

MotionDesk

Automation

For MotionDesk 4.8

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About This Document

Contents This document introduces you to the tool automation of MotionDesk. It provides basic information of MotionDesk's automation interface.





Required knowledge You must have experience with the Python programming language or programming in MATLAB.


Tip

To learn more about Python, refer to <http://www.python.org/> for a tutorial and other documents on Python.

Symbols

dSPACE user documentation uses the following symbols:

| Symbol | Description |
|--|--|
|  DANGER | Indicates a hazardous situation that, if not avoided, will result in death or serious injury. |
|  WARNING | Indicates a hazardous situation that, if not avoided, could result in death or serious injury. |
|  CAUTION | Indicates a hazardous situation that, if not avoided, could result in minor or moderate injury. |
| NOTICE | Indicates a hazard that, if not avoided, could result in property damage. |
| Note | Indicates important information that you should take into account to avoid malfunctions. |
| Tip | Indicates tips that can make your work easier. |
|  | Indicates a link that refers to a definition in the glossary, which you can find at the end of the document unless stated otherwise. |

| Symbol | Description |
|---|--|
|  | Precedes the document title in a link that refers to another document. |

Naming conventions

dSPACE user documentation uses the following naming conventions:

%name% Names enclosed in percent signs refer to environment variables for file and path names.

< > Angle brackets contain wildcard characters or placeholders for variable file and path names, etc.

Special folders

Common Program Data folder A standard folder for application-specific configuration data that is used by all users.

%PROGRAMDATA%\dSPACE\<InstallationGUID>\<ProductName>

or

%PROGRAMDATA%\dSPACE\<ProductName>\<VersionNumber>

Documents folder A standard folder for user-specific documents.

%USERPROFILE%\Documents\dSPACE\<ProductName>\<VersionNumber>

Local Program Data folder A standard folder for application-specific configuration data that is used by the current, non-roaming user.

%USERPROFILE%\AppData\Local\dSPACE\<InstallationGUID>\<ProductName>

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dSPACE Help (local) You can open your local installation of dSPACE Help:

- On its home page via Windows Start Menu
- On specific content using context-sensitive help via **F1**

dSPACE Help (Web) You can access the Web version of dSPACE Help at www.dspace.com/go/help.

To access the Web version, you must have a *mydSPACE* account.

PDF files You can access PDF files via the  icon in dSPACE Help. The PDF opens on the first page.

Basics and Instructions

Where to go from here

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| Introduction to the MotionDesk Automation Interface..... | 7 |
| Introduces the MotionDesk automation interface and the required user experience. | |
| Features of MotionDesk Automation Interface..... | 8 |
| Describes the features of the MotionDesk automation interface. | |
| Overview of the Object Model..... | 9 |
| Shows you the object dependencies, object attributes and methods in the MotionDesk object model at a glance. | |
| Example of Automating MotionDesk with a Python Script..... | 18 |
| Code examples demonstrate how you can automate MotionDesk with a Python script. | |

Introduction to the MotionDesk Automation Interface

Introduction

To introduce the MotionDesk automation interface.

MotionDesk automation interface

The MotionDesk automation interface allows you to control MotionDesk with scripts. It is a COM interface which you can use in several programming languages. This document mainly describes the Python programming language. The MotionDesk automation interface consists of classes with attributes and methods. The scripts can be run in a Python interpreter, for example, PythonWin.

Overview of classes

MotionDesk's tool automation contains several classes that you can use in your scripts:

- [Classes for Handling MotionDesk \(MotionDesk Basics !\[\]\(687b6c142f51ac6f390f8bd444e38d03_img.jpg\)\)](#)
- [Classes for Project and Experiment Management \(MotionDesk Project and Experiment Management !\[\]\(861b7aaa71df51b93037a486c3b17630_img.jpg\)\)](#)
- [Classes for 3-D Objects \(MotionDesk Custom Object Library Management !\[\]\(605f40b2c3d6e1d01a5766f59c82e1d4_img.jpg\)\)](#)
- [Classes for Scene Creation \(MotionDesk Scene Creation !\[\]\(5f28278c0ebbde07efa8ee7d80530cb7_img.jpg\)\)](#)
- [Classes for Scene Animation \(MotionDesk Scene Animation !\[\]\(c982d49bb610fbb6c7f10026c3033e9e_img.jpg\)\)](#)
- [Classes for Sensor Simulation Control \(MotionDesk Sensor Simulation Control !\[\]\(ad734bd1cbdd22a20e20a47a0c506662_img.jpg\)\)](#)

Related topics

Basics

[Features of MotionDesk Automation Interface..... 8](#)

Features of MotionDesk Automation Interface

Introduction

This topic describes the features of the MotionDesk automation interface.

Automation features

The MotionDesk automation interface provides the following features:

- Projects and experiments
 - Open, create, save, and close projects
 - Add, activate, and remove experiments
- 3-D objects library
 - Access the path to the dSPACE and custom objects libraries
 - Import 3-D objects into the custom object library
- Scene
 - Add and remove movable objects
 - Read and set properties of movable objects
 - Add and remove static objects
 - Read and set properties of static objects
 - Start scene generation
- Visualization
 - Start and stop the animation
 - Set the window mode (normal or full screen)
 - Set the view mode and select the observers for the views
 - Activate a preset atmospherics mode or specify a custom atmospherics

- Simulation
 - Configure all the supported data source types
 - Select the data source type for the motion data
 - Read information on the data stream
 - Stop and start the data stream
- Sensor manager
 - Connect to the SensorSim application instances
 - Start and stop the SensorSim application instances
 - Download the scene to all running SensorSim application instances
 - Enable and disable the sensors in the MotionDesk scene
 - Access the sensors in a MotionDesk scene and set the sensor properties, for example, the simulation data stream

Related topics

Basics

[Introduction to the MotionDesk Automation Interface..... 7](#)

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[Overview of the Object Model..... 9](#)






Overview of the Object Model

Introduction

Shows you the object dependencies, object attributes and methods in the MotionDesk object model at a glance.

Symbols







































The following symbols are used in the object model overview:

| Symbol | Description |
|---|------------------------------------|
|  | Method, function |
|  | Attribute (property, class) |
|  | Collection |
|  | Level of dependency (0, 1, 2, ...) |
|  | Read only |




































Application

This is an overview of an application's object model:

| Application | |
|---|--|
| Boolean Visible | |
| String ProductVersion | |
| ActiveProject ActiveProject | |
| None Quit(Boolean SaveAll) | |
| ActiveProject NewProject(String ProjectPath, String projectName, Boolean SaveActive) | |
| ActiveProject OpenProject(String ProjectPath, String InitialExperiment, Boolean SaveActive) | |
| String Name | |
| String Fullname | |
| Boolean Close(Boolean saveChanges) | |
| None Save() | |
| Experiments Experiments | |
| Int Count | |
| Experiment Item(object experimentIdentifier) | |
| String Name | |
| String Fullname | |
| String IsModified | |
| ActiveExperiment Activate(Boolean saveActive) | |
| String Name | |
| String Fullname | |
| String SavedWithMotionDeskVersion | |
| VisualizationManager VisualizationManagement | |
| Double FramesPerSecond | |
| MoveableObjectManager MoveableObjectManager | |
| Int Count | |
| Boolean Remove(String ObjectName) | |
| MovableObject Item(Object ObjectIdentifier, IdentifierTypes IdentifierType) | |

| Application |  |
|--|---|
| <ul style="list-style-type: none">  MovableObjectManager Children ☒  String CustomIdentifier ☒  String Name  String GeometryFilePath  Int MotionDataID  Boolean IsVisible  Boolean IsGrouped  Double XPosition  Double YPosition  Double ZPosition  Double XRotation  Double YRotation  Double ZRotation  Double XScale  Double YScale  Double ZScale  RenderModes RenderMode  Double Transparency  Int FellowIndex  String MotionDataStream  SubObjectManager SubObjects <ul style="list-style-type: none">  Int Count ☒  SubObject Item(object ItemIdentifier) <ul style="list-style-type: none">  string CurrentState  string DataStream  string Name ☒  SimulationModes SimulationMode  MovableObject Add(LibraryElementTypes elementType, string libraryElementRelPath, string objectNameInScene)  StaticObjectManager StaticObjects <ul style="list-style-type: none">  Int Count ☒  Boolean Remove(String ObjectName)  StaticObject AddGroup(String ObjectName)  StaticObject Item(Object ObjectIdentifier, IdentifierTypes IdentifierType) | <div>  </div> <div>  </div> <div>  </div> <div>  </div> |

| Application | |
|---|--|
| StaticObjectManager Children | |
| String CustomIdentifier | |
| String Name | |
| String GeometryFilePath | |
| Boolean IsVisible | |
| Boolean IsGrouped | |
| Double XPosition | |
| Double YPosition | |
| Double ZPosition | |
| Double XRotation | |
| Double YRotation | |
| Double ZRotation | |
| Double XScale | |
| Double YScale | |
| Double ZScale | |
| RenderModes RenderMode | |
| Double Transparency | |
| SubObjectManager SubObjects | |
| StaticObject Add(LibraryElementTypes elementType, string libraryElementRelPath, string objectNameInScene) | |
| AtmosphericsManager Atmospherics | |
| AtmosphericsModes ActiveAtmosphericsMode | |
| CustomAtmospherics CustomAtmosphericSettings | |
| Double HeadlightIntensity | |
| Sunlight Sunlight | |
| Boolean Enabled | |
| Double Intensity | |
| Object Color | |
| Double ElevationAngle | |
| Double AzimuthAngle | |
| Fog Fog | |
| Boolean Enabled | |
| Object Color | |
| Double Range | |
| DensityModes Density | |
| Rain Rain | |

| Application | | 0 |
|---|--|---|
|  Boolean Enabled | | 9 |
|  Object Color | | |
|  Double Speed | | |
|  Double Intensity | | |
|  Double ParticleSize | | |
|  Double FallingAngle | | |
|  Double HeadingAngle | | |
|  Snow Snow | | 8 |
|  Boolean Enabled | | 9 |
|  Object Color | | |
|  Double Speed | | |
|  Double Intensity | | |
|  Double ParticleSize | | |
|  Double FallingAngle | | |
|  Double HeadingAngle | | |
|  Shadow Shadow | | 8 |
|  Boolean Enabled | | 9 |
|  Double Transparency | | |
|  void ApplyPreset(AtmosphericPresetModes PresetMode) | | 8 |
|  ViewManager Views | | 6 |
|  String ActiveView | | 7 |
|  Int HorizontalSplitterPosition | | |
|  Int VerticalSplitterPosition | | |
|  ViewModes ViewMode | | |
|  View BottomLeft | | |
|  String ActiveObserver | | 8 |
|  String Name ☒ | | |
|  View BottomRight | | 7 |
|  View TopLeft | | |
|  View TopRight | | |
|  ObserverManager Observers | | 6 |
|  Int Count ☒ | | 7 |
|  Boolean CreateDefaultObservers(string movableName) | | |
|  Boolean Remove(string observerName) | | |
|  Observer Add(string observerName) | | |

| Application | 0 |
|--|------------------|
| <ul style="list-style-type: none"> string AttachedTo FollowBehaviour Behaviour double[] GetOrientation double[] GetPosition string Name double XOrientation double XPosition double YOrientation double YPosition double ZOrientation double ZPosition Boolean GetPositionAndOrientation(double[] Position, double[] Orientation) void SetOrientation(double[] Orientation) void SetPosition(double[] Position) void SetPositionAndOrientation(double[] Position, double[] Orientation) Observer Item(object objectIdentifier) | 8 |
| <ul style="list-style-type: none"> Sensors <ul style="list-style-type: none"> Int Count Sensor Item(sensorIdentifier, identifierType) <ul style="list-style-type: none"> String Name Boolean Enabled String SensorSimConnections SimulationDataStream SensorID XOffset YOffset ZOffset XOrientation YOrientation ZOrientation | 7 6 7 8 |
| <ul style="list-style-type: none"> SceneManager SceneManagement <ul style="list-style-type: none"> Boolean IsLoadingSceneCompleted None GenerateScene(String definitionFilePath) None GenerateSceneExtended(String roadNetworkFilePath, GenerationFlags flag) SceneStates SceneState() SynchronizationModes SynchronizationMode() SynchronizationStates SynchronizationState() None UpdateFellows(String trafficFellowsFilePath) | 5 6 |

| Application | |
|--|---|
| <ul style="list-style-type: none"> ActiveExperiment ActiveExperiment() ActiveExperiment ActivateExperiment(String experimentName) ActiveExperiment AddExperiment(String experimentName) Boolean RemoveExperiment(String experimentName, Boolean deleteFromDisk) | 4 |
| <ul style="list-style-type: none"> LibraryManager LibraryManagement <ul style="list-style-type: none"> String dSPACEObjectsPath() String CustomerObjectsPath() Boolean ImportElement(String SourceFilePath, String RelativeDestinationFolder, String Keywords, Boolean OverwriteExisting) | 2 |
| <ul style="list-style-type: none"> SimulationManager SimulationManagement <ul style="list-style-type: none"> Boolean IsAnimationRunning ☒ Int MaxSimulationFrames SimulationDataSources ActiveSimulationDataPoint DataStreamNames DataStreamNames <ul style="list-style-type: none"> String[] BodyNames String[] SignalNames String[] SignalUnits SimulationBufferManager SimulationBuffer <ul style="list-style-type: none"> Int Frame Boolean IsEmpty ☒ SimulationBufferFrameData FrameData <ul style="list-style-type: none"> Int Bodies ☒ Int Signals ☒ Double Time ☒ Double SignalData(Int signalIndex) SimulationMotionData MotionData(Int bodyIndex) <ul style="list-style-type: none"> Float[] Rotation ☒ Float[] Translation ☒ Boolean IsPlaying() None Play() None StopPlaying() None StoreBufferedFrames(String mdffilepath) SimulationDataPointADAS SimulationDataPointADAS <ul style="list-style-type: none"> String IPv4Address ☒ Int Port SimulationDataPointFile SimulationDataPointFile <ul style="list-style-type: none"> String MotionDataFilePath SimulationDataPointHardware SimulationDataPointHardware <ul style="list-style-type: none"> String Stream ☒ | 5 |

| Application | |
|---|--------|
| <ul style="list-style-type: none"> Int StreamBufferSize PHSHardware Type Int DaqRefreshInterval Boolean Connect(PHSHardware hardwareType, String streamName) | 1 |
| <ul style="list-style-type: none"> SimulationDataPointHardwareNet SimulationDataPointHardwareNet String Stream Int StreamBufferSize PHSHardware Type Boolean Connect(PHSHardware hardwareType, String streamName) | 2 3 |
| <ul style="list-style-type: none"> SimulationDataPointNetwork SimulationDataPointNetwork String IPv4Address Int Port1 Int Port2 Int Port3 Int StreamBufferSize | 2 3 |
| <ul style="list-style-type: none"> SimulationDataPointScalexio SimulationDataPointScalexio String BoardSystemName String IPv4Address Int StreamBufferSize Boolean AssignBoardByIP(String ipAddress) Boolean AssignBoardByName(String systemName) Boolean UnassignBoard() Boolean ConnectToApplication(String ApplicationName) | 2 3 |
| <ul style="list-style-type: none"> SimulationDataPointVEOS SimulationDataPointVEOS String BoardSystemName String IPv4Address Int StreamBufferSize Boolean AssignBoardByIP(String ipAddress) Boolean AssignBoardByName(String systemName) Boolean UnassignBoard() Boolean ConnectToApplication(String ApplicationName) | 2 3 |
| <ul style="list-style-type: none"> SimulationDataPointDS1007 SimulationDataPointDS1007 String BoardSystemName String IPv4Address Int StreamBufferSize Boolean AssignBoardByIP(String ipAddress) Boolean AssignBoardByName(String systemName) Boolean UnassignBoard() Boolean ConnectToApplication(String ApplicationName) | 2 3 |

| Application | |
|--|--|
| SimulationDataPointMABX SimulationDataPointMABX | |
| string BoardSystemName | |
| string IPv4Address | |
| Boolean AssignBoardByIP(string ipAddress) | |
| Boolean AssignBoardByName(string systemName) | |
| Boolean UnassignBoard() | |
| Boolean ConnectToApplication(String ApplicationName) | |
| SimulationDataPointMlbox SimulationDataPointMlbox | |
| string BoardSystemName | |
| string IPv4Address | |
| Boolean AssignBoardByIP(string ipAddress) | |
| Boolean AssignBoardByName(string systemName) | |
| Boolean UnassignBoard() | |
| Boolean ConnectToApplication(String ApplicationName) | |
| Boolean StartAnimation() | |
| Boolean StopAnimation() | |
| WindowManager WindowManagement | |
| MainWindowModes MainWindowMode | |
| ConnectionManager | |
| SensorSimConnections SensorSimConnections | |
| int Count | |
| Boolean DownloadScene() | |
| Boolean StartConnections() | |
| Boolean StopConnections() | |
| SensorSimConnection Item(connectionIdentifier) | |
| String Name | |
| Boolean Start() | |
| Boolean Stop() | |

Related topics

Basics

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| Features of MotionDesk Automation Interface..... | 8 |
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Example of Automating MotionDesk with a Python Script

Introduction

Code examples demonstrate how you can automate MotionDesk with a Python script.

Starting MotionDesk and accessing an experiment

The code shows how you can open a project and activate an experiment.

```
from win32com.client import Dispatch
# Start MotionDesk
MdApp = Dispatch("MotionDesk.Application")
# Set MotionDesk visible
MdApp.Visible = True
# Create a project (replace the names by your project/experiment name)
MyProject = MdApp.NewProject(r"D:\work", r"Project_001.cdp", 1)
# or open an existing project
# MyProject = MdApp.OpenProject(r"D:\ExamplePath\Project_001.cdp", "Experiment_001", 1)
MyExperiment = MyProject.ActiveExperiment
```

The `Dispatch("MotionDesk.Application")` function starts MotionDesk and returns an object which is used to handle MotionDesk. MotionDesk is not displayed when started by default. To display it, the `Visible` attribute must be `True`.

The `NewProject` method creates a new MotionDesk project. The `OpenProject` method loads a MotionDesk project. For details of the `Application` class, refer to [Application \(MotionDesk Basics\)](#).

Editing the scene

The code shows how to import a 3-D object to the custom object library.

```
LibraryManager = MdApp.LibraryManagement
LibraryManager.ImportElement(r"C:\ExamplePath\MyObject.dae", "\TestFolder", "Test", True)
```

The `ImportElement` method imports the `MyObject.dae` object file into the `TestFolder` folder of the custom object library and assigns the `Test` keyword. If an object with the same name already exists, it is overwritten. For details of the `LibraryManagement` class, refer to [LibraryManager \(MotionDesk Custom Object Library Management\)](#).

The following code shows how to add 3-D objects to the scene and modify their properties.

```
VisualizationManager = MyExperiment.VisualizationManagement
MyMovableObjects = VisualizationManager.MovableObjects
Chassis = MyMovableObjects.Add(0, r"Car_Formula1\Racecar1_MOV", "Chassis")
sleep(2)
WheelFL = MyMovableObjects.Add(0, r"Car_Formula1\TireFront_MOV", "Wheel FL")
sleep(2)
WheelFR = MyMovableObjects.Add(0, r"Car_Formula1\TireFront_MOV", "Wheel FR")
sleep(2)
WheelRL = MyMovableObjects.Add(0, r"Car_Formula1\TireRear_MOV", "Wheel RL")
sleep(2)
WheelRR = MyMovableObjects.Add(0, r"Car_Formula1\TireRear_MOV", "Wheel RR")
sleep(2)
print "Number Movable:", MyMovableObjects.Count
MyStaticObjects = VisualizationManager.StaticObjects
Plate = MyStaticObjects.Add(0, r"Env_Plates\GrassPlate1000", "Grass Plate")
sleep(2)
Plate.XPosition = 0
Plate.YPosition = 0
Plate.ZPosition = -0.1
Dome = MyStaticObjects.Add(0, r"Env_Domes\HorzLand1000", "Horizont")
sleep(2)
Dome.XPosition = 0
Dome.YPosition = 0
Dome.ZPosition = 0
```

In the code, 3-D objects are added to the scene. In the first part, movable objects are added to the scene. The `sleep` command ensures that the objects are added completely before they are accessed by another method. This is especially required if the objects have large geometries. In the second part, static objects are added. When the static objects are added, their position are set. Other properties can be specified in the same way. For details of the `VisualizationManagement` class, refer to [VisualizationManager \(MotionDesk Scene Animation\)](#).

Getting the motion data

The code shows how you can use an MDF file as data source.

```
SimulationManager = MdApp.SimulationManagement
# Specify the MDF file
SimulationManager.SimulationDataPointFile.MotionDataFilePath = r"D:\ExamplePath\MDF_File.mdf"
# Select MDF file as data source
SimulationManager.ActiveSimulationDataPoint = 1
```

You can specify a simulation data point for several platform. In the example, the simulation data point is an MDF file. You can select the active simulation data point using the `ActiveSimulationDataPoint` attribute.

When a data source is selected, you can assign the motion data to the movable objects, see the following code.

```
Chassis.MotionDataID = 0
WheelFL.MotionDataID = 1
WheelFR.MotionDataID = 5
WheelRL.MotionDataID = 9
WheelRR.MotionDataID = 13
```

Controlling the animation

The code shows how to start the animation.

```
SimulationManager = MdApp.SimulationManagement
SimulationManager.StartAnimation()
```

You can use the **StopAnimation** method to stop the animation. For details of the **SimulationManagement** class, refer to [SimulationManager \(MotionDesk Scene Animation !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)).

The following code shows how to set the full screen mode for the window.

```
WindowManager = MdApp.WindowManagement
MyWindowManager.MainWindowMode = 1
```

You can use the same attribute to switch to the normal mode. For details of the **WindowManagement** class, refer to [WindowManager \(MotionDesk Basics !\[\]\(ec9132f1d27c8919987d92907322654d_img.jpg\)](#)).

Exiting MotionDesk

The code shows how to stop the animation, save the project, and exit MotionDesk.

```
MySimulationManager.StartAnimation()
# Save the project
MyProject.Save()
# Exit MotionDesk
MdApp.Quit(False)
# Delete Application object
del MdApp
```

The **Save** method of the **Project** class saves the project.

The **Quit** method of the **Application** class exits MotionDesk. For details of the **Application** class, refer to [Application \(MotionDesk Basics !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)).

Related topics

References

[Classes for 3-D Objects \(MotionDesk Custom Object Library Management !\[\]\(248b91fcdac4810ffd15cf33fb6aec6f_img.jpg\)](#))
[Classes for Handling MotionDesk \(MotionDesk Basics !\[\]\(3f4a2271a4366a6bc6b830ded36cdf1a_img.jpg\)](#))
[Classes for Project and Experiment Management \(MotionDesk Project and Experiment Management !\[\]\(aba5d812f20f4a229ba8e41db3f10569_img.jpg\)](#))
[Classes for Scene Animation \(MotionDesk Scene Animation !\[\]\(7a463d66e21d5f431741fdb5dd939b80_img.jpg\)](#))
[Classes for Scene Creation \(MotionDesk Scene Creation !\[\]\(0af8c45ca3240f975a765f9fcff2d950_img.jpg\)](#))

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