Real 3D Scene + GPS (Video)

Hwaseong Fortress – UNESCO list of World Heritage
3D Scene and Movable Facilities (1)
3D Scene and Movable Facilities (2)
A 3D Scene Management System

• 3D facilities monitoring and user interface control
• Creation of 3D environments and buildings
• Creation of 3D facilities
• Arrangement of facilities in 3D environments
• GPS based environments and facilities management

• Application: CCTV management system
Viewer Capability

- Attach movable facilities (CCTV) to a GPS defined location in a scene
- Arrange 3D fixed and movable facilities in a scene
- Viewing and navigating 3D scenes
- Managing facilities and their information
GPS Node Definition (1)

- NMEA Protocol
  - The National Marine Electronics Association (NMEA)

\$GPRMC,114455.532,A,3735.0079,N,12701.6446,E,0.000000,121.61,110706,,*0A

- A: Reliability of GPS signal (A = yes, V = no)
- 3735.0079: Latitude
- N: North (South)
- 12701.6446: Longitude
- E: East (West)
- 0.000000: Velocity (knots)
- 121.61: Progression angle (degree)
- 110706: Date
- *0A: Checksum
GPS Node Definition (2)

GPS_Node {  
  SFFloat       time  
  SFBool       availability  
  SFFloat       latitude  
  SFFloat       longitude  
  SFFloat       speed  
  SFFloat       trackAngle  
  SFFloat       date  
  SFFloat       checkSum  
}

Physical Node:  
Length, Area, Mass, GPS…?

The position of a GPS Node in the X3D structure?
GPS Nodes in X3D

• Definition
  – A GPS node is located just below a scene node
  – A scene node has maximum and minimum GPS values
  – Each movable object has positional GPS data
  – Each movable object is located according to the GPS values
GPS Synchronization with a 3D Scene

Hwaseong Fortress – UNESCO list of World Heritage (From satellite)
A GPS Node for a Scene

<X3D profile="Immersive" version="3.0">
  <Scene>
    <GPS-Bound max-latitude = "38.445484" max-longitude = "127.168188"
     min-latitude = "38.315381" min-longitude = "127.015138" />
  </Scene>
  <Transform DEF="body" translation="201274 54.7559 -420296" scale="0.013904 0.013904 0.013904">
    <Shape>
      <Appearance>
        <Material ambientIntensity="1.0" diffuseColor="0.5882 0.5882 0.5882"
            shininess="0.145" specularColor="0.0 0.0 0.0" transparency="0.0"/>
        <ImageTexture url="map.bmp"/>
      </Appearance>
    </Shape>
  </Transform>
</X3D>

• No single specific GPS position data
• A range of GPS information for a scene
A GPS Node for a Movable Object

<X3D profile="Immersive" version="3.0">
  <Scene>
    <GPS-Node time = "0831" available = "true" latitude = "38.445484" longitude = "127.168188" speed = "0"
      trakAngle = "0.0" date = "20101208" checkSum = "0"/>
    <Transform DEF="body" translation="201274 54.7559 -420296" scale="0.013904 0.013904 0.013904">
      <Shape>
        <Appearance>
          <Material ambientIntensity="1.0" diffuseColor="0.5882 0.5882 0.5882" shininess="0.145" specularColor="0.0 0.0 0.0" transparency="0.0"/>
          <ImageTexture url="map.bmp"/>
        </Appearance>
      </Shape>
    </Transform>
  </Scene>
</X3D>
Position of a Movable Object

- Synchronization of GPS data in relation to the scene’s GPS range
- A movable object is located according to the GPS information
- The GPS values of a movable object can be variable and stored in its X3D file through the GPS interface
Position of a Movable Object (Video)
GPS Implementation for Movable Objects (Video)

FPS: 58.3
X: 201316.125000
Y: 50.500000
Z: -420293.562500

GPS DATA
Latitude: N38.473203
Longitude: E127.268937
Implementation

• Programming (Windows)
  – Visual C++
  – OpenGL
  – X3D
  – Windows
• Programming (Mobile)
  – Android
  – Java
  – OpenGL ES
• Modeling
  – 3ds Max
Conclusions

• A standardization item
  – A real world synchronization interface for virtual worlds
  – A GPS node definition

• Issues
  – The position of the GPS node inside the X3D specification
  – Units and scaling problems
  – Methods of combining multiple X3D scenes or multiple X3D objects