User Manual

PI

C-887.VM1 PIVeriMove Software for the Collision Check

Contents

General

PIVeriMove is a software-based solution. It does not comprise any hardware for collision detection or avoidance (e. g. collision sensors.)

License

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Introduction
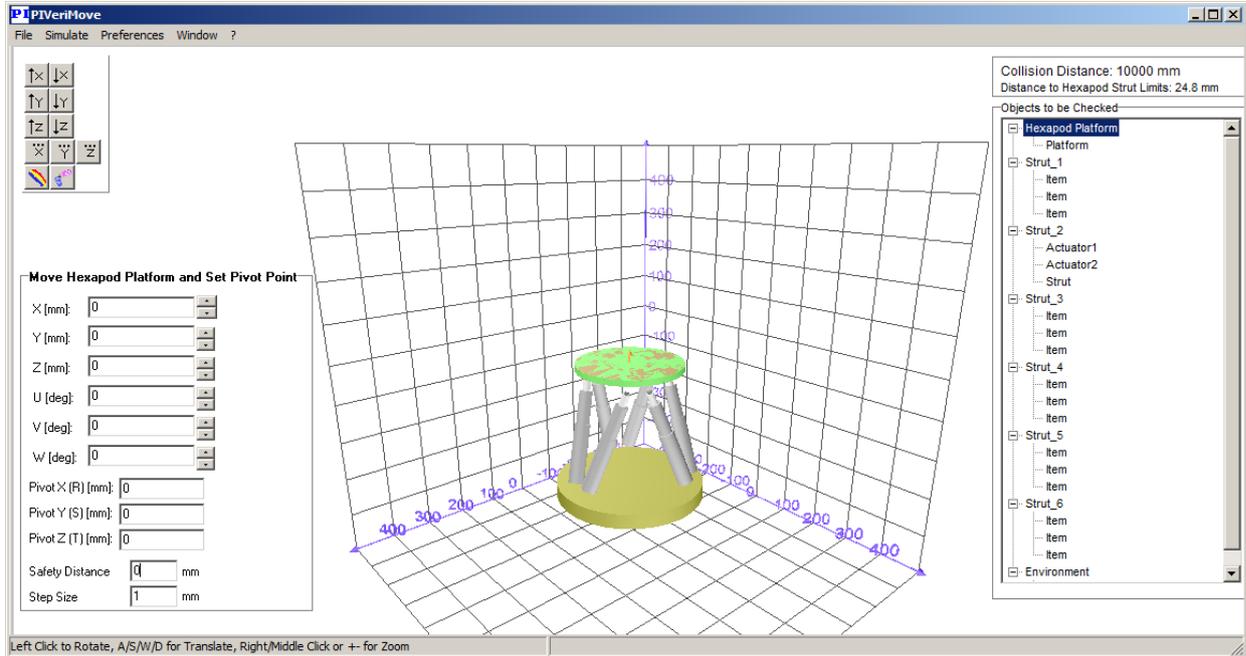
PIVeriMove is a PC software designed for use with the Hexapod systems provided by PI. By checking if the moving platform of the Hexapod can actually reach the commanded target position and the nodes of the calculated trajectory, PIVeriMove helps to avoid collisions between the following items:

- Any Hexapod part and items in the environment
- Any Hexapod part and items of the set-up mounted to the Hexapod
- A set-up mounted to the Hexapod and items in the environment

With PIVeriMove, you can perform the following tasks for your Hexapod model:

- Create an individual "collision configuration" consisting of Hexapod and additional objects (set-up, environment) and store it in a "collision configuration file" on the PC. Supported functions:
    - Modelling of items present in the set-up and/or the environment
    - Import of 3D objects

- Simulate motions on the PC for a selected collision configuration. Supported functions:
    - Calculation of the minimum collision distance and the minimum distance to the Hexapod strut limits (i.e. the minimum available travel range) for a given target, trajectory or workspace
    - Calculation of the distance the axes still can move from the current position

- Send a collision configuration file from the PC to a Hexapod controller where it is stored and used to prohibit motions which would cause collisions

The use of PIVeriMove requires a license code which can be obtained from PI.

In addition to this user manual, read the user manual of the C-887 Hexapod controller (MS204E) and the user manual of your Hexapod microrobot (standard models: H-810, H-811, H-820, H-824, H-840, H-850 or H-206).

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Installing and Activating PIVeriMove

INFORMATION

A license code is required for the Hexapod controller to which you want to send a collision configuration file.

System Requirements

The following system requirements must be met to operate the PIVeriMove PC software:

- ✓ PC with Windows operating system (7, 8, 10; 32 bit, 64 bit) and ca. 35 MB free hard disk space

- ✓ Display resolution of the monitor connected to the PC:
  Required: Super VGA 800x600,
  Recommended: Super VGA 1024x768 or higher

Installing PIVeriMove on the PC

PIVeriMove is provided on the product CD of supported controllers and can be installed with a common setup procedure:

1. Insert the controller product CD in the host PC.

2. If the Setup Wizard does not start automatically, start it from the root directory of the CD by doubleclicking the 🖥 icon or the setup.exe file.

3. Follow the on-screen instructions. You can choose between "complete" and "custom" installation. Other components of the "complete" installation are, for example, PIMikroMove, LabView driver and DLLs. "Complete" is recommended.

Activating PIVeriMove

Before you start PIVeriMove for the first time, you have to activate the program for the PC on which it is installed. In the activation process, you also have to register the Hexapod controller on which you want to store collision configurations created with PIVeriMove. Registration of the Hexapod controller requires its serial number (9-digit number).

1. If necessary, identify the serial number of your Hexapod controller:

   - Use the SSN? command. See the user manual of the Hexapod controller for communication details and command descriptions.
   or

   - See the type plate on the rear panel of the Hexapod controller.

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2. Start the licence generator program on the PC via the **Start > All Programs > PI > C-887 > PIVeriMove > GenerateActivationID** menu sequence.
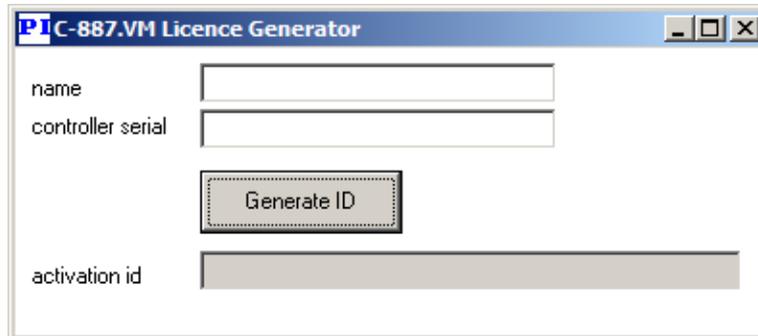
3. Generate the activation ID in the licence generator:

    a. Enter your name or the name of your company in the **name** field. Spaces are permissible, but do not use the "_" character.

    b. Enter the serial number of your Hexapod controller in the **controller serial** field. Note that the **controller serial** field must not be empty. If you have no Hexapod controller, enter a dummy number. Possible characters are 0 to 9.

    c. Click **Generate ID** to create the activation ID. The result is displayed in the **activation id** line.

    d. Make a note of the content of the **activation id** line.

4. Obtain the PIVeriMove licence key from PI:

    a. Send the activation ID (generated in step 3) to PI (mailto:info@pi.ws or write a direct e-mail to your PI sales engineer). In return, PI will send you the expirydate.txt file. This file contains a license key for your PC.

    b. Copy the expirydate.txt file to the directory in which the PIVeriMove.exe file is located on your PC. The path of this directory was defined during the installation of PIVeriMove, by default something like C:\Program Files\PI\C-887\PIVeriMove.

Starting PIVeriMove on the PC

➢   Start PIVeriMove on the PC via the **Start > All Programs > PI > C-887 > PIVeriMove > PIVeriMove** menu sequence.

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Main window of PIVeriMove

This section describes the components which are always present in the main window. Depending on the action performed, additional components can be present in the main window. These additional components are described in the corresponding action instructions.
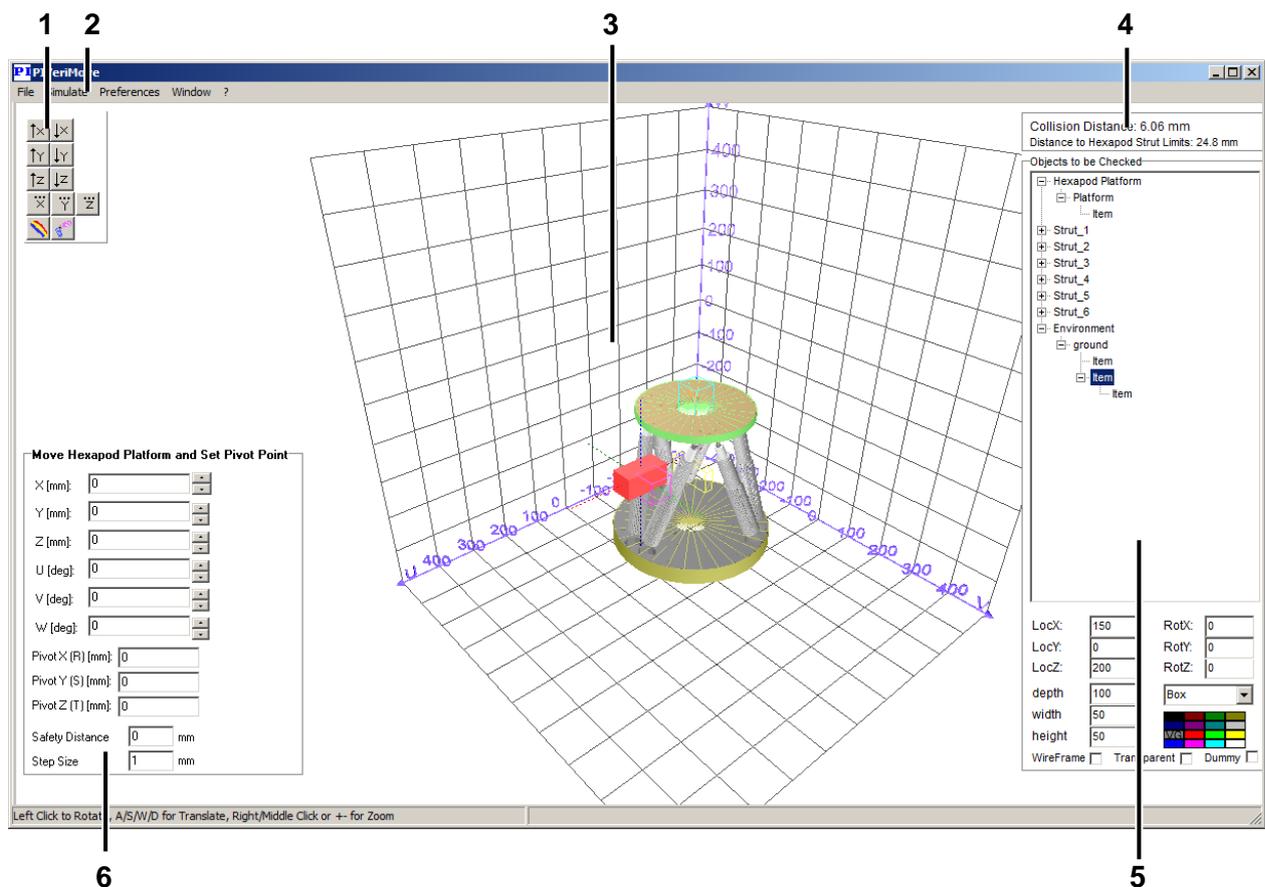
Figure 1: Main window of PIVeriMove

1   Pane with configuration buttons (p. 6)
2   Menu bar (p. 7)
3   Graphic display (p. 6)
4   Information pane (p. 7)
5   **Objects to be checked** pane (p. 6)
6   **Move Hexapod Platform and Set Pivot Point** pane (p. 7)

The following panes can be moved in the main window of PIVeriMove by clicking in the pane and dragging the mouse pointer with the left mouse button pressed:

- Pane with configuration buttons
- Information pane
- **Objects to be Checked** pane
- **Move Hexapod Platform and Set Pivot Point** pane

Graphic Display and Configuration Buttons

The graphic display in the main window of PIVeriMove visualizes the following:

- Collision configuration consisting of Hexapod and mounted set-up and environment

- Current location of the pivot point

- Simulated motion of the Hexapod

You can change the visualization in the graphic display as follows:

- Change the orientation of the Hexapod with the ↑x ↓x ↑Y ↓Y ↑z ↓z buttons so that the specified axis points in the specified general direction on the screen.

- Change the position of the grid with the Ẍ Ÿ Z̈ buttons. Click several times to return to starting point.

- Change the background color using the ◥ button.

- Rotate the view by dragging the mouse pointer across the graphic display with the left mouse button pressed. To translate the view, you can use A S W D on the PC keyboard.

- Zoom in or out on the view by dragging the mouse pointer across the graphic display with the right or middle mouse button pressed, or by using + and − on the PC keyboard.

- Change the visualized collision configuration as described in „Loading Hexapod Model and Collision Configuration File" on p. 10.

Using the ◢ button, you can show or hide the ***Objects to be Checked*** pane (see below).

***Objects to be Checked* Pane**

While the graphic pane visualizes the collision configuration, the ***Objects to be Checked*** pane shows all items of the collision configuration in a tree structure.

In the ***Objects to be Checked*** pane, you can work with the collision configuration as follows:

- Add a new item ("child") to any item of the tree ("parent"), details see p. 11. Note that items can also be added via the ***File > Import > 3D CAD Object*** menu sequence (p. 11).

- Configure added items, details see p. 12

- Save the collision configuration on the PC, details see p. 13

- Send the collision configuration to a Hexapod controller, details see p. 21.

Move Hexapod Platform and Set Pivot Point Pane

In the ***Move Hexapod Platform and Set Pivot Point*** pane, you can simulate the Hexapod motion to a given target position with a given "safety distance", details see p. 20.

Information Pane

The information pane is located on the right top of the PIVeriMove main window. The pane displays the following:

- Minimum collision distance: minimum distance between any two items of the three item groups Hexapod parts, environment and mounted set-up.

- Minimum soft limit distance: minimum of the distances that the six Hexapod axes can still move until at least one strut reaches a limit switch.

If the motion is simulated via the controls of the ***Move Hexapod Platform and Set Pivot Point*** pane (p. 20), the displayed values are related to the current Hexapod position.

If a motion simulation was started via the ***Simulate*** menu, the displayed values are related to the Hexapod position marked by the cursor in the ***Simulation Data*** pane (p. 17).

Menu Bar

File menu—note that the menu items apply to files located on the PC where PIVeriMove is installed or on storage media connected to this PC:

- ***New (F5)***: Opens the ***Select the Hexapod*** window, details see p. 10.

- ***Open (F6)***: Opens file selection windows for Hexapod model and collision configuration, details see p. 10.

- ***Open Recent***: Lists recently used collision configuration files, details see p. 10.

- ***Save (Ctrl W)***: Saves the current collision configuration in the collision configuration file which is currently loaded.

- ***Save As… (F2)***: Saves the current collision configuration in a collision configuration file which can be selected via a file selection window.

- ***Import > 3D CAD Object***: Opens a file selection window where you can select a 3D object to be imported, details see p. 11.

- ***Exit***: Closes PIVeriMove with or without saving the current collision configuration.

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Simulate menu—all simulations are applied to the current collision configuration:

- **Load Macro Sequence**: Opens a file selection window where you can select a file with a sequence of motion commands (file type: *.dat, *.txt or *.mac), details see p. 14

- **Simulate Workspace**: Adds the **Simulate Workspace** pane to the main window of PIVeriMove, details see p. 15

- **Simulate Trajectory**: Adds the **Simulate Trajectory** pane to the main window of PIVeriMove, details see p. 16

- **Simulate possible Movement**: Adds the **Simulate Possible Movement** pane to the main window of PIVeriMove, details see p. 19

Preferences menu:

- **Render Settings**: Sets degree of details of graphic display, possible values depend on graphic card of PC.
  Default Detail corresponds to **Medium Detail**

- **Show Calculation Time**: Shows or hides the display of the calculation time for a simulation, in µs

- **Show Texture of Face Materials**: Shows or hides texture of Hexapod and imported items

- **Program Settings**: Opens the **Program Settings** window where you can configure automatic saving of the current collision configuration, details see p. 13

Window menu: Lists all collision configurations which are currently loaded to PIVeriMove and allows switching between them, details see p. 10.

? menu:

- **About PIVeriMove**: Displays a window with version information for PIVeriMove.

- **Hotkey and MouseAction Reference**: Displays a window with keyboard shortcuts and mouse action reference.

- **Help**: Opens a window which gives access to the documentation for PIVeriMove.

- **Websites**: Gives access to PI homepage and download server

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Working with Collision Configurations

General Note

> **INFORMATION**
>
> The minimum permissible collision distance entered in the **Safety Distance** field of the **Move Hexapod Platform and Set Pivot Point** pane (p. 7) is applied only for motions simulated using the controls in this pane. This safety distance does **not** become part of any collision configuration file and is **not** used for simulations started from the **Simulate** menu (p. 8).
>
> Observe the following to ensure that a collision configuration stored on the Hexapod controller can avoid collisions:
>
> ➢ Create a collision configuration file with items that completely contain the mounted set-up and environment of the Hexapod. If required represent set-up and environment by several objects.
>
> ➢ Make sure that the dimensions of an added item are in a close proximity to the real model.
>
> ➢ Provide an environment that allows sufficient space, for example, for moving cables or the unpredictable moves during a reference move of the Hexapod.

Overview

Working with collision configurations in PIVeriMove typically comprises the following steps:

1. Load a Hexapod model and a collision configuration file, details see p. 10.

2. Adapt the collision configuration to your system as close as possible, details see p. 11.

3. Save the collision configuration on the PC, details see p. 13.

4. Perform one or more simulations with the collision configuration to check for possible collisions, details see p. 14.

5. If necessary, adapt and save the collision configuration again on the PC.

6. Send the collision configuration to a Hexapod controller, details see p. 21.

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Loading Hexapod Model and Collision Configuration File

A collision configuration can only be changed, saved and used for simulations if it is shown in the graphic display and the *Objects to be Checked* pane of PIVeriMove. It can be shown there as follows:

➢ Load a Hexapod model and a collision configuration file using one of the following sequences of the *File* menu:

▪ *File > New (F5):* Opens the *Select the Hexapod* window. Selecting a Hexapod loads a Hexapod model and the corresponding default collision configuration file to the graphic display.

▪ *File > Open (F6)*: Opens file selection windows where you can load the Hexapod model (.dat file) and the collision configuration to be used (*.collision.xml file) to the graphic display manually.

▪ *File > Open Recent*: One of the recently used collision configuration files (*.collision.xml file) can be selected. The selected collision configuration is loaded to the graphic display, together with the Hexapod model for which that collision configuration was created.

➢ If multiple collision configurations with the corresponding Hexapod models are already loaded to PIVeriMove, switch between them via the items of the *Window* menu (*.dat files with their paths).

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Adapting the Collision Configuration

The collision configuration is visualized in the graphic display and shown as a tree structure of "parents" and "childs" in the *Objects to be Checked* pane. A child item is linked to the center of the parent. The position of a child is relative to its parent, i.e. moving the parent in a simulation will also move the child. Note that *Environment* or an item linked to it must be the parent of any item which may not move with the Hexapod.

In the *Objects to be Checked* pane, the items of the set-up and environment can be added to the graphic display and the tree structure as follows:

1. In the tree structure, select the parent, i.e. the item to which the new item is to be linked as child.

2. Click with the right mouse button on the selected item and select *Add* from the context menu. The new item is added to the tree structure with default dimensions, location and properties.

3D objects can be imported from *.3ds files and added to the graphic display and the tree structure in the *Objects to be Checked* pane as follows:

1. In the CAD application, remove details from the 3D object that are not relevant for the collision calculation.

2. In PIVeriMove, open the file selection window via the *File > Import > 3D CAD Object* menu sequence.

3. Select the *.3ds file of the object to be imported. Sample objects are available in the *3D* directory which is located in the installation directory of PIVeriMove.

4. In the corresponding dialog window(s), determine the level of detail for importing. Examples for different levels of detail:
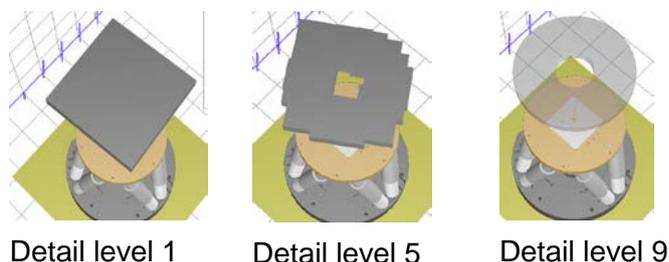

Detail level 1   Detail level 5   Detail level 9

Figure 2: Imported objects with different levels of detail

The *Import 3D Object* pane is added to the main window of PIVeriMove. During the import process, the pane shows the *Calculating* status message. Importing takes some time and is finished when a message box with further instructions is displayed.
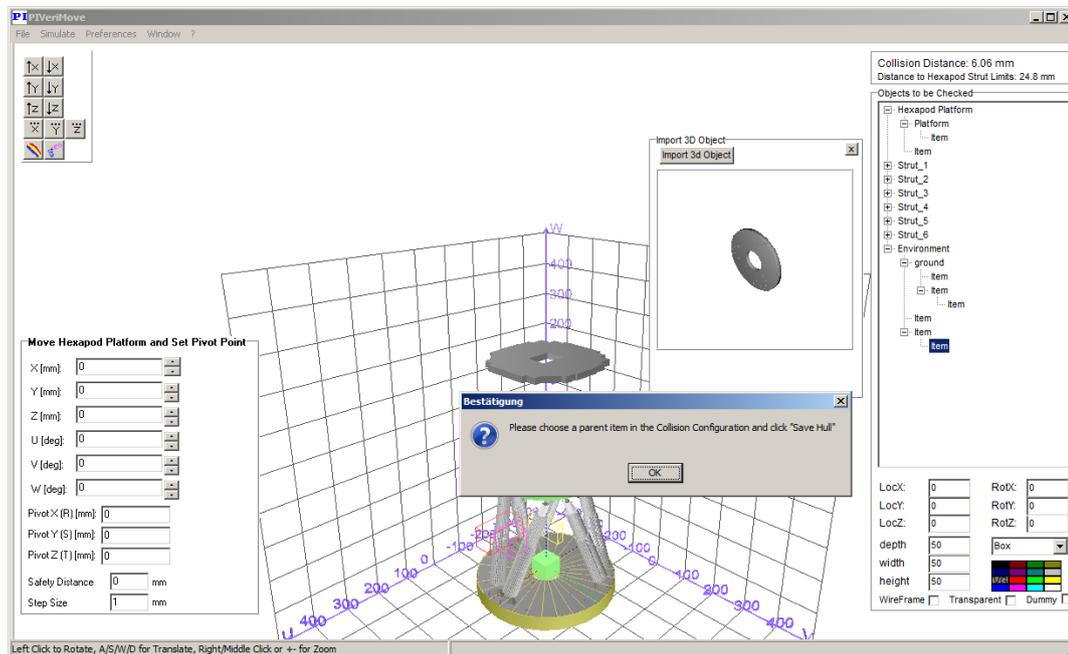
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Figure 3: Main window with *Import 3D Objects* pane and message box

5. Click *OK* in the message box.

6. In the tree structure in the *Objects to be Checked* pane, click on the item which is to be the parent of the imported object.

7. In the *Import 3D Object* pane, click on *Save Hull* to add the imported object to the collision configuration.

In the *Objects to be Checked* pane, added items can be configured as follows:

➢ Delete, copy or paste an item: Click on a selected item with the right mouse button and select the corresponding entry from the context menu.

➢ Move an item in the tree structure: Click on the item with the left mouse button and move it to the desired parent item with the left mouse button pressed ("drag and drop").

➢ Rename an item: Click on the item with the left mouse button and enter a new name.

➢ Change the location, the dimensions, the shape, the color and the type of visualization for the item: Make sure that the item is selected in the tree and change the properties of the item using the controls at the bottom of the *Objects to be Checked* pane (see Figure 4 below). "Dummy" items are disregarded by the collision calculation, but can be used as a parent item.
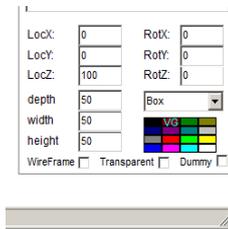
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Figure 4: Controls at the bottom of the *Objects to be Checked* pane

Saving the Collision Configuration on the PC

➢ If you want to save the collision configuration in the collision configuration file which is currently loaded: Use the *File > Save (Ctrl W)* menu sequence.

➢ If you want to select a collision configuration file (*.collision.xml) via a file selection window:

▪ Use the *File > Save As… (F2)* menu sequence.

or

▪ Click somewhere in tree structure in the *Objects to be Checked* pane with the right mouse button and select *Save Configuration* from the context menu.

➢ If you want to save the current collision configuration automatically, configure PIVeriMove as follows:

a. Open the *Program Settings* window using *Preferences > Program Settings* menu sequence.

b. In the *Default Directory* field, enter the folder where the *.collision.xml files are to be saved. Alternatively, click *Change* to select the folder.

c. In the *minutes* field, enter a value for the time period for automatic saving.

d. Activate automatic saving by checking the *AutoSave* checkbox.

e. Click *Save* to save the configuration and close the *Program Settings* window.

▪ To deactivate automatic saving, open the *Program Settings* window again, uncheck the *AutoSave* checkbox and click *Save*.

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Performing Simulations with the Collision Configuration

With PIVeriMove, you can perform several simulations on the PC to check for possible collisions:

- Simulations whose results can be evaluated and saved using the **Simulation Data** pane (p. 17):

  – Simulate the Hexapod motion given by a loaded sequence of motion commands, see p. 14

  – Simulate the Hexapod motion to all limit positions of a given work space, see p. 15

  – Simulate the motion trajectory of the Hexapod from a given start position to a given target position, see p. 16

- Display the permissible distance an Hexapod axis can move in positive and negative direction, see p. 19

- Simulate the Hexapod motion to a given target position with a given "safety distance", see p. 20

You can simulate the motion given by a loaded sequence of motion commands (i.e. a sequence file). In the sequence file, you can also set the coordinates of the pivot point using the SPI command.

INFORMATION

Before the command sequence, a macro file must contain four lines as header. The four header lines can contain dummy text, e.g. something like:

```
PHYSIK INSTRUMENTE (PI) GmbH
WAIT xxx    Delay [ms] 1..64000
Capital Letters only
Next Line for Commands
```

Proceed as follow:

1. Open the file selection window using the **Simulate > Load Macro Sequence** menu sequence.

2. Double-click the sequence file to be loaded (file type: *.dat, *.txt or *.mac). The **Simulate Trajectory from Macro Sequence** pane is added to the main window.

   Note that the **Simulate Trajectory from Macro Sequence** pane can be moved in the main window by clicking in the pane and dragging the mouse pointer with the left mouse button pressed.

3. If necessary, set the velocity and the step size for the simulated motion.

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4. If the graphic display is not to be updated during the calculation process to accelerate the process: Deactivate the **graphic** checkbox.
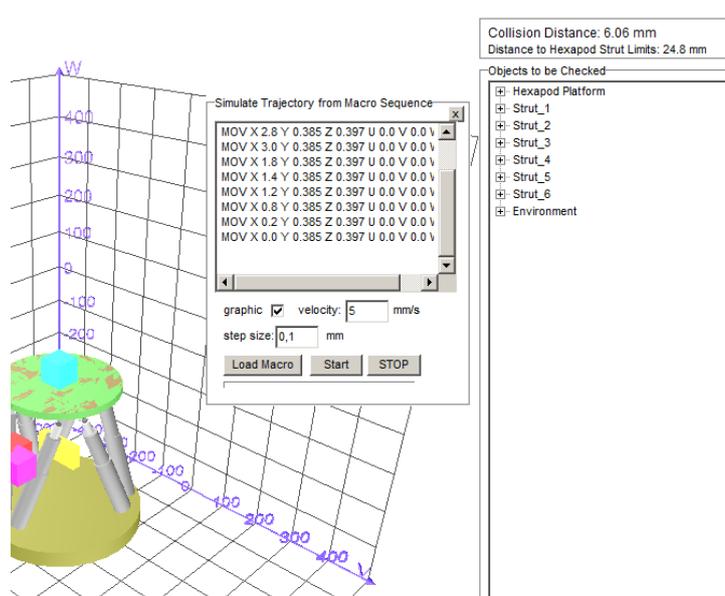
5. Click the **Start** button to start the simulation.

Figure 5: *Simulate Trajectory from Macro Sequence* **pane in the main window, with loaded sequence of motion commands**

6. Evaluate the result of the simulation:

   ▪ If the simulation was performed successfully, the result is displayed in a message box and in the **Simulation Data** pane which is added to the main window of PIVeriMove. See p. 17 for details.

   ▪ The simulated motion is aborted if, for example, a collision would occur or a strut limit would be reached. In this case, a message box displays an appropriate information.

You can simulate the motion to all limit positions of a given work space as follows:

1. Add the **Simulate Workspace** pane to the main window using the **Simulate > Simulate Workspace** menu sequence.

   Note that the **Simulate Workspace** pane can be moved in the main window by clicking in the pane and dragging the mouse pointer with the left mouse button pressed.

2. Enter the limits of the work space for the individual Hexapod axes in the corresponding **Min** and **Max** fields (work space = the entirety of all combinations of translations and rotations which can be performed).

3. If necessary, set the coordinates of the pivot point in the **Pivot X/Y/Z (mm)** fields.

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4. If necessary, set the values in the *calculate steps X,Y,Z/U,V,W* fields to suitable values.
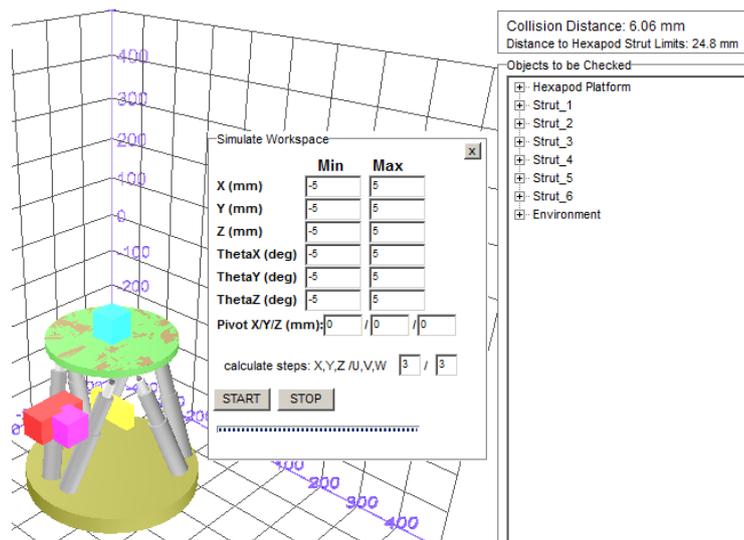
5. Click the *Start* button to start the simulation.

Figure 6: *Simulate Workspace* **pane in the main window**

6. Evaluate the result of the simulation:

- If the simulation was performed successfully, the result is displayed in a message box and in the *Simulation Data* pane which is added to the main window of PIVeriMove. See p. 17 for details.

- The simulated motion is aborted if, for example, a collision would occur or a strut limit would be reached. In this case, a message box displays an appropriate information.

You can simulate the motion trajectory of the Hexapod from a given start position to a given target position as follows:

1. Add the the *Simulate Trajectory* pane to the main window using the *Simulate > Simulate Trajectory* menu sequence.

   Note that the *Simulate Trajectory* pane can be moved in the main window by clicking in the pane and dragging the mouse pointer with the left mouse button pressed.

2. Enter start and target positions for the individual Hexapod axes in the corresponding *Start* and *Target* fields.

3. If necessary, set the coordinates of the pivot point in the *Pivot X/Y/Z (mm)* fields.

4. If necessary, set the velocity and the step size for the simulated motion.

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5. If the graphic display is not to be updated during the calculation process to accelerate the process: Deactivate the **graphic** checkbox.
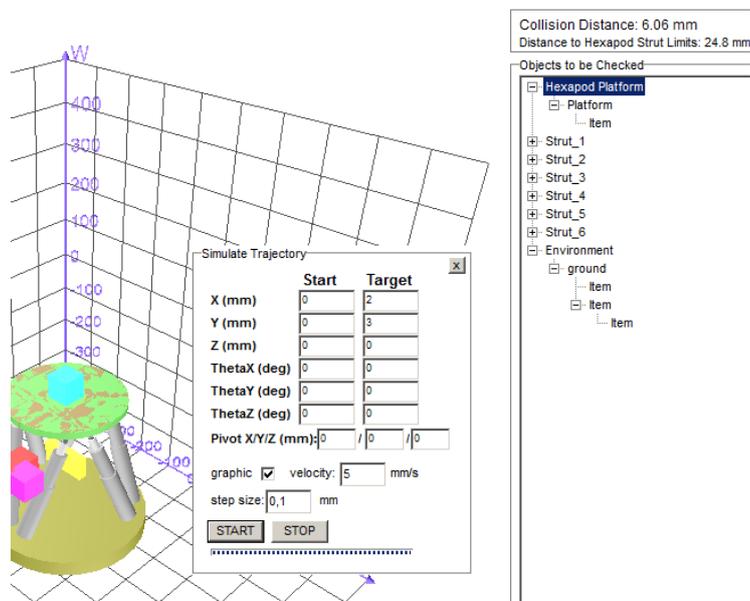
6. Click the **Start** button to start the simulation.

Figure 7: *Simulate Trajectory* pane in the main window

7. Evaluate the result of the simulation:

    ▪   If the simulation was performed successfully, the result is displayed in a message box and in the **Simulation Data** pane which is added to the main window of PIVeriMove. See below for details.

    ▪   The simulated motion is aborted if, for example, a collision would occur or a strut limit would be reached. In this case, a message box displays an appropriate information.

The results of successful simulations started from the **Simulate Trajectory from Macro Sequence** pane, **Simulate Workspace** pane and **Simulate Trajectory** pane are displayed in a message box and in the **Simulation Data** pane.

These simulations are performed in multiple iteration loops (the number of iteration loops depends on the settings for the step size). Each iteration loop reperesents a certain position of the Hexapod platform. The following is calculated during the simulation for each iteration loop:

    ▪   Minimum distance to hexapod strut limits: minimum of the distances that the six Hexapod axes can still move until at least one strut reaches a limit switch.

    ▪   Minimum collision distance: minimum distance between any two items of the three item groups Hexapod parts, environment and mounted set-up.

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You can evaluate and save the simulation results as follows:
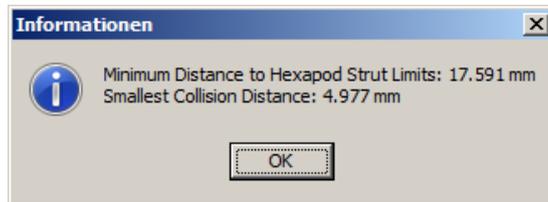
1. Read the content of the message box.

Figure 8: Message box window with simulation results

The message box shows the absolute minimum values which were calculated during the simulation. These values are also available in the **Simulation Data** pane.

2. Close the message box by clicking on **OK**.

3. If the **Simulation Data** pane is minimized (see figure below), click **show graph** to expand the pane.

Figure 9: Minimized Simulation Data pane

4. Evaluate the content of the **Simulation Data** pane:

The diagram in the **Simulation Data** pane shows the minimum distance values over the iteration loops for the whole simulation.

- In the diagram, place the mouse cursor on the curve (see figure below) to display the values of an individual curve point. For the cursor position, the following is shown below the diagram:

  - Hexapod position
  - Pivot point coordinates
  - Minimum values of collision distance and distance to the Hexapod strut limits
    Note that the information pane on the right top of the PIVeriMove main window (p. 7) also displays the minimum values for the cursor position.
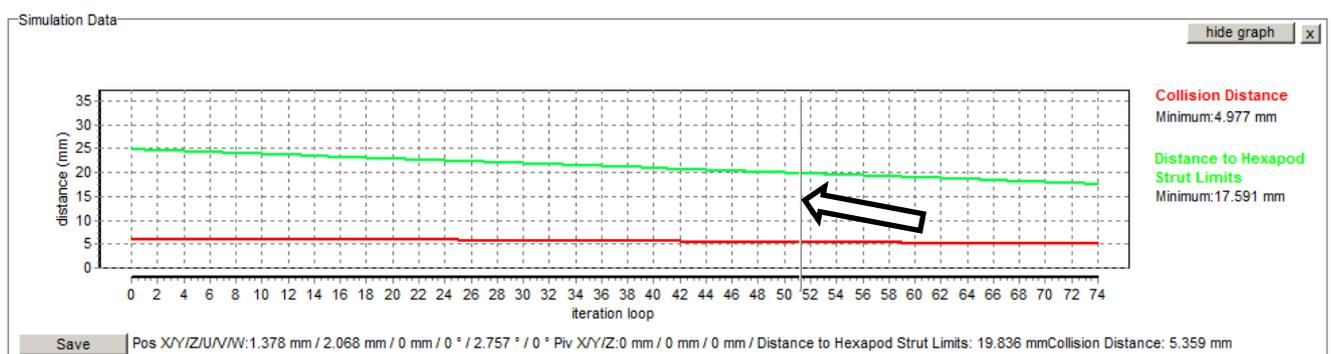

Figure 10: Simulation Data pane, the arrow shows the position of the mouse cursor

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- To the right of the diagram, read again the absolute minimum values which were calculated during the simulation (same content as in the message box that you have closed in step 2).

5. If you want to keep the simulation results, save the content of the diagram in the **Simulation Data** pane as a *.txt file on the PC:

   a. Click the **Save** button in the **Simulation Data** pane. A file selection window opens.
   b. In the file selection window, select the directory and enter a file name for the *.txt file.
   c. Confirm saving in the file selection window.

You can display the permissible distance an Hexapod axis can move in positive and negative direction as follows:

1. Add the the **Simulate Possible Movement** pane to the main window using the **Simulate > Simulate possible Movement** menu sequence.

   Note that the **Simulate Possible Movement** pane can be moved in the main window by clicking in the pane and dragging the mouse pointer with the left mouse button pressed.

2. Select a Hexapod axis in the selection field. Selecting an axis displays the permissible distance the axis can move in positive and negative direction, starting from the current position given by the **Move Hexapod Platform and Set Pivot Point** pane (p. 7).
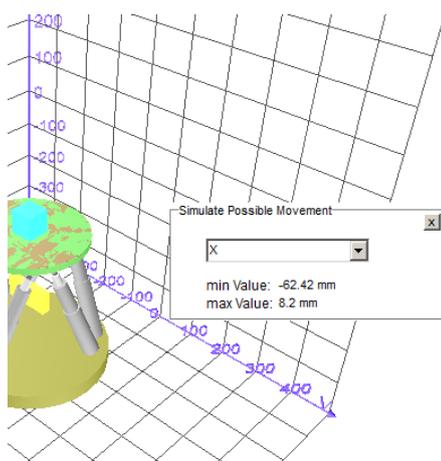

Figure 11: *Simulate Possible Movement* pane in the main window, with axis X selected

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The *Move Hexapod Platform and Set Pivot Point* pane is always present in the main window of PIVeriMove. In this pane, you can simulate the Hexapod motion to a given target position with a given "safety distance".

INFORMATION

The minimum permissible collision distance entered in the *Safety Distance* field of the *Move Hexapod Platform and Set Pivot Point* pane is applied only for motions simulated using the controls in this pane. This safety distance does **not** become part of any collision configuration file and is **not** used for simulations started from the *Simulate* menu (p. 8).

The settings for the coordinates of the pivot point made in the *Move Hexapod Platform and Set Pivot Point* pane are applied for motions simulated using the controls in this pane. These pivot point settings are also applied for simulations of the Hexapod motion given by a loaded sequence of commands (p. 14), if the command sequence does not determine the pivot point coordinates.

Proceed as follows:

1. If necessary, change the distance for the simulated motion caused by one click on the arrow buttons of the Hexapod axes:

   - Enter a new value in the *Step Size* field.

2. If necessary, set the coordinates of the pivot point in the *Pivot X (R) [mm]*, *Pivot Y (S) [mm]* and *Pivot Z (T) [mm]* fields.

3. If you want to set a minimum permissible collision distance for the simulated motion, enter the value in the *Safety Distance* field.

4. Give the target positions for the Hexapod axes:

   - Enter target position values in the *X [mm]*, *Y [mm]*, *X [mm]*, *Z [mm]*, *U [deg]*, *V [deg]* and *W [deg]* fields.

   or

   - Click the arrow buttons next to the fields for the target position. The distance for the motion caused by one click is given by the *Step Size* field.

   Only permissible target positions are accepted: "permissible" means that the current minimum of the collision distance does not fall below the minimum permissible value and no strut limit is reached.

   The simulated motion is visualized in the graphic display (p. 6) and information pane (p. 7).
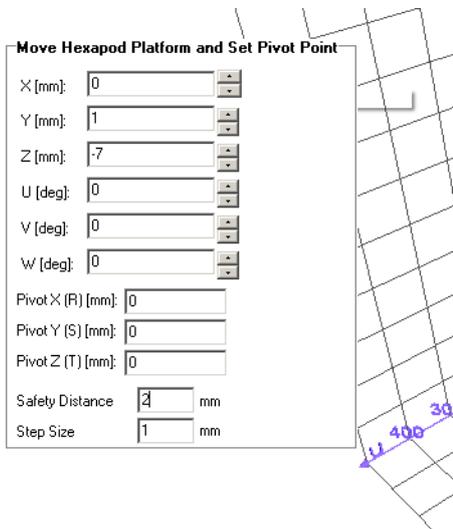
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Figure 12: *Move Hexapod Platform and Set Pivot Point* **pane in the main window**

Sending the Collision Configuration to the Hexapod Controller

NOTICE

Motions without collision check!

In the following cases, a collision configuration file stored on the Hexapod controller cannot avoid collisions:

- During a reference move started by an FRF command, no collision check is performed.
- If the motion profile is **not** specified by the trajectory generator of the Hexapod controller but defined by the customer via consecutive MOV commands (see "Motions of the Hexapod" in the manual of the Hexapod controller):
  A collision check is only performed for the target positions given by the MOV commands, but **not** for the motion from one target to the next.

Avoid collisions in these cases as follows:

➢ Make sure that a reference move is only exerted when the Hexapod with the given environment cannot cause a collision.

➢ Before you switch off the Hexapod system, move the Hexapod to its reference position. If you have a customized Hexapod, contact your PI sales engineer for the position recommended for switch-off.

➢ Make sure that the distance between the individual target positions set with consecutive MOV commands is as small as possible (may only be maximally as large as the value of parameter 0x19001504).

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INFORMATION

When a collision configuration file is stored on the Hexapod controller and the motion profile for the Hexapod is created by the trajectory generator (default setting; parameter 0x19001900 has the value 0):

A check is carried out before the start of each motion whether the moving platform can actually reach the nodes of the calculated trajectory and the commanded target position. If a node or the target position cannot be reached, the motion is not executed.

INFORMATION

When a collision configuration file is sent to the Hexapod controller, date and time are added automatically to the file name to avoid overwriting of configuration files.

Sending a collision configuration does not change the geometrical data of the Hexapod which are stored on the Hexapod controller.

Only the latest collision configuration stored on the Hexapod controller is used to avoid collisions and displayed in the user interface of the controller.

A collision configuration file (*.collision.xml file) can be sent from the PC to a Hexapod controller where it is stored and used to prohibit motions which would cause collisions. Proceed as follows:

1. Make sure that the following conditions are fulfilled:

   ▪ The correct collision configuration is loaded, i.e. shown in the graphic display and the **Objects to be Checked** pane of PIVeriMove (see p. 10 for how to show a collision configuration in PIVeriMove).

   ▪ The loaded collision configuration is suitable to avoid collisions (e.g. perform or repeat simulations with this configuration in PIVeriMove, see p. 14).

2. Make sure that you have registered the Hexapod controller in the activation process of PIVeriMove, see p. 3 for details.

3. Connect the Hexapod controller to the PC via TCP/IP. See the user manual of the Hexapod controller for details regarding the connection and communication via TCP/IP interface.

4. Switch on the Hexapod controller. See the user manual of the Hexapod controller for details.

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5. In PIVeriMove, send the collision configuration file to the Hexapod controller:

a. Click somewhere in the *Objects to be Checked* pane with the right mouse button and select *Send To Controller* from the context menu. The *Send File To Controller* pane is added to the main window of PIVeriMove.

b. In the *Send File To Controller* pane, click *Search Controller* to display a list of controllers which are connected via TCP/IP.

c. In the list, identify the right Hexapod controller via its nine-digit serial number and click the corresponding entry.

d. Click *Send* to send the collision configuration to the Hexapod controller.

On the Hexapod controller, the collision configuration will be used immediately to prevent collisions. The collision configuration will be displayed in the user interface of the Hexapod controller (available via a monitor connected to the Hexapod controller, see the user manual of the controller for details).

Figure 13: *Send File To Controller* **pane, the connected controllers are not listed yet**

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