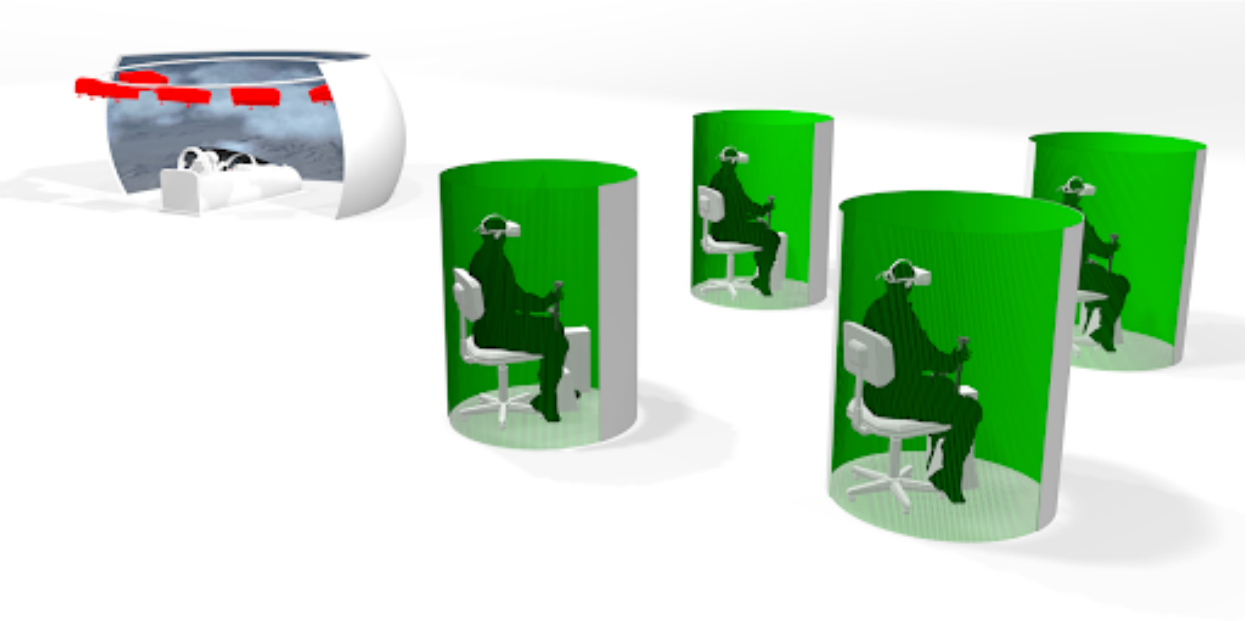
June
2019

What's Up MAK

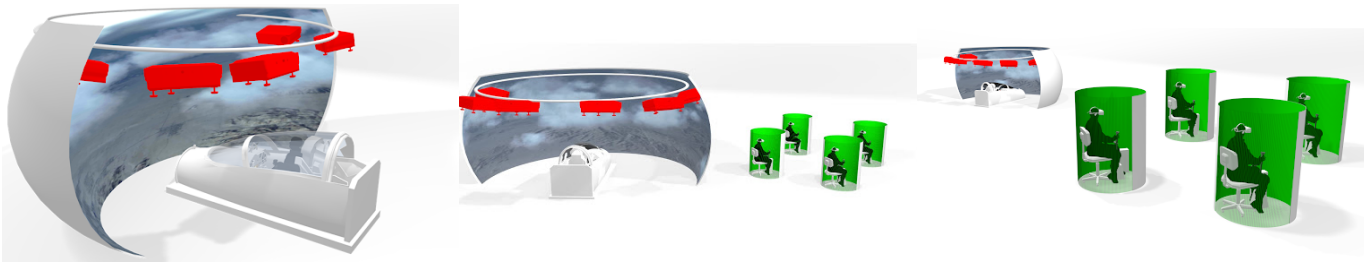


Experience Mixed Reality with MAK!

How to mix the right amount of Virtual with your Reality

Creating an immersive experience, whether for R&D, T&E, or Training, by definition requires that the user's perception is completely surrounded in a way that seems real to all the relevant senses: Visual, Aural, Haptic, and Olfactory. Okay, for most modeling and simulation applications, smell and taste are not important enough to bother with, and sound is straightforward enough. Let's consider options for how to create a compelling visual and haptic environment.

With the rise of VR headgear in commercial markets come advances in the display and tracking technologies that make it possible to design viable immersive training systems. The allure of replacing a large, expensive display system with a low cost headset is very compelling. The fidelity needed depends, of course, on the training task.

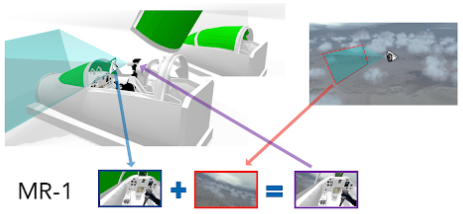


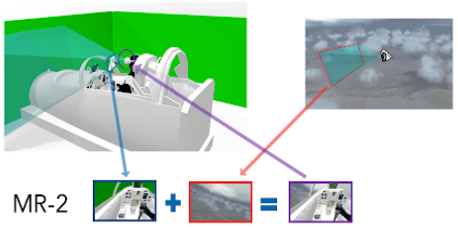
Virtual Reality

While there is a lot of investment in Virtual Reality techniques to address the haptic issues, this article focuses on Mixed Reality techniques. In fully virtual immersive environments, techniques are being developed that attempt to render a virtual proxy for the users' hands. In these mixed reality techniques, users see their real hands and feel real equipment.

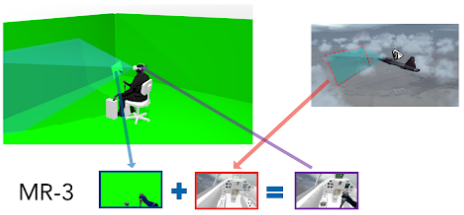
Mixed Reality

Mixed Reality is named after the idea that two video sources are "mixed" to produce the final video that is sent into the user's head-mounted display. In the first two illustrations (Technique MR-1 and MR-2), the green-screen indicates where the windows of the cockpit are. The first, by literally painting the windows green. The second, by hanging a green-screen on the walls outside the cockpit. In either case, the video images from the cameras mounted on the front of the user's HMD have green areas. In parallel, the eyepoint of the pilot is positioned in a virtual scene from which "virtual" scenes are rendered. Then a technique called "chromakey" is used to determine which parts of the virtual video scenes are mixed with the camera video to make the image presented to the user.

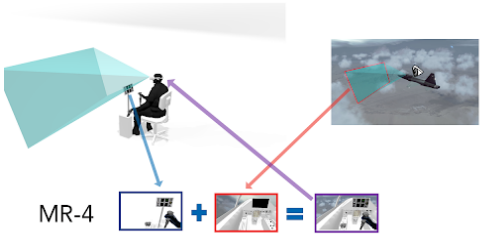




Technique MR-3 also uses a green-screen but, in this case, there is no physical cockpit. Instead, a 3-D model of the cockpit is included in the rendering of the virtual scenes. The cockpit model is also used to determine which parts of the HMD video are mixed with the virtual scene video.

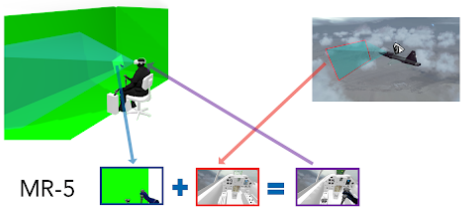


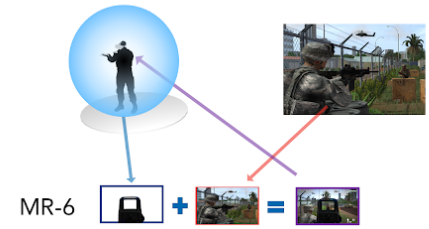
Technique MR-4 doesn't use a green-screen at all; It relies on the virtual model of the cockpit and depth cues from the stereo cameras on the HMD to specify which parts of each video to mix together. This technique requires precise registration between the physical gear and the virtual cockpit model.



Technique MR-5 is a hybrid technique that uses the green-screen technique in front of the user and the geometry mask from the virtual cockpit model behind the user where it's inconvenient to have a green-screen.

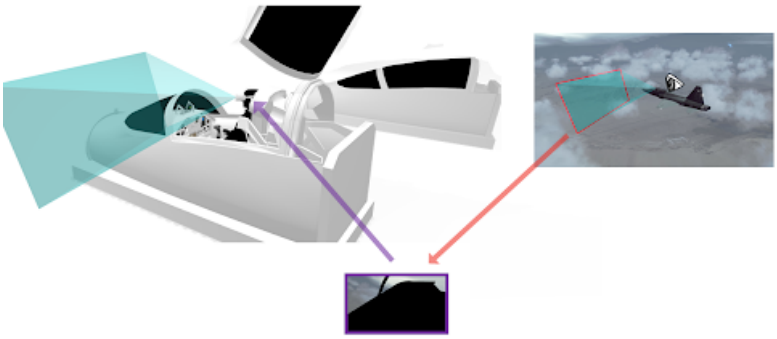
Technique MR-6 uses depth cues in the proximity of the user's HMD to determine what part of the HMD video should be mixed with the virtual video. This technique fits nicely in cases where the user is a person that is not confined to a vehicle cockpit.





Augmented Reality

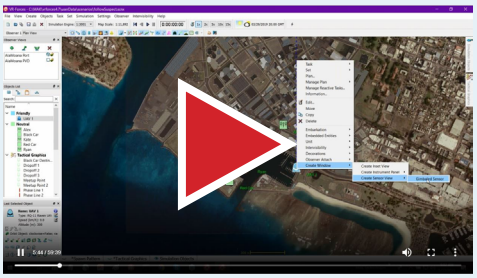
In future articles, we'll discuss Augmented Reality — where the user wears see-through glasses and virtual renderings are projected onto the glasses to add virtual elements to real visual scenes.



What's new on MAKTV

Virtual Reality and Mixed Reality with Dan Brockway and Bob Holcomb

Dan and Bob get together to discuss hardware MAK is using for virtual reality and mixed reality systems. Bob breaks down the benefits and tradeoffs of the current range of products, and which products are best for different systems.



What's new in VR-Forces 4.7

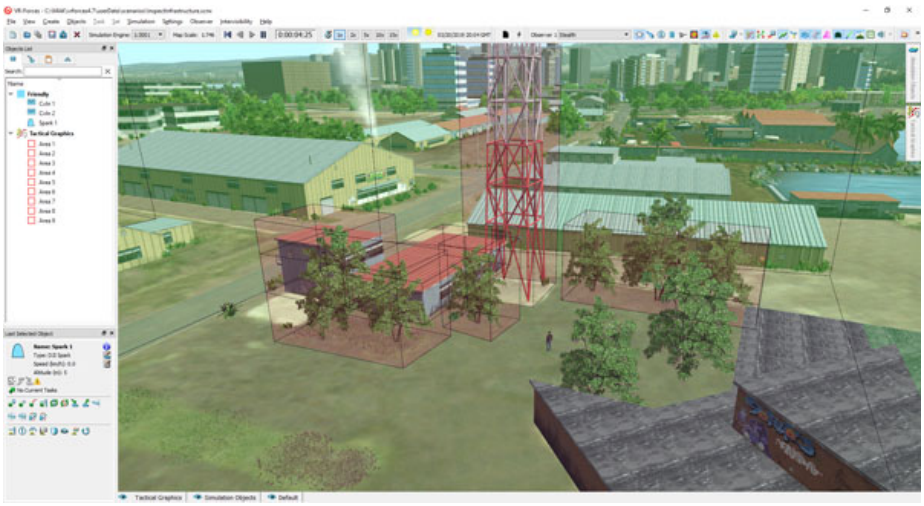
This webinar was held recently, and is now available as a recording. The webinar is designed to introduce and explore the latest features of VR-Forces 4.7, the newest release.

Geofencing for Drone Operator Training

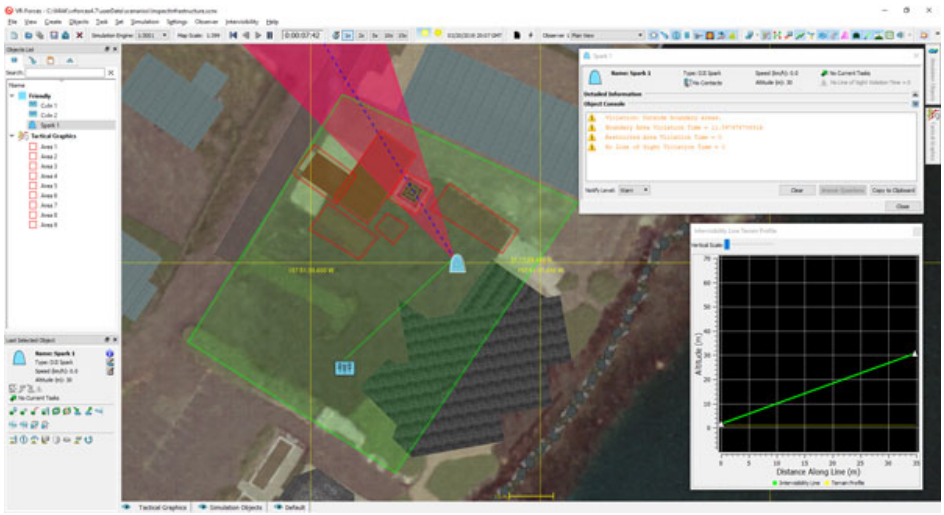
Last month at AUVSI, we debuted the latest VR-Engage product, the Drone Operator. This new role is designed specifically to teach individuals and classes the nuances of commercial drone flight, while minimizing associated costs.

One of the biggest security concerns and ambiguities for commercial drone operators are restricted zones, which may include airports, stadiums, or areas around vulnerable infrastructure. Class instructors are able to give specific directions (for example, to always maintain sight of the drone), and run scripts on the students that generate reports on how well they upheld federal and local laws. Students need to be able to operate drones safely within boundary areas while avoiding restricted zones, and the classroom is a low-risk/low-cost way to get repetitions.

To support this training, VR-Forces and VR-Engage support a feature called "geofencing", which allows three-dimensional spaces in a simulated environment to be designated as either "restricted" or "boundary". Students can start off by keeping these 3-D spaces visible in their sensor gimbal view, to get a feel for where they are spatially. As they gain experience, the visual representations can be turned off to better represent reality. Here is what those spaces look like in the 3-D view in VR-Engage:



Typically, this would be the view from the students' perspective. The instructor would most likely be observing the class action through a 2-D view in VR-Forces:

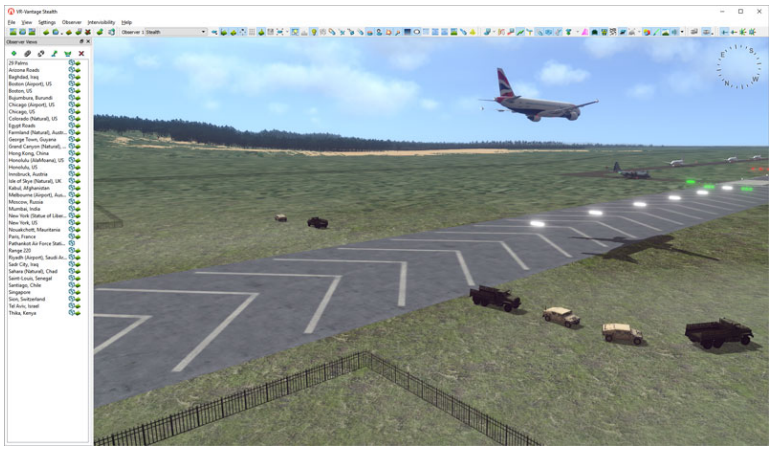


Whether the students are all operating within one scenario, or each in their own scenario, there are scripts designed to assess student performance. The scripts are capable of reporting on when and if the pilot lost sight of a drone, when and for how long a drone entered a restricted area, and when and for how long it left a boundary area. Instructors can also customize the scripts to detect an array of different factors and create a report.

For more information and pricing on VR-Engage Drone Operator for your classroom, email the sales team.

Tech Tip: Adding Fences to Your Terrain

VR-Forces and VR-Vantage customers often want to add additional features to the terrains provided by MAK or want to understand how to add features to the terrains that they have developed. One type of feature that is often requested is fencing, for example around an aerodrome.
Fences are flat extruded linear features that have no thickness. They are created from a shapefile by the MAK Earth terrain engine within VR-Vantage and VR-Forces. It is your responsibility to create or obtain a shapefile that has the fences you want to add.



The aerodrome earth files provided by MAK have a flattened area around them. If you are adding a fence to an aerodrome, you should ensure that your fence features fit within the flattened area. If they are in unflattened areas, they might not conform to the terrain.

To add your fences to an earth file, add the following block of code. Replace "../../data/Terrain/World/Features/myAirportFencesL.shp" with the path to your shape file. If you add it to .\userData\servers\airports.worldwide.xml, it will be included in the procedural terrains provided by MAK. However, you can add this example to any earth file.

```
!-- Extruded  fences Aerodrome -->
<model name="aerodrome_fences"
      driver="feature_geom"
      vrfsim:enabled="true"
      cacheid="aerodrome_fences">
 <features name="aerodromewalls" driver="ogr">
   <url>../../data/Terrain/World/Features/myAirportFencesL.shp</url>
 </features>
 <backface_culling>false</backface_culling>
 <!—backface culling needs to be on, so that fences render on both sides -->
 <clustering>true</clustering>
 <cluster_culling>false</cluster_culling>
 <lighting>true</lighting>
 <layout>
   <tile_size_factor>3</tile_size_factor>
 </layout>
 <styles>
   <library name="us_resources">
      <url>http://vr-theworld.com/vr-theworld/filemanager/download/public/Library/catalog.xml</url>
   </library>
   <style type="text/css">
      default {
         extrusion-height:      2;
         extrusion-flatten:     false;
         extrusion-wall-style:  building-wall;
         extrusion-random-seed: 1;
         altitude-clamping:     terrain;
         altitude-resolution: 0.00068664550781250000;
      }
      building-wall {
         skin-library: us_resources;
         skin-tags:    fence;
         skin-random-seed: 1;
         fill:         #ffffff;
      }
   </style>
 </styles>
</model>
```

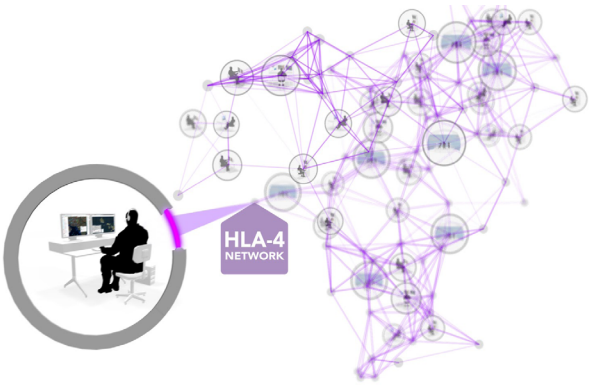
HLA 4 Standards update

By Doug Wood, HLA 4 Interface Specification Editor, SISO

Many people know the RPR FOM as the object model that takes the contents of the DIS PDUs and organizes them into HLA object and interaction classes. The primary goal of RPR 1 and RPR 2 was, according to the standard, to "Support transition of legacy DIS systems to the HLA." The idea was to make the transition easy by presenting the same data in a new format. RPR 1 was designed to support this goal for DIS 5, while RPR 2 added the capabilities of DIS 6. The RPR FOM group is still playing catch-up with DIS, with RPR 3 aimed at DIS 7.

However, this time our goal has changed. The RPR group no longer considers DIS to be a legacy standard. Both standards have strong user bases, and the RPR FOM simply wants HLA users to have access to the full object model available in modern DIS simulations. So for RPR 3, especially as mixed architecture exercises become ever more common, we have changed that goal: we are now aiming to "Support the interoperability of DIS and HLA systems through the use of a gateway."

This new goal provides a more clear purpose to our decisions, but there are always cases where the correct choice is not obvious. Take, for instance, the DIS variable parameter records and Attribute PDU. These concepts were added to DIS 7 in order to make the standard more extensible, allowing users to easily add their own optional extensions to the core DIS PDUs. However one of the strengths of HLA has always been the extensibility of its object model. This is a case of DIS adding something that the HLA standard already had. So does RPR 3 even need to address this capability?



When you consider the new goal of supporting interoperability through a gateway, the answer clearly becomes "yes." What is a DIS-RPR gateway supposed to do with all of these new extended DIS records, especially when the contents may not be defined in the core standard? Since RPR is a reference FOM, which is designed to be extended via federation agreements to meet user needs, the ideal solution would be for each federation to extend the RPR FOM itself with new FOM attributes that can map to any extended DIS records. This is, in fact, the course of action that RPR 3 will recommend as best practice, but it requires work to support every new DIS record added. Not only do RPR federates need to be updated, so does your FOM and your gateway. This may not always be practical or even possible.

As a result, RPR 3 will likely add new base classes from which all other object and interaction classes will be derived. These base classes will add a new FOM attribute that will be defined as an array of variant records. Any DIS extension records that cannot be directly mapped by the gateway to known FOM attributes can instead be encoded into this array for consumption by any federates that can parse this new data. While we recognize this does not conform to the typical "HLA-style" of FOM design, it is a practical consideration that helps the standard best achieve its new goal of interoperability between standards.

NewsMAKers

Recent product releases:
VT MAK is pleased to announce the release of DI-Guy 13.4. This is a significant feature release, containing many performance improvements, several new features, and lots of new content. Core improvements include adding many more entities into the scene with little impact on performance, faster initial character creation, improved visualization of people entering and exiting vehicles, and improved crowd collision avoidance logic.

Upcoming training classes:
Topic: VR-Engage Introduction & Overview
Date: June 25, 9:00 AM - 10:00 AM EDT
Webinar will focus on demonstrating VR-Engage, MAK's multi-role virtual simulator. The webinar will demonstrate the ability for a player using VR-Engage to assume the role of a first-person human character; a vehicle driver, gunner or commander; or the pilot of an airplane or helicopter. It will show how scenarios can be created and executed using the embedded VR-Forces simulation engine.

Topic: VR-Forces Training (On-site)
Date: September 16 -20
Week-long class designed to guide students through VR-Forces. Please contact your sales rep to sign up.

Recent Class Recordings:
Topic: What's new in VR-Forces 4.7
This class is designed to introduce and explore the latest features of VR-Forces 4.7, the newest release.

Topic: VR-Forces 104 - Simulating Humans Characters & Activity in VR-Forces
Webinar will focus on how VR-Forces can be used to simulate individual human characters and their associated behaviors and actions. The webinar will also cover how these individuals can be aggregated into a group and associated group behaviors.

Jobs @ MAK:
We're hiring! Check out our brand new MAK careers page and see the latest job postings.