through, aerial view, jump
Travel on road, flight path and driving simulation	Roll, circle around an object, aerial view
Pedestrian	Roll, jump
Pursuit	Circle around an object, aerial view



▲ Pursuit movement mode

#### Movement modes:

- **Pedestrian**: walk around the 3D environment using the keyboard
- **Pursuit**: the camera follows the selected 3D model - for example follow a vehicle inside traffic simulation vehicle inside traffic simulation

### 7. Improved audio

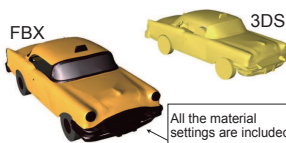
#### New driver

In the previous versions, Direct Sound API was used. This is a Microsoft API from the DirectX Library Collection. However, due to the change in the configuration in the Windows OS after Vista, all calculation was being done by the CPU without the sound card. In version 5, to accelerate the hardware processing speed, an API called OpenAI is utilized.

#### Driving simulation vehicle

The engine sound of the vehicle during driving simulation has been improved. Multiple sound sources can now be configured to simulate various engine sounds according to the RPM. Moreover, volume profiles can be adjusted according to the RPM also.

### 1. FBX file compatibility



▲ Comparison between data imported as 3ds and data imported using FBX ▲ FBX compatible file formats and their versions

File format	Version
Autodesk AutoCAD DXF (.dxf)	Version 13 and earlier.
Collada DAE (.dae)	Version 1.5 and earlier.
3D Studio 3DS (.3ds)	All versions.
Alias OBJ (.obj)	All versions.

FBX data import function is developed to enhance the file type supported in UC-win/Road. The material attribution, texture, and triangle information saved in FBX data are acquired during import so that they can be used as the model in UC-win/Road. We will develop the function of 3D model, primarily FBX format in future. After releasing the first version which supports for FBX, writing on FBX file, support for animation, light source, and the view point will be developed.

### 2. LOD function

#### MD3 character

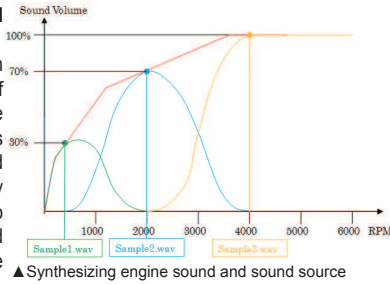
Now, MD3 characters are displayed in three phases of LOD. Maximum LOD utilizes the same methods as before. In the second phase of LOD, the character is displayed on rectangular panes. The textures of the front and the side views are generated internally from the 3D mesh data which will become the basis of the character. In the third phase, the character is displayed as a bar or a dot. In addition, users can alter the view angle to switch between various the LODs.



▲ MD3 character generated by the LOD second phase

**Synthesizing engine sound and sound source**

The sound of wind and tires can now be reproduced. The sound of the wind can be varied by vehicle types and the sound of the tire is variable according to the road surface materials. The frequency and volume changes according to the driving speed, and detailed settings for the sound volume are also possible.



▲Synthesizing engine sound and sound source

**Background sounds**

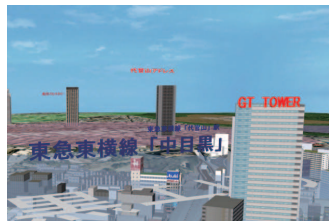
Other vehicles: sounds from up to 10 vehicles in the proximity of the camera can now be reproduced. The 3D audio effect is achieved using EAX (Environmental Audio extensions) library which includes Doppler effect.

**Low-pass filter:** low-pass filter can be set based on the vehicle type.

**Reverberation:** Reverberation inside tunnels is also simulated.

**8. 2D/3D text**

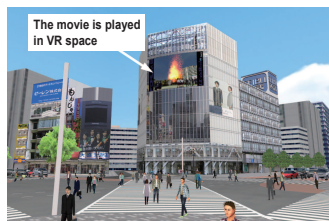
Text display is improved in version 5. Text displayed during scenarios and scripts are now visualized using OpenGL. Moreover, using the 3D model generation function on OpenGL, 3D text can now be placed inside the 3D environment easily.



▲Visualization of a video wall

**9. Video wall function**

It is now possible to display videos in the UC-win/Road VR space as a 3D object, enabling you to visualize electronic billboards etc. In UC-win/Road Ver.5, video files saved on the local hard drive can be selected to be displayed in the VR environment as a video wall. We are planning our to develop video streaming of external video files.



▲Visualization of a video wall

**10. Special weather function**

New enhancements are added to the existing weather functions of rain, snow, wind, and fog. Rain and snow are much more realistically represented in the VR environment. Thunder and lightning are a new option. Windshield wipers are supported.



▲Rain



▲Snow



▲Volume fog



▲Thunder & Lightning

**11. Tsunami function**

Tsunami function is added in UC-win/Road. A real water surface such as a water splash by a tsunami can be expressed. The simulation can be performed by combining the analysis result of xpswmm and the VR data.



▲Tsunami in urban area

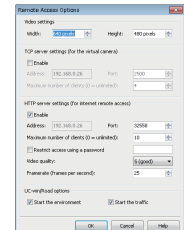
**12. UC-win/Road for SaaS Plugin**

UC-win/Road for SaaS enables utilization of virtual reality in a SaaS environment. We developed a server function for SaaS (Software as a Service) as a UC-win/Road option. UC-win/Road is run on the host computer and the UC-win/Road data is published on the web. Clients can manipulate the VR space on the browser using Adobe Flash Player.

VR environment is created and the simulation is calculated inside UC-win/Road on the server and transmitted to the client systems. The server receives the client's command in HTTP protocol. We believe it can be used as a communication tool as well as a data publication medium or other advanced applications based on this algorithm.



▲ UC-win/Road for SaaS Client screen



▲ server setting screen

**13. Point cloud data modeling Plugin**

This plugin is supported by UC-win/Road Ver .5 Advanced. The visualization and editing of point-cloud, and road modeling based on point-cloud can be performed. The following functions are available: the point cloud data editor; road centerline extraction; road alignment and cross section generation and road editor; road section extraction; and road section creation and road section editor. The linkage with SENSO-Wheel has been developed for CarSim.

- Maximum number of point cloud data
- 32bit OS(Windows XP) : less than 16 million points
- 64bit OS(Windows Vista, Windows 7): more than 25 million points

- Main edit functions
- Point cloud display
- TIN terrain data generation
- Extraction of road alignment and cross section information

**•Plug-in**

Plug-in name	Advanced	DS	Ultimate
ECO Drive Plug-in	—	○	○
Driving Simulator Plug-in (including SensoDrive Simulator plug-in)	—	○	○
Scenario Plug-in	—	○	○
Micro Simulation Player Plug-in	○	○	○
S-PARAMICS Plug-in	○	○	○
Communication Plug-in	○	○	○
Point Cloud Modeling Plug-in	○	—	○
Civil 3D Plug-in	○	—	○
InRoads Plug-in	○	—	○
GIS Plug-in	○	—	○
OSCADY PRO Plug-in	○	—	○
Xpswmm Plug-in Ver.2 (for Tsunami)	○	—	○
aaSIDRA Plug-in	○	—	○
12D Model Plug-in	○	—	○
EXODUS Plug-in	—	—	○
TRACKS Plug-in	—	—	○
Noise simulation plug-in	—	—	○

**•Options(Sold separately)**

Optional Products
UC-win/Road SaaS Plugin
UC-win/Road Cluster Plug-in
UC-win/Road Motion Platform Plug-in (System option)
UC-win/Road for RoboCar(R) Plug-in



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