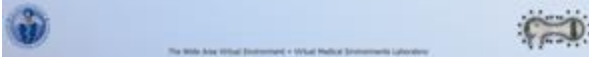


# Creating A Dynamic 4D Environment

Designing, building, and implementing virtual scenes

Valerie Henry  
3D Medical Simulation Designer  
Val G. Hemming Simulation Center



## Our Virtual Environments



Middle Eastern City Street



ER Tent Hospital



Air MEDEVAC – Helicopter Flight



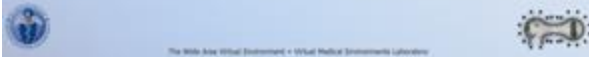
Mass Casualty – Airport Disaster



Balad Air Base

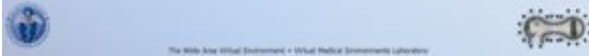


Domestic Terrorist Attack – Metro Station



## The Driving Questions

- ❖ Who is our end user?
- ❖ How will they be using the WAVE?



## Planning the Environment

- ❖ Research
- ❖ Gathering References
- ❖ Draw up a plan



## The City Scene Example

- Need:** Point of injury, respond to call and treat casualties
- Use:** Provide context, impose stressors on trainees
- Design:** City street in Baghdad with several triggered events of differing intensities and appropriate soundscape



### ❖ Research

After asking the key questions the research will help to determine the location to create.



Baghdad from Above, © AP



Balad Air Base © M. Bowyer, MD



Minsk metro bombing, © BELTA



© Washington Metropolitan Area Transit Authority



### ❖ Gathering References



Adhamiyah, Baghdad © Michael Totten



Iraqi street © Jim Lo Scalzo for USN&WR



Baghdad, Iraq © Michael Totten

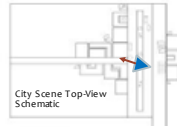


Adhamiyah, Baghdad © Michael Totten

References – images, video, literature – of the location will provide a blueprint for layout and design.

### ❖ Draw up a plan

Planning how the scene will fit into the physical space will drive how the virtual scene will be built.



City Scene Top-View Schematic

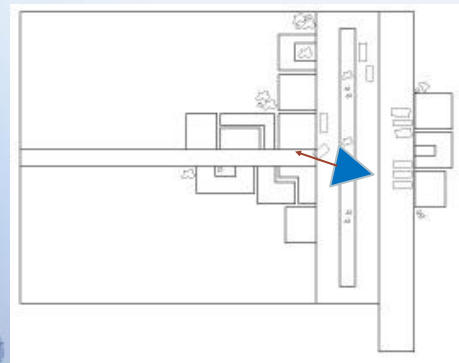


Point of Injury

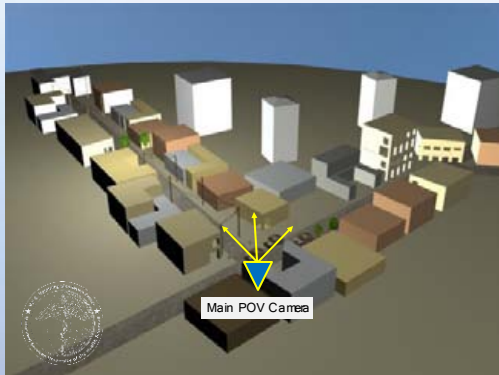
## Beginning the Scene

- ❖ Establish POV
- ❖ Layout basic shapes in 3ds Max, add camera
- ❖ Export and Test

### ❖ Establish POV and basic layout plan



### ❖ Basic Shapes, Add Camera, Export and Test



## Pipeline

### Custom 3ds Max Exporter

- choose camera
- direct to maps location
- name file

### Custom desktop renderer



- ❖ Basic Shapes, Add Camera, Export and Test



View through the main POV Camera



The Wide Area Virtual Environment - Virtual Reality Environments Laboratory



## The Stages of Modeling

- ❖ Rough models, lights, special FX, sound
- ❖ Event and Character placement
- ❖ Refine models, lights, Special FX, sounds
- ❖ Animate non-character events



The Wide Area Virtual Environment - Virtual Reality Environments Laboratory



- ❖ Rough models, lights, special FX, sound



The Wide Area Virtual Environment - Virtual Reality Environments Laboratory



- ❖ Refine models, lights, special FX, sound



The Wide Area Virtual Environment - Virtual Reality Environments Laboratory



## Finalized Scene



The Wide Area Virtual Environment - Virtual Reality Environments Laboratory



## Export and Test



The Wide Area Virtual Environment - Virtual Reality Environments Laboratory



### Metro Environment – Early Stages



The Station



The Train Platform

The Wide Area Virtual Environment - Virtual Reality Environment Laboratory

### Metro Environment – Finished Platform

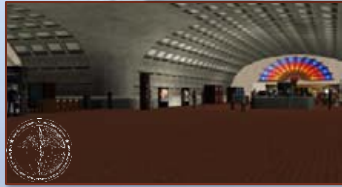
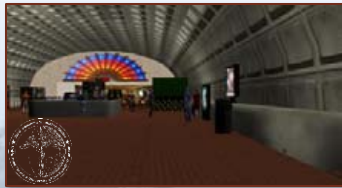


Character creation and animation by Fernando Reyes



The Wide Area Virtual Environment - Virtual Reality Environment Laboratory

### Metro Environment – Finished Station



Characters contributed by Fernando Reyes

The Wide Area Virtual Environment - Virtual Reality Environment Laboratory

## Pipeline

### Configuration files – sounds

Sounds are defined by name, linked to, volume controlled through gain and given a parent object from the 3D scene.

The Wide Area Virtual Environment - Virtual Reality Environment Laboratory

## Pipeline

### Configuration files – triggers

Triggers are set up for a number of event types and given a keyboard input control or told to begin when the scene is loaded.

The Wide Area Virtual Environment - Virtual Reality Environment Laboratory

## Pipeline

### Configuration files – events

Events can hold any number of event-types like the starting or stopping of animations, firing off air cannons, and pulsing smoke machines.

The Wide Area Virtual Environment - Virtual Reality Environment Laboratory

## The Stages of Animation

- ❖ Establish timing, rough motion
- ❖ Begin to animate rigged characters
- ❖ Set everything to triggers
- ❖ Refined motion and secondary animation
- ❖ Sound FX

- ❖ Establish timing, rough motion



- ❖ Rigged Characters, set to triggers



## The Final Animation



## The Stages of the MedEvac Scene

Old terrain and animation



New terrain and animation



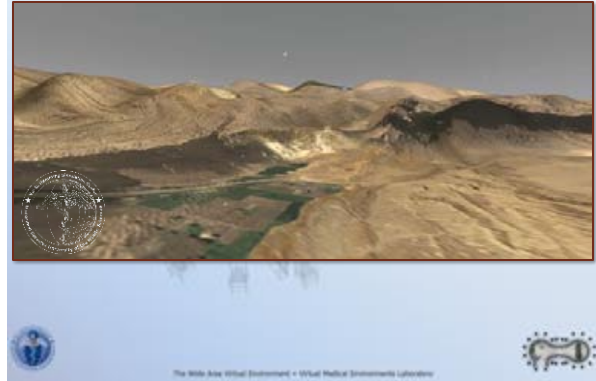
## Takeoff - Old



Takeoff - New



Flying - Old



Flying - New



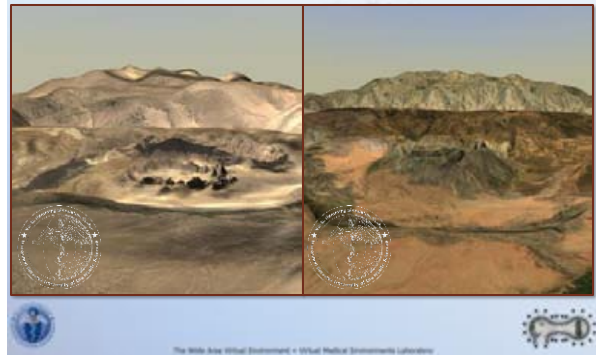
Landing - Old



Landing - New



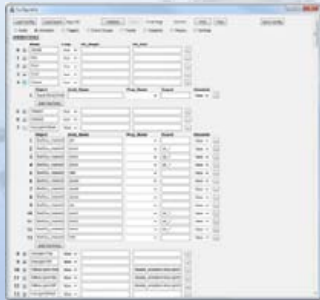
The terrain, old and new



## Pipeline

### Configuration files – animations

Animations are defined by name, constructed of units and can be either absolute or relative.

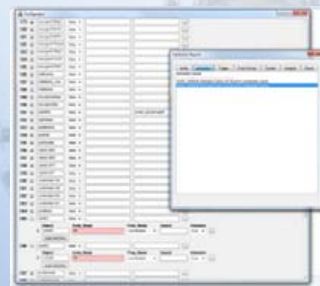


The Wide Area Virtual Environment - Virtual Medical Simulations Laboratory

## Pipeline

### Configuration files – error checking

Validation will check a loaded 3d scene with the animations, sounds, events and triggers and report any errors or warnings.



The Wide Area Virtual Environment - Virtual Medical Simulations Laboratory

## Beyond the Scene

Integrate and test Physical FX

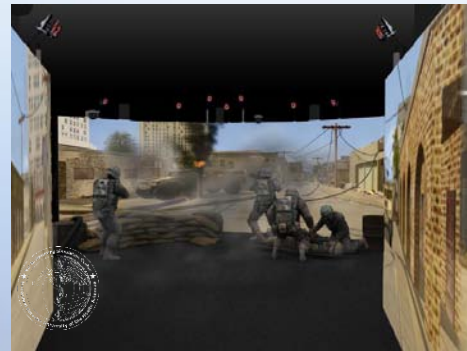
Set up the WAVE space with props and tools that extend the scene off the screens



The Wide Area Virtual Environment - Virtual Medical Simulations Laboratory

### ❖ Beyond the Scene: The User's POV

The users' perspective is important to take into account when determining the placement of events both on and off the screens.



The Wide Area Virtual Environment - Virtual Medical Simulations Laboratory

### ❖ Beyond the Scene: The User's POV

Integrate and test Physical FX



The Wide Area Virtual Environment - Virtual Medical Simulations Laboratory

## In review

Who are our users and what do they want to do?

Plan scenes and design the Physical FX to fit

Build the scenes in line with plan and give life through animation, sound, and triggerable events

The Wide Area Virtual Environment - Virtual Medical Simulations Laboratory

