

Onda Connection Library

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Onda Connection Library is a C++ library interfaced from MATLAB that enables a GNU/Linux-system to control the Onda Acoustic Intensity Measurement System (AIMS) 3.

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Basic Usage

1. The Soniq 5.0 Software must be running on the PC connected to the Onda AIMS 3 system, and the PC must be connected to the LAN.
2. By calling `onda_initialize;` from within MATLAB, a connection is opened to the Onda system. The Soniq software then goes in "external" mode, which disables the GUI and it can now only be controlled via `onda_lib`.
3. Movement of the Onda system can now be accomplished by calling `onda_move_absolute(int axis, double length)` OR `onda_move_relative(int axis, double length)`. Length is in meters and axis is an integer.
4. When the Onda system is no more needed, its connection must be terminated with a call to: `onda_terminate;`.

MATLAB Functions

In some functions in `onda_lib` are the axes identified with an integer. The following table shows the conversion from an integer to an axis name:

Axis integer	Name
0	x-axis
1	y-axis
2	z-axis
3	1. rotation -axis
4	2. rotation -axis

`onda_version`

This function prints the version number of the currently installed version of `onda_lib`. It has no input arguments and returns no variables.

```
>> onda_version  
Onda connection library, version 1.2, 2013-04-17.
```

`onda_initialize`

This function initializes `onda_lib`. It must be called before all other functions in the library, except `onda_version`. It currently only opens a TCP connection to the Onda system, but does not set any variables. This means, all settings of the Onda system are kept, e.g. if the coordinate system is set to machine coordinates, it will stay so.

Input arguments

Name	Type	Explanation
<code>host_ip_addr</code>	Optional, String	Optional string that contains the host IP address. If no input argument is given, the Onda system is assumed to have IP: 10.59.44.100.

Returns

None.

Examples

```
1. onda_initialize; % Standard initialization.  
2. onda_initialize('10.10.128.244'); % If the Onda system has IP: 10.10.128.244
```

`onda_terminate`

This function terminates the connection to the Onda system. It is automatically called when `clear all` is called and when MATLAB is closed properly down. It accepts no input and returns no variables.

Example

```
onda_terminate;
```

onda_get_position

This function gets the current (x,y,z) position.

Input arguments

none.

Returns

Name	Type	Explanation
Position	Vector with three elements	(x,y,z) -coordinate of the current position.

Example

```
% Get x,y and z coordinate of current position:  
pos = onda_get_position;
```

onda_set_position

This function sets (or changes) the coordinate of the current position to what is given as input. This function causes no movement of the Onda system.

Input arguments

Name	Type	Explanation
Position	3x1 Vector	New (x,y,z) coordinate for the current position.

Returns

None.

Example

```
onda_set_position([0 20 20]/1000); % Sets the current position to [0 20 20] mm.
```

onda_move_absolute

This function moves one axis of the Onda system to a given coordinate.

Input arguments

Name	Type	Explanation
Position	3x1 Vector OR Scalar	(x,y,z) coordinate of position to move to. If scalar is given, axis must also be set.
Axis	Integer or vector	The axis to move on. If set, it must have same dimensions as position. If not set, it defaults to [0,1,2].

Returns

None.

Example

```
% Move to coordinate (0,10,50):
onda_move_absolute([0 10 50]/1000);
```

```
% Change z-depth to 40 mm.
onda_move_absolute(40/1000, 2);
```

onda_move_relative

This function moves the Onda system in coordinates relative to current position.

Input arguments

Name	Type	Explanation
Position	3x1 Vector OR Scalar	Relative (x,y,z) coordinate of position to move to. If scalar is given, axis must also be set.
Axis	Integer or vector	The axis to move on. If set, it must have same dimensions as position. If not set, it defaults to [0,1,2].

Returns

None.

Example

```
% Move 10mm in positive x-direction and 15mm deeper (z-direction):
onda_move_absolute([10 0 15]/1000);
```

```
% Move 20 mm higher (z-direction):
onda_move_absolute(-20/1000, 2);
```

onda_get_low_limit

This function gets the lower limit of the software limitation on the position, on a given axis.

Inputs

Name	Type	Explanation
Axis	Integer	Axis to read the lower limit of.

Outputs

Name	Type	Explanation
low_limit	Double	Lower limit on the chosen axis.

Example

```
low_lim_x = onda_get_low_limit(0);
```

onda_set_low_limit

This function sets the lower limit of the software limitation on the position, on a given axis.

Input arguments

Name	Type	Explanation
Axis	String	Axis to set the limitation on. Accepts 'x', 'y' and 'z'.
Limit	Double	Lower limit (in meters) on position of the chosen axis.

Returns

None.

Example

```
onda_set_low_limit('x', -60/1000); %sets the lower limit on the x-axis
```

onda_get_high_limit

This function gets the higher limit of the software limitation on the position, on a given axis.

Input arguments

Name	Type	Explanation
Axis	String	Axis to get the higher limit of. Accepts 'x','y' and 'z'.

Returns

Name	Type	Explanation
Limit	Double	Higher limit (in meters) on position of the chosen axis.

Example

```
high_lim_y = onda_get_high_limit('y');
```

onda_set_high_limit

This function sets the higher limit of the software limitation on the position, on a given axis.

Input arguments

Name	Type	Explanation
Axis	Integer	Axis to get the limitation on.
Limit	Double	Limit in meters on the position (or coordinate) of the chosen axis.

Returns

None.

Example

```
onda_set_high_limit('y', 90/1000); %sets the higher limit on the y-axis to 90 mm.
```

Installation

The Onda library is located at file:/data/cfu/libraries/onda_lib/

To install the library run the following:

1. Copy the files:

```
cp -r /data/cfu/libraries/onda_lib ~/Documents/MATLAB/
```
2. Add onda_lib to the search path:

```
echo "addpath('~\Documents\MATLAB\onda_lib\current\/')" >> ~/Documents/MATLAB/startup.m
```

That's it.

Compilation

The library is compiled on Ubuntu 12.04 and with MATLAB 2010b (7.11.0.584). Compiling the library is therefore usually not needed, but it is easy to do.

onda_lib uses CMAKE as a compilation tool. To configure the compilation, run the following:

- To configuration, run:
./run_me.sh
- To compile the binary, run:
make

TO DO

- Have the move functions use vectors instead of an axis index and a scalar (almost done).
- At the moment all "set"-functions return as soon as they have transmitted their commands to the Onda system. If a network error appears, the Onda system may never receive the command. Instead the functions could be extended to read out data from the Onda system and verify that the "set" command was a success (not started).
- Have better input verification in each function (almost done).
- Change axis-identification from integers to the strings: 'x', 'y', 'z', 'rot1' and 'rot2' (almost done).
- Test whether the Onda System is using beam coordinates or machine coordinates. (not started).
- Read out the orientation of the beam coordinates (not started, and maybe not possible at the moment).

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