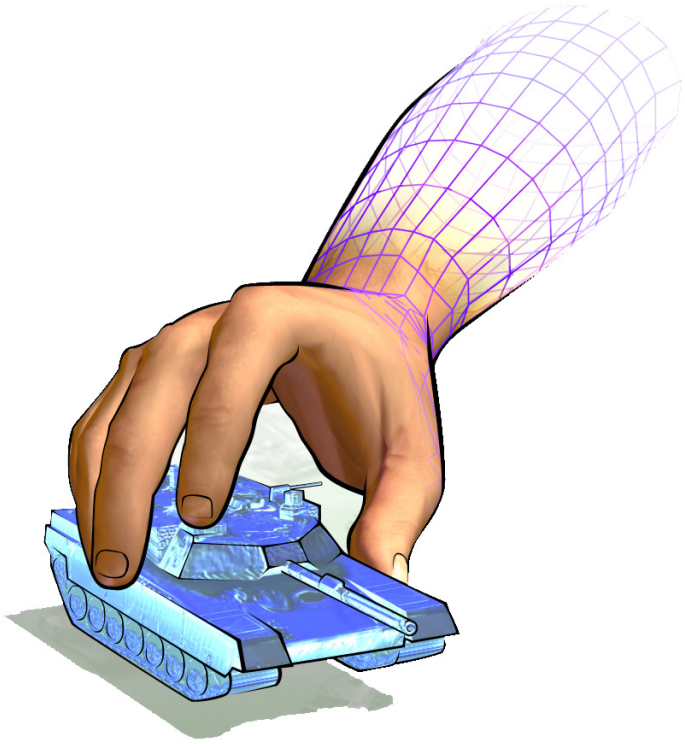

B-HAVE Module for VR-Forces

First Experience

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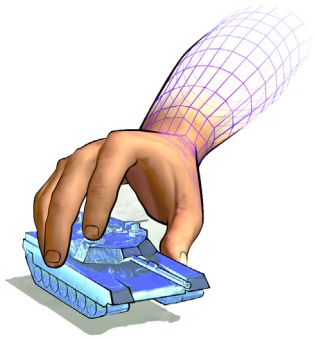
Revision BHV-2.0.3-3-120217



B-HAVE Module for VR-Forces First Experience

Thank you for deciding to try out the B-HAVE Module for VR-Forces (Brains for Human Activity in Virtual Environments). The B-HAVE Module for VR-Forces is a VR-Forces plug-in that extends the movement models for lifeforms and ground platforms. It improves:

- 3D path finding.
- Simplicity of use of basic agents (GoTo).
- Complexity and realism of behaviors (Hide, Flee, Wander).
- Complexity and realism of scenarios.

B-HAVE is powered by Kynapse®, the world's leading artificial intelligence (AI) technology solution, from Autodesk®. It is based on Kynapse's fundamental concepts of Topological Modeling for Path Finding, and Spatial Reasoning for Advanced Behaviors, which are integrated into VR-Forces as advanced planning capabilities.

Before you begin, install and license the software, as described in "Installing B-HAVE," on page 2.

When you are ready, this guide will help you:

- "Experience Improved Entity Movement"
- "Assign B-HAVE Tasks to Entities"
- "Create Multiple Entities"
- "Create Background Traffic"
- "Generate PathData"
- "Run a Lua Script"

This guide assumes that you have some basic familiarity with VR-Forces and can create scenarios, entities, and tactical graphics without detailed instructions.

1. Installing B-HAVE

B-HAVE is provided as an executable installation program. Please note the following important installation criteria:

- You must install B-HAVE into the directory in which you have installed VR-Forces. The installer defaults to the default installation directory for the associated version of VR-Forces, for example, *C:\MAK\vrforces4.0.3*. If you did not install VR-Forces into the default directory, it is your responsibility to change the B-HAVE installation directory to your VR-Forces installation directory.

  If the installer warns you that you are installing into an existing directory, ignore the warning.

- Each version of the B-HAVE is built for a specific version of VR-Forces and will work only with that version. For example, B-HAVE 2.0.3 for VR-Forces 4.0.3 will work only with VR-Forces 4.0.3. It would not work with VR-Forces 4.0.2.

➤ To install the B-HAVE, run the installation executable and follow the directions of the installation wizard.

You must have a license to run B-HAVE. Your MÄK salesperson should have provided you with a license as part of this evaluation or product purchase. Place it in the License Manager directory on the license server. License management and server setup should already be complete as part of installing VR-Forces.

2. Experience Improved Entity Movement

B-HAVE improves the movement models for lifeforms and ground vehicles when they execute tasks such as Move to Waypoint or Patrol Route. This lets entities intelligently navigate terrain without the need to create complex routes or waypoints. In this first exercise, we will ask an entity to walk from the roof of one building to the roof of another. Since we can't easily compare B-HAVE movement to non-B-HAVE movement without changing some configuration files, just take our word for it – you would not be able to do this without B-HAVE.

1. Start VR-Forces.
2. Create a new scenario that uses the VR-Village terrain.
3. In Plan View mode, zoom into the village to area just south of the intersection where the gazebo is located (Figure 1).

Figure 1. VR-Village center

4. Create a Neutral Civilian Female on the roof of the building to the left of the road, as shown by the circle in Figure 2. (Just place the entity on the roof. By default entities are placed on the highest polygon, so you do not have to specify the altitude.)

Figure 2. Entity on roof

5. Open the entity's plan window.
6. Choose **Set** → **B-HAVE Movement Mode**. The Movement Mode dialog box opens.
7. Select Free. (We will explain this choice later.)
8. Click OK. The set statement is added to the plan.
9. Choose **Task** → **Move to Location**. The Move to Location dialog box opens.
10. Click the top of the building across the street from the building on which you placed the entity. (Where the arrow in Figure 2 points.)
11. Select the Plan Path option. The dialog box should look like Figure 3.

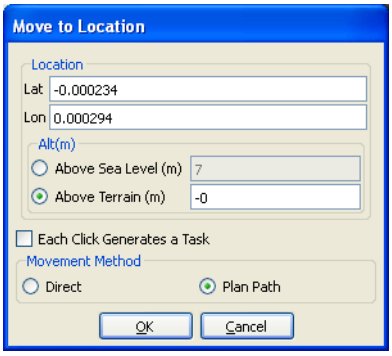


Figure 3. Move to Location dialog box

12. Click OK.
13. Click OK to save the Plan.
14. Save the scenario.

15. In the Observer Control toolbar, change the observer mode to Stealth (Figure 4).

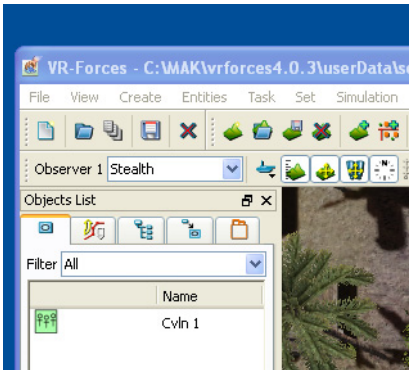


Figure 4. Observer mode

16. In the Objects List panel, right click the entity and select Attach Mimic. The observer attaches in Mimic mode. You might want to press the **s** key a few times so that the observer is just behind the entity.

17. Run the scenario. The entity walks down from the roof, across the street, into the other building, and up two sets of stairs to the roof.

2.1. The B-HAVE Movement Mode

In Step 7 of the previous section, we asked you set the B-HAVE Movement Mode to Free. B-HAVE lets you set a movement preference for entities. By default, vehicles prefer to travel on roads and lifeforms prefer to avoid roads. Lifeforms will cross a road if there is no other way to get to their destination, but otherwise they will stay off of them.

In this terrain, there is a tunnel under the street. If we did not set the movement mode to free, the entity would have walked through the first building, down into the tunnel, and then up into the building on the other side of the street. Since in the normal course of events you would expect a person to cross the street to get to the other side, we changed the movement mode.

You can test this out by removing the Set Movement Mode from the entity's plan and running it again.

3. Assign B-HAVE Tasks to Entities

As we discussed in "Experience Improved Entity Movement," on page 3, B-HAVE improves the movement models for lifeforms and ground vehicles when they execute VR-Forces movement tasks. However, B-HAVE also installs some additional tasks – Flee, Wander, and Hide – that are not available in standard VR-Forces. The Flee task causes entities to try to stay a specified distance from some other specific entity. The Hide task causes entities to flee until they are out of line-of-sight of a specified entity. The Wander task causes entities to move randomly throughout the terrain or within a specified area. Let's take a look at the Flee task.

1. Start VR-Forces.
2. Create a new scenario that uses the VR-Village terrain.
3. In Plan View mode, zoom into the village to the intersection where the gazebo is located (Figure 5).

Figure 5. VR-Village center

4. Create three or four civilian lifeforms in the intersection, as in Figure 6.

5. Zoom out a bit and put an Opposing force Technical Truck on a side street, as in Figure 6.

Figure 6. VR-Village center

6. Select the Technical Truck and open its Plan window.
7. Give it a Move to Location task, with the location the intersection where the lifeforms are. Select Use Roads as the movement mode.
8. Select the lifeforms that you created. (Hold down **`Alt`** and drag a box around them or **`Ctrl`**-click each one.)
9. Open a Plan window. This plan will apply to all of the selected entities.
10. Choose **Task** → **Flee From**. The B-HAVE Flee From dialog box opens.
11. In the window of the dialog box, select the Technical Truck.
12. In the Radius box, type 20.
13. Select Stop When Hidden. This means that the entity will stop if it is not in line-of-sight of the Technical Truck, even if it has not gone a full 20 meters away from it. Line-of-sight can be blocked by telephone poles and similar objects. The dialog box should look like Figure 7.

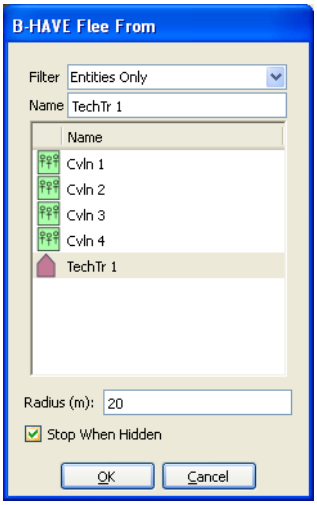


Figure 7. Flee From dialog box

14. Save the Plan.
15. Save the scenario.
16. Run the scenario. When the truck approaches the intersection, the entities move to be 20 meters away from it.

4. Create Background Traffic

One of the important uses for B-HAVE is to create background traffic to fill out a scenario. The B-HAVE lets you create continuous streams of lifeforms and vehicles that can enter a scenario, move to a specific or random location, and then exit the scenario. All this takes place without the need to program actions of individual entities.

You do this by placing spawn points, at which entities enter the scenario, and sink points, at which they leave. You need at least one of each. If you have multiple sink points, entities randomly choose the ones to use, so the behaviors are not predictable.

1. Create a new scenario using the Makland terrain.
2. Zoom in on the town.
3. Choose **Create** → **Traffic** → **Friendly** → **Vehicle Spawn Point**. The cursor changes to look like a waypoint.
4. Click on the terrain to locate two or three spawn points, as in Figure 8.

Figure 8. Spawn points

5. Choose **Create** → **Traffic** → **Friendly** → **Vehicle Sink Point**. The cursor changes to look like a waypoint.

6. Click on the terrain to locate two or three sink points, as in Figure 9.

Figure 9. Sink points

7. Save the scenario.
8. Run the scenario. Vehicles will appear at the spawn points every few seconds. Then they will travel to one of the sink points and be removed from the scenario (Figure 10).

Figure 10. Traffic

5. Create Multiple Entities

Another way to quickly populate a scenario with entities is to create multiple entities at once and give them a task, set their state, or both.

1. Create a new scenario using the TerraSimSampleUrban terrain.
2. Zoom in to the high-resolution area.
3. Choose **B-HAVE → Create Multiple Entities**. The Create Multiple Entities dialog box opens (Figure 11).

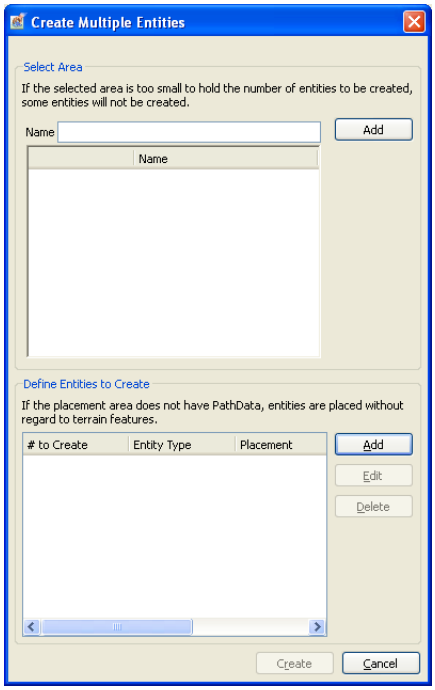


Figure 11. Create Multiple Entities dialog box

4. When you create multiple entities, you must create them in an area and this scenario does not have one yet, so in the Select Area group box, click Add. A Create Area tab is added to the window.
5. Create an area following the standard VR-Forces procedure for creating areas. The area is added to the window in the Select Area group box.
6. In the Select Area window, select the area you created.

7. In the Define Entities to Create group box, click Add. The Add Group of Entities dialog box opens (Figure 12).

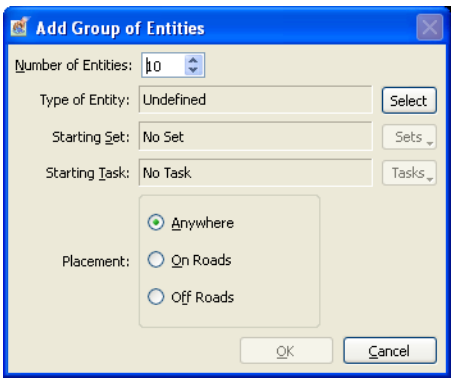


Figure 12. Add Group of Entities dialog box

8. The default number of entities to create is 10. This is fine, but you can change it if you want to.
9. Click the Select button that is next to the Type of Entity text box. The Entity Type dialog box opens. It is similar to the Entity Palette.
    a. Select the Lifeform category.
    b. Select the Neutral force.
    c. In the entity list, select Civilian Male.
10. Click the Tasks button. A list of tasks is displayed. Choose Wander. The Wander dialog box opens.
    a. Leave the Duration as Indefinitely.
    b. In the Movement group box, select Restricted to Area.
    c. Select the area you created.
    d. Click OK.
11. In the Placement group box, select Off Roads.
12. Click OK. The entity set is added to the list in the Define Entities To Create group box.
13. Click Create. The entities get created in the area.
14. Save the scenario.
15. Start the scenario. The entities will wander within the area.

6. Generate PathData

To use B-HAVE features, a terrain must have PathData. PathData is a topological model of the 3D environment that B-HAVE uses to plan the paths for entities when they move. The terrains that are shipped with VR-Forces all have PathData, which is why you are able to use B-HAVE in the previous sections of this guide without having to generate it yourself. However, the guide would not be complete if we did not give you a chance to generate it yourself.

1. When you generate PathData, you overwrite any existing PathData for the terrain. So, before you start this exercise, you should rename the PathData directory for the terrain you are going to use so that you can revert to the original PathData when you are done. Rename *./userData/terrains/Ground-db_PathData* to something else, such as *./userData/terrains/originalGround-db_PathData*.
2. If a scenario is open, close it.
3. Choose **File** → **Open Terrain**.
4. Open *Ground-db.mtf*.
5. Choose **B-HAVE** → **Generate PathData**. The PathData Generation dialog box opens and the cursor changes to a cross-hair.
6. Draw a box on the terrain similar to that in Figure 13.

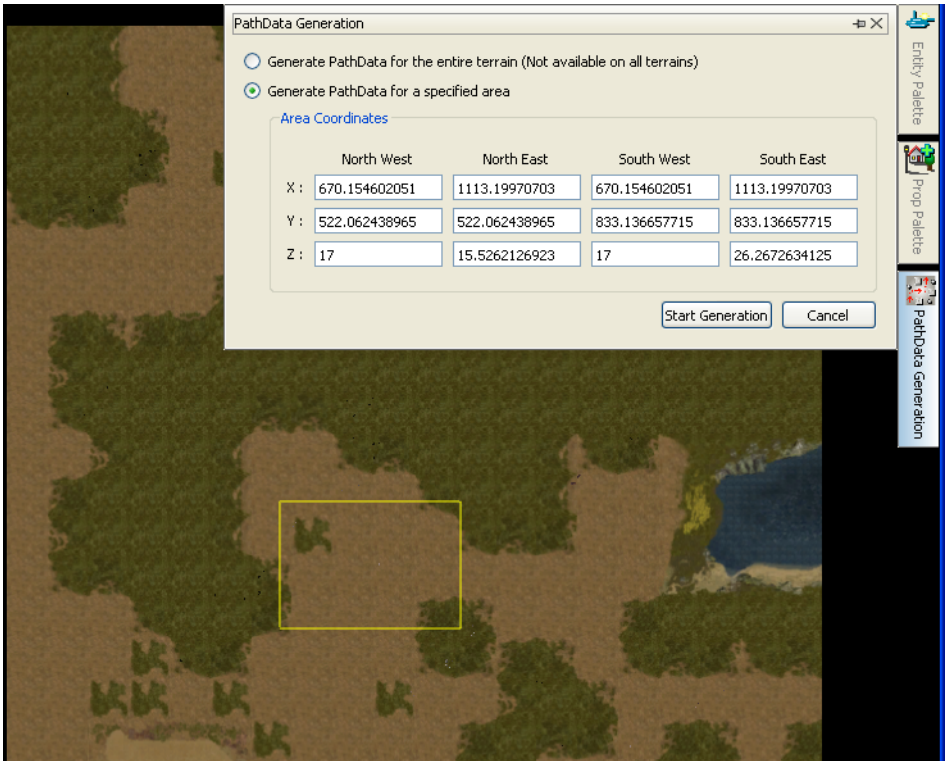


Figure 13. PathData generation box

7. Click Start Generation. An informational prompt is displayed.
8. Click OK. It will take 2-3 minutes to generate PathData for the area shown. When generation is complete, VR-Forces displays a notification prompt.
9. Choose **B-HAVE** → **Show Generated PathData** → **Lifeform**. The new PathData is displayed.
10. Zoom in to see the polygons.

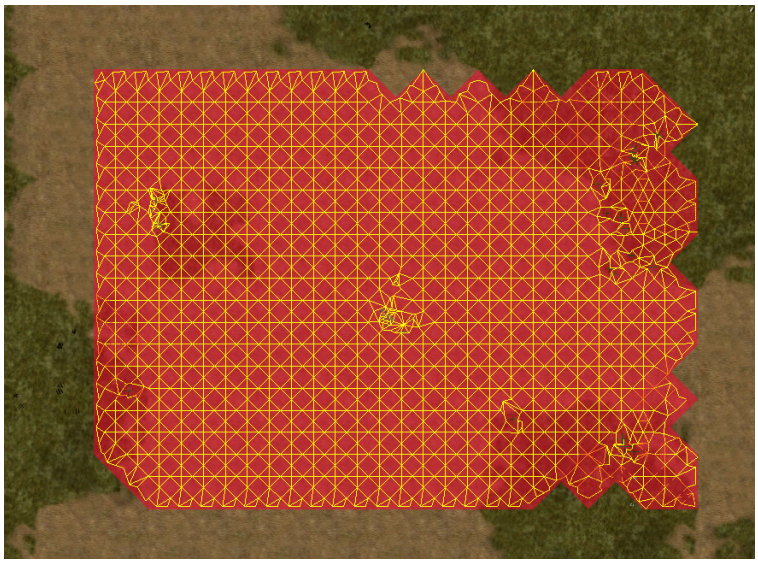


Figure 14. PathData generation box

11. Close the terrain.
12. To restore the PathData for the entire terrain, delete *./userData/terrains/Ground-db_PathData* and rename *./userData/terrains/originalGround-db_PathData* to the original name.

7. Run a Lua Script

One of the most powerful features of B-HAVE is its support for Lua scripts. Lua is a scripting language commonly used in artificial intelligence applications. B-HAVE has a library of functions that give you access to most VR-Forces tasks and set data requests and to B-HAVE features as well. You can use Lua scripts to supplement or replace the plan language in VR-Forces.

We will not ask you to do any actual scripting, but we want you to know about this feature and try out one of the supplied scripts.

1. Create a new scenario with at least three civilian entities. The only real requirement is that there is an entity named Cvln 1 and a second one named Cvln 2.
2. Select Cvln 1.
3. Choose **Set** → **B-HAVE Script**. The Set B-HAVE Lua Script dialog box opens (Figure 15).

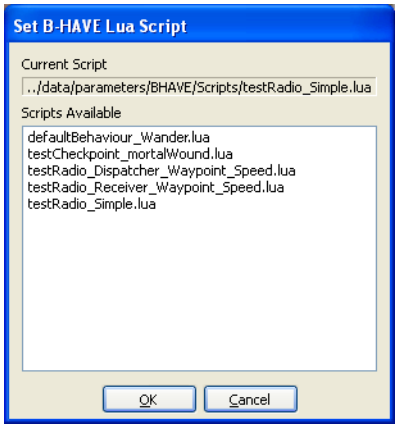


Figure 15. Set B-HAVE Lua Script dialog box

4. Select *testRadio_Simple.lua*.
5. Click OK.
6. Save the scenario.
7. Select Cvln 1 and press **`i`**. The Entity Information dialog box opens.
8. Open the Entity Information dialog boxes for Cvln2 and Cvln 3.
9. In the Entity Information dialog box for each entity, change the Notify Level to Info.
10. Run the scenario. Every ten seconds or so, Cvln 1 will send a message to its console that it is sending a message. Then it will send “Hello world” to all entities (including itself). It will also send a message only to Cvln 2. If you compare the messages received on the Cvln 2 console to Cvln 3, you can see the difference.

If you would like to look at the script that you ran to get a sense for how it works, do the following:

1. Choose **B-HAVE** → **Lua Scripts**. The B-HAVE Scripts dialog box opens (Figure 16).

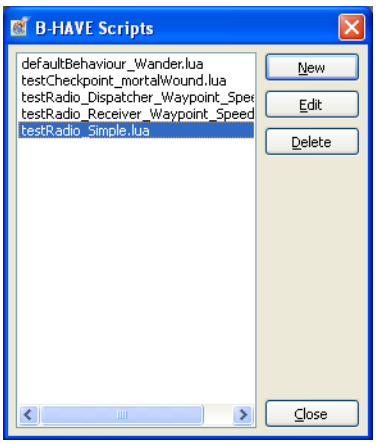


Figure 16. B-HAVE Scripts dialog box

2. Select *testRadio_Simple.lua*.
3. Click Edit. You will be prompted to do so. If you do not have a personal preference for text editors, you can select Notepad.
4. The script opens (Figure 17).

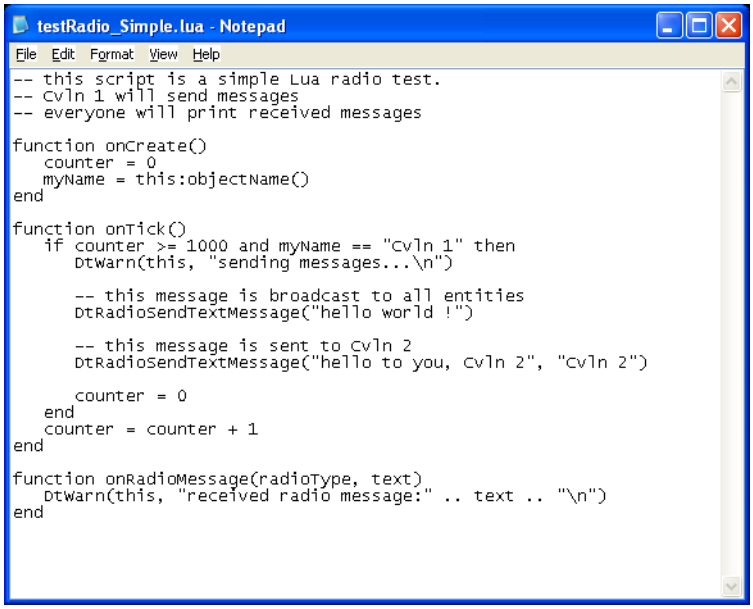


Figure 17. Lua script