We review 3D computer technology. Our experience in creating a virtual bicycling environment at the University of Indonesia Green Eco-campus. We explain the implementation of the VR environment using 3D-Games Studio and our experience in viewing the result with VR device, i.e. 3D E-Dimensional wireless goggle. We present the real world elements with the graphics that imitate the real world such as bicycle movement, camera perceptions, and object collision handling to other entities such as wall, tree, or building. The environment includes bicycle track, trees and obstacles in the pathways. Application is subsequently tested by the users in terms of the general object condition, user’s respond to the virtual reality environment and the future development.
Agenda

- Virtual Reality
- Stereoscopic Equipment
- VR Applications
- 3D Games Studio
- Lite-C, World Editor
- Model Editor (Model, Sprite)
- Sublevel, Terrain
- Design of the Application
- Architectural design (class diagram).
- Result and Evaluation
- System and Software Evaluation

Universitas Indonesia

Location: Depok, Indonesia
- 320 Hectares of land
- 49,000 students and 2,400 academic staff
- 12 Faculties and more than 50 departments (240 study programs)
Virtual Reality

- Sophisticated 3D games and application.
- 40 Km bicycle track at the University of Indonesia, and 1000 free bicycle to use.
- Purpose: creating a complete bicycle object and environment, using 3DGames Studio.
- WED, Script editor, Model Editor
- Evaluated and viewed using E-Dimensional 3D wireless glasses for PC.

Stereoscopic Equipment

- E-Dimensional 3D wireless glasses for PC:
  - Dongle, Wireless glasses, transmitter, Monitor.
- VR Application in Video Game industry (developing models and creating cinema cut-senses)
  - 3D computer graphics software: 3Ds Max, Blender, Cinema 4D, Lightwave 3D, Maya 
    Autosdesk, Softimages/XVI (Avid).
3D Games Studio

- GameStudio or 3DGS:
  - 3D computer game development, allows user to create 3D games and other VR application.
- Can be used for 2D or 3D games, simulation, and multimedia application.
- Requires MED, WED, and script editor to see all variables, functions, and actions.
- Library of prefabricated textures, building parts, furniture, vehicles, weapons and actors.

Scripting languages

- Script Editor (SED)
- Scripting languages for controlling objects or actors.
- Most script languages are interpreted- translated into an intermediate bytecode
- Lite-C: supports of multimedia objects, sounds, images, movies, user interfaces element, 2D and 3D models.
- Supports FBX, 3DS, OBJ, ASE, MAP, MDL, MD2, FX, BMP, PCX, text fragments
World Editor

- Editor for creating the virtual world.
- Control center, in which all levels, model, and scripts are linked.
- Various objects can be arranged, actions can be assigned to models, defined through scripts, textures can be assigned to level geometry, levels can be built using Binary Space Partitioning Tree (BSP) technique.
Model Editor

- Provides capabilities of designing models.
- Made of meshes (polygons) to form a shape, skeleton of bones for animation, one or several textures for the skin, effect files .fx for shades.
- Textures created in external graphic editor.
- 3D object is a set of 3D points that formed unity of faces. Game engine can render several types of separate 3D objects-entities on the screen.
- Support entities such as: Model, Sprite (2D object that can serve several purposes), sublevel, terrain.

Model Editor (MED) View
Design with the UML Diagrams

- Use Case Diagram
- Activity Diagrams
- Class Diagrams

Web Services

Choose camera perception

Bicycle movement

User

Respond to problem or barrier
Bicycle Model in WED

Objects in WED
RESULT OF THE USER TESTING

<table>
<thead>
<tr>
<th>Question</th>
<th>Result</th>
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<tbody>
<tr>
<td>1. Familiarity with 3D Applications.</td>
<td>3.5 ± .935</td>
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<tr>
<td>2. Familiarity with Lite-C.</td>
<td>1.5 ± 0.787</td>
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<tr>
<td>3. Familiarity with 3D Gamestudio.</td>
<td>2.4 ± 0.728</td>
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<tr>
<td>4. 3D bicycle object design.</td>
<td>3.2 ± 0.392</td>
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<td>5. Object control.</td>
<td>3.3 ± 0.418</td>
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<tr>
<td>6. Object forward movement</td>
<td>3.5 ± 0.327</td>
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<tr>
<td>7. Object backward movement</td>
<td>3.4 ± 0.433</td>
</tr>
<tr>
<td>8. Object to the right movement.</td>
<td>3.7 ± 0.299</td>
</tr>
<tr>
<td>9. Object forward movement</td>
<td>3.6 ± 0.320</td>
</tr>
<tr>
<td>10. Direct perspective camera.</td>
<td>3.7 ± 0.299</td>
</tr>
<tr>
<td>11. Un-direct perspective camera.</td>
<td>3.8 ± 0.261</td>
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<tr>
<td>12 Object speed</td>
<td>3.1 ± 0.196</td>
</tr>
<tr>
<td>13. Collision handling.</td>
<td>3.6 ± 0.320</td>
</tr>
<tr>
<td>14. Virtual world can really imitate the real world</td>
<td>3.2 ± 0.489</td>
</tr>
<tr>
<td>15. Future projections.</td>
<td>4 ± 0.000</td>
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Wireless Glasses

- Closer to the reality.
- Wireless glasses which receive a signal to synchronize the glasses with the 3D image on the monitor.
- The 3D goggle in this experiment used the same concept with the equipment the 3D movie in the theatre.

3D Implementation
The use of E-Dimensional wireless glasses

Conclusion

- The implementation of virtual reality of bicycling at University of Indonesia green eco-campus environment using 3D Games studio software
- The user test results show that users are relatively satisfactory with the 3D built environment.
- The use of 3D Glasses for the VR experience has provided an extra experience using different devices to create a more real environment.
Future work

- Improving the virtual reality environment of the bicycle track and all buildings at the University of Indonesia’s Depok campus.
- Explore other VR application development platform such as using Alice.
- Put the system in public spaces in which students and other users can use the VR system.
- Promote the preservation of environment by using the free bicycling facility.

References

- GameStudio-FAQ, http://www.conitec.net/english/gstudio/faq.htm#was1, last accessed 4th March 2008