



CS-525V:
Building Effective
Virtual Worlds

Wayfinding

Robert W. Lindeman

Worcester Polytechnic Institute
Department of Computer Science
gogo@wpi.edu

Plan for Tonight

- Wayfinding
- Project Demos

Navigation

- Navigation = Travel + Wayfinding
- Travel is the component of VR that involves moving from one place to another
- Wayfinding is:
 - Knowing where you are,
 - Knowing where your destination is, and
 - Having some knowledge of how to get there.

Wayfinding in the Real World

- How do we do wayfinding in the real world?

Why Study Wayfinding?

- Two reasons for wayfinding improvement in VR
 - VR performance enhancement
 - Training transfer

- We can show that:
 - One set of wayfinding cues works better than another
 - Exposure to wayfinding cues in a VR improve wayfinding in the real world.

- Spatial Comprehension:
 - The ability to perceive, understand, remember, and recall for future use.

Spatial Knowledge Acquisition

- Direct environmental exposure
- Indirect tools, like maps
 - These can be used outside or inside of the environment
- Direct cues (urban situations)
 - **Landmarks**
 - **Routes** (or paths) between landmarks
 - **Nodes** are junctions in routes
 - **Districts** are regions of the city
 - **Edges** prevent or deter travel
 - Typical edge is a river or lake
 - Landmarks and nodes typically live in districts, and routes pass through districts and connect them

Spatial Knowledge Acquisition

Using Maps

- Can be used prior to travel
 - Used to plan ahead
 - Should be "North Up"
- Can be used during travel
 - Require a ego-to-geo transformation
 - Where am I? Which direction am I facing?
 - This must be updated during travel
 - Should be "Forward Up"
- The key to map use for navigation is resolving the egocentric to geocentric perspective transformation.

Spatial Acquisition

- Landmark, Route, Survey (or LRS) model described by Seigel and White and Thorndyke and Goldin
 - Landmarks are acquired
 - Route knowledge is added to go between certain pairs of landmarks
 - Survey knowledge allows me to plan a route between any two landmarks

- The use of maps allows us to leapfrog directly to survey knowledge
 - But, this is inferior to real-world survey knowledge development

Strategies

- Looking for shoes in the mall

Map Examples

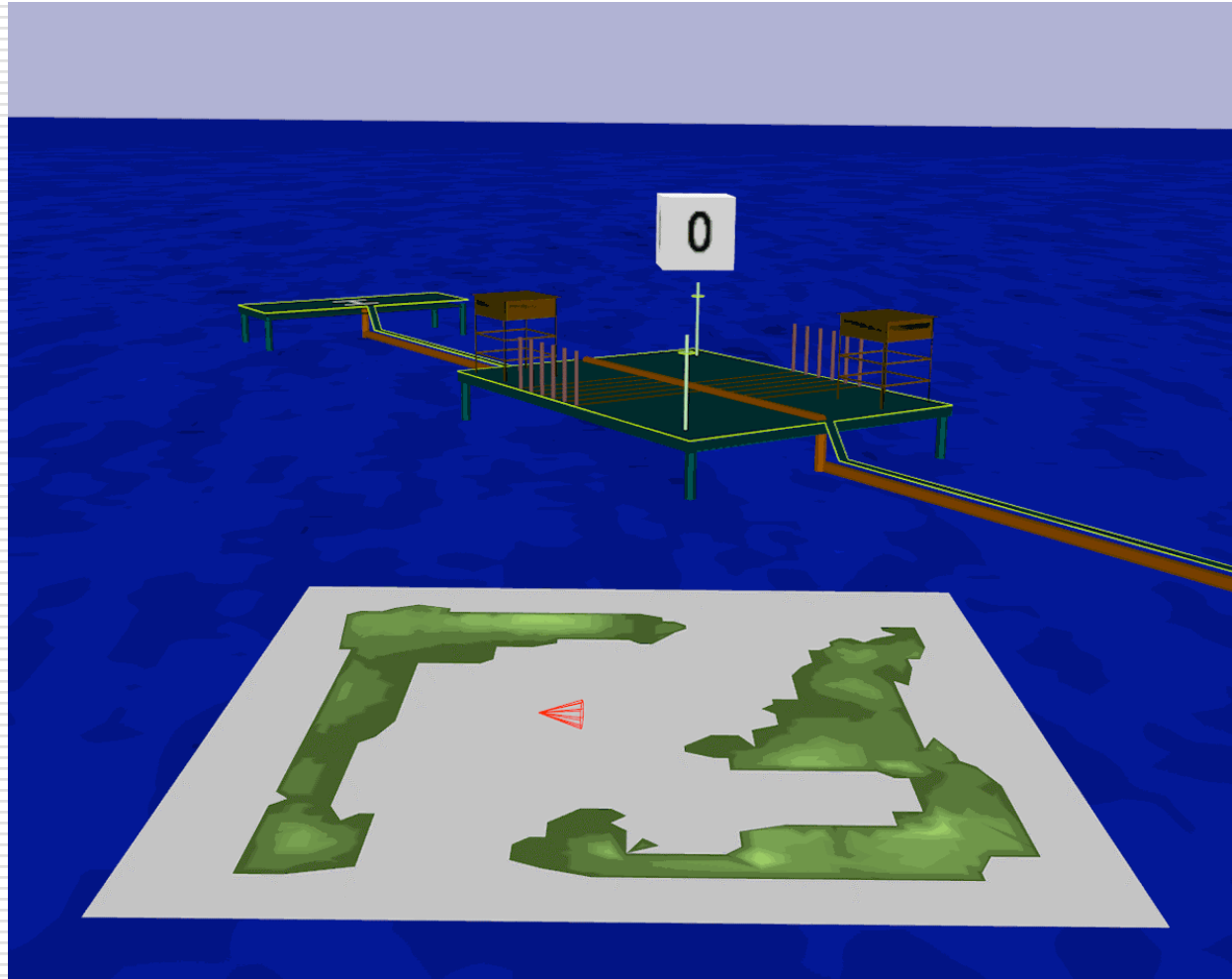
□ Forward-Up Map

- <http://www.gametrailers.com/player/32457.html>
- <http://www.gametrailers.com/player/17541.html>

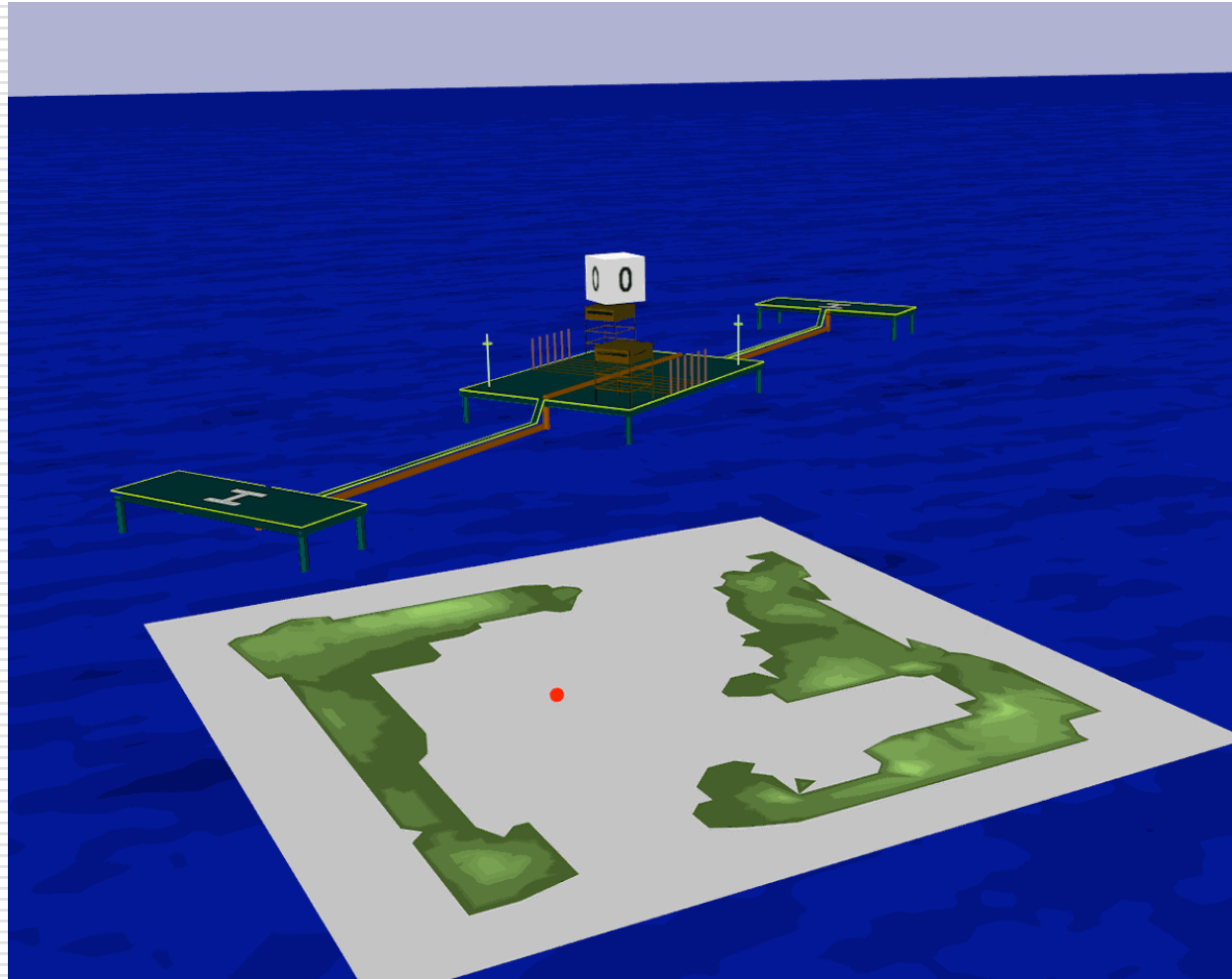
□ North-Up Map

- <http://www.gametrailers.com/player/19720.html>

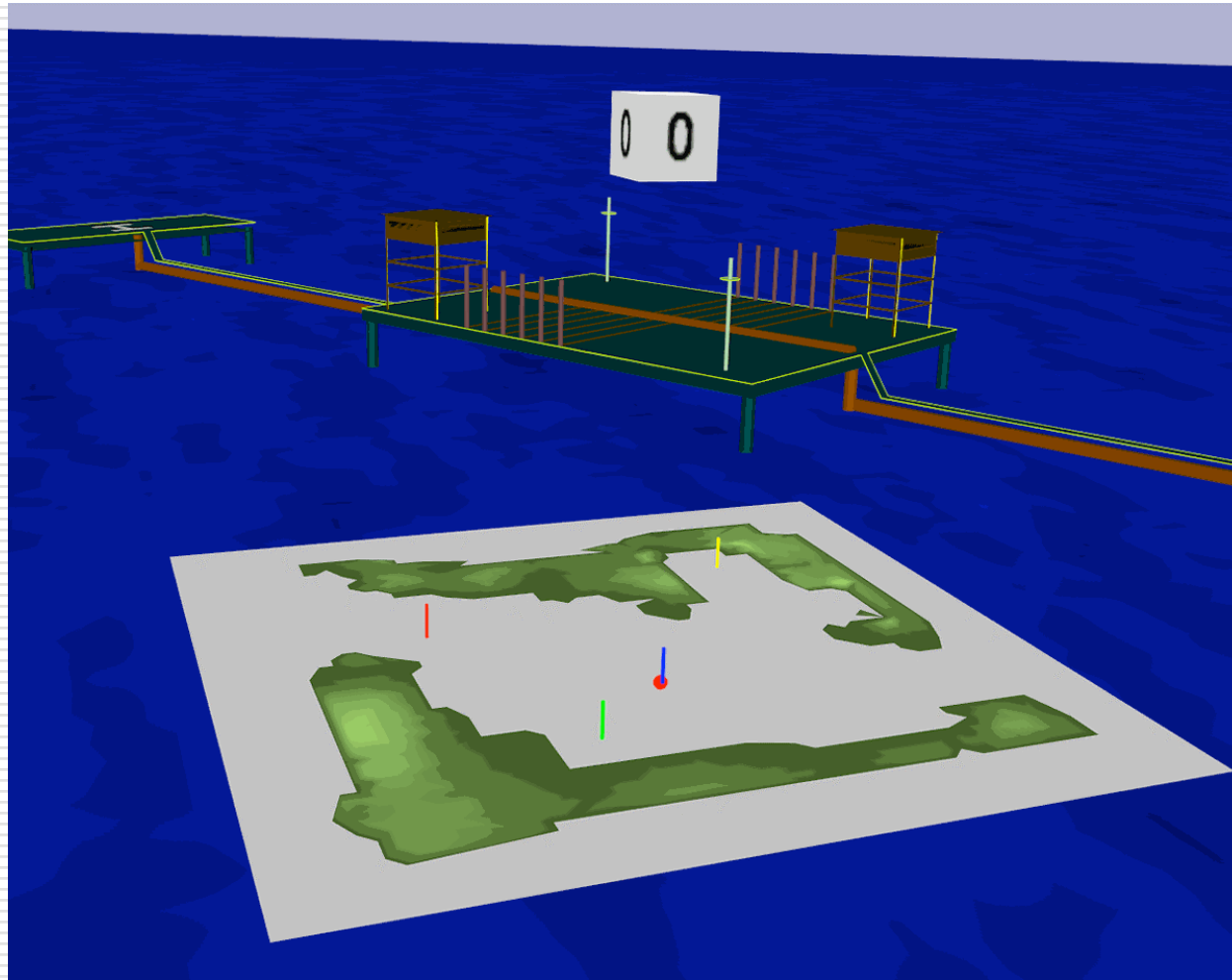
Maps: North Up



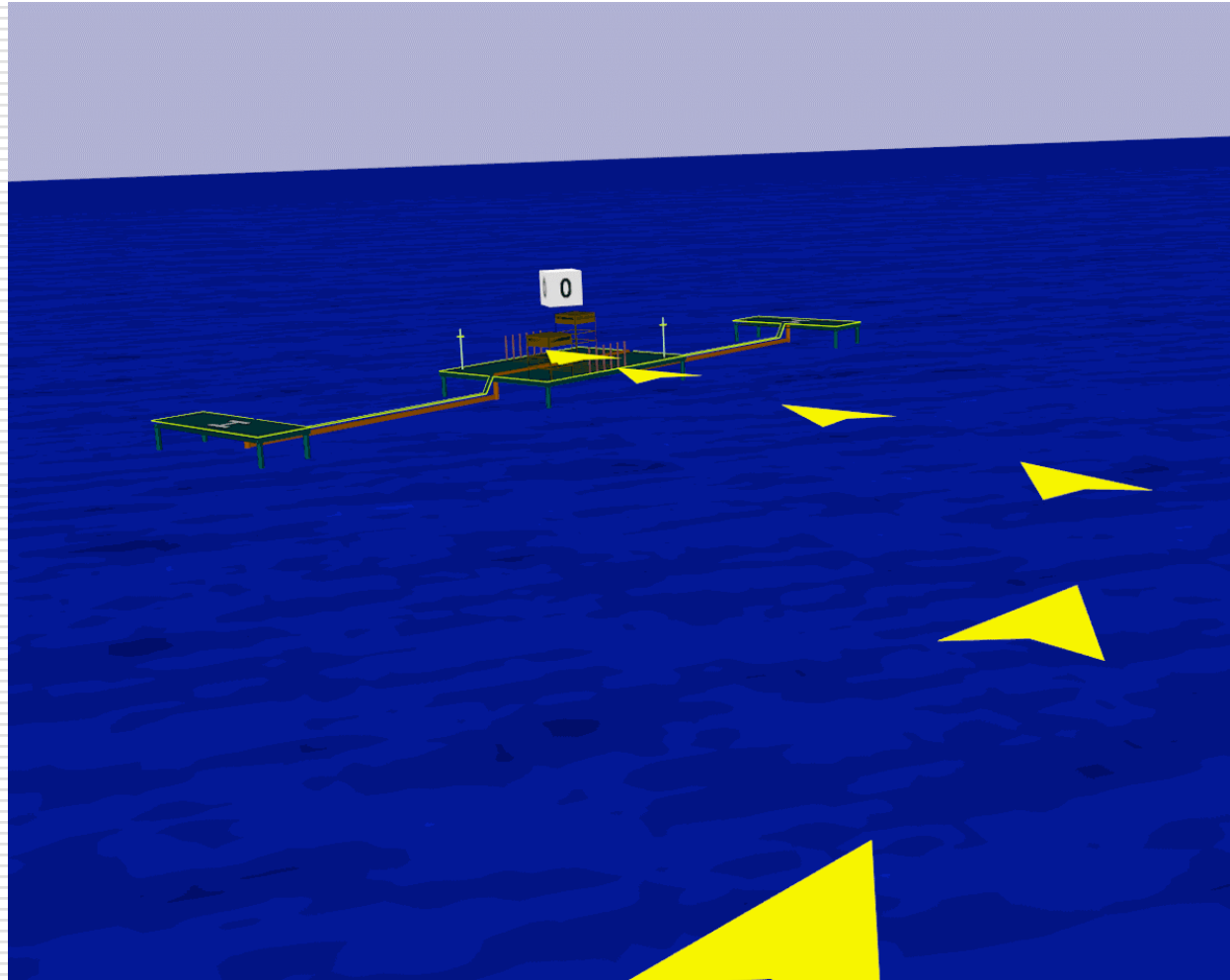
Maps: Forward Up



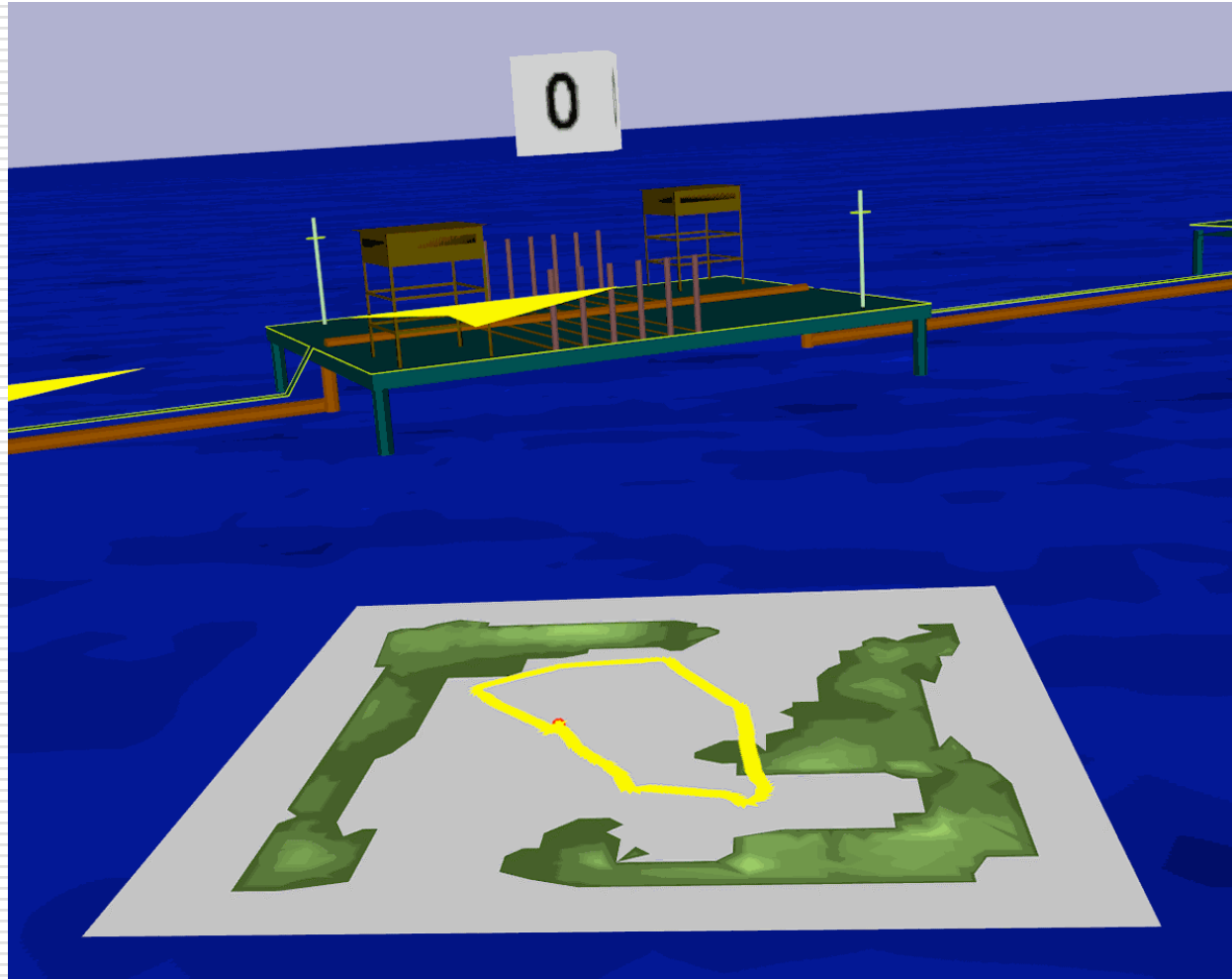
Maps: Forward Up + Landmarks



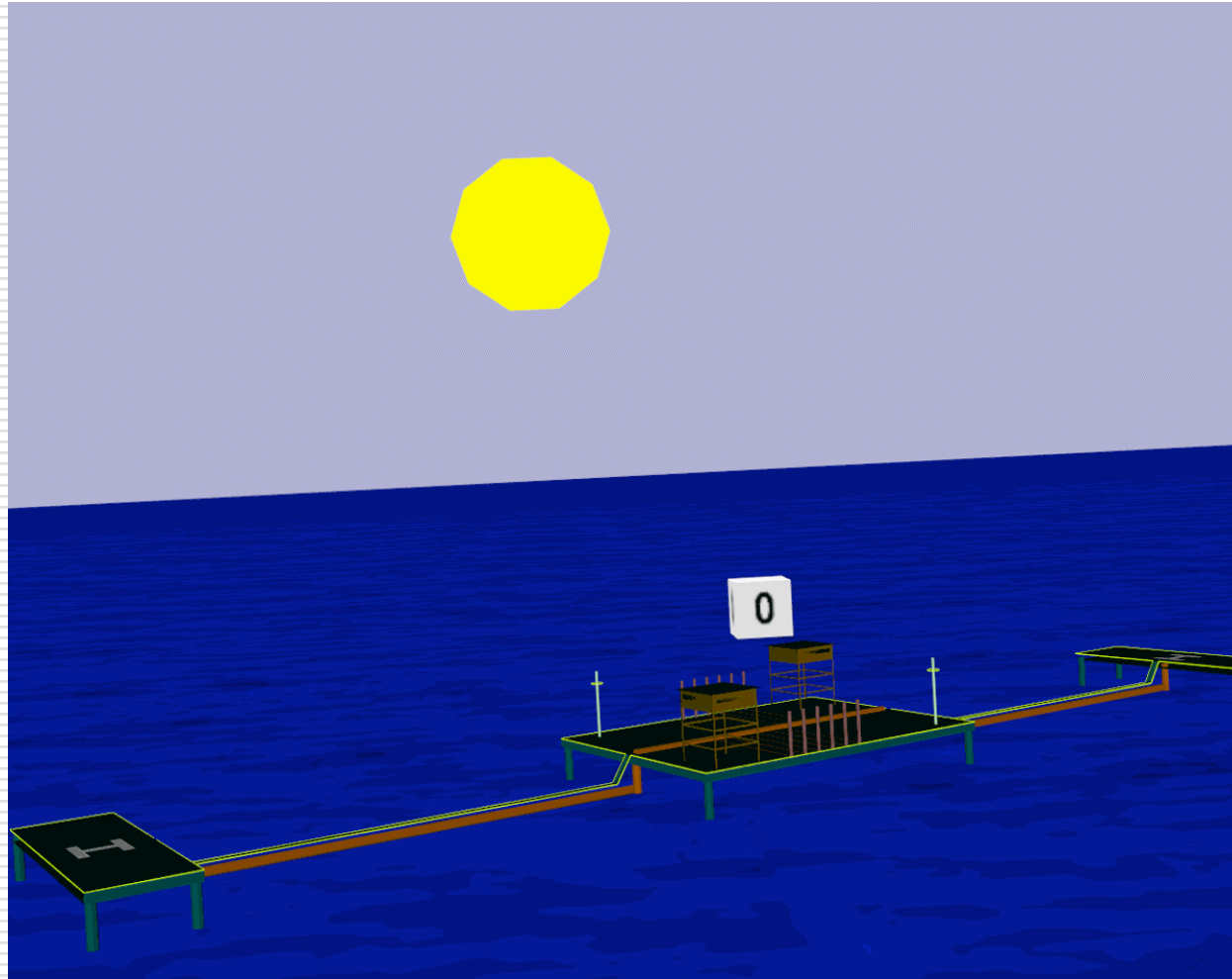
Maps: Paths



Maps: Paths on the Map



Maps: Sun as Landmark



Landmarks

- ❑ Distinguishable (unique)
- ❑ Viewable from a good distance
- ❑ Memorable

Signage

- Can be:
 - World fixed
 - Body fixed
 - Object fixed

Signage



(<http://www.FourWindsInteractive.com/>)

Reference

- Much material from
 - Darken, R.P., Peterson, B. (2002) "Spatial Orientation, Wayfinding, and Representation," *Handbook of Virtual Environments: Design, Implementation, and Applications*, Kay M. Stanney (ed.), pp. 493-518.

<http://vehand.engr.ucf.edu/handbook/Chapters/Chapter28/Chapter28.html>