MSeg Documentation

Release 1.2.0

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Apr 04, 2018

Guides

MSeg is a framework for the ArmarX robot development environment, built to run and evaluate motion segmentation algorithms.

It provides the core functionality to easily integrate motion segmentation algorithms written in various programming languages. To integrate a motion segmentation algorithm, a supplied *Programming Language Interface* (PLI) can be used.

For more information about the structure of MSeg, please refer to the *architectural overview*:

CHAPTER 1

Quickstart

This guide will show how to install MSeg on a 64 bit Ubuntu machine. This includes the MSeg Core Module, all PLIs, and all available tools to use with MSeg.

Note: **THIS IS A WORK IN PROGRESS DOCUMENTATION - THIS WAY OF INSTALLING MSEG IS NOT YET SUPPORTED**. Please refer to the installation from source

Note: It is *strongly recommended* to use MSeg with Ubuntu 14.04 x64, as it eases the installation process drastically. If this should be a problem, consider using a virtual machine like VirtualBox and install Ubuntu 14.04 there.

1.1 Preconditions

- Freshly installed Ubuntu 14.04.5 LTS x64 trusty [64-bit PC (AMD64) desktop image]
- `sudo` privileges
- Approx. hard disk size required: 1 GiB (Make sure to have enough space if you want to install additional software like IDEs or MATLAB)

1.2 Installation

Open a terminal (`Ctrl` + `Shift` + `T`) and add the H2T package server and the MSeg package server. The H2T package server is needed as it bundles required dependencies like ArmarX.

```
# Add H2T signing key and package server
$ curl https://packages.humanoids.kit.edu/h2t-key.pub | sudo apt-key add -
$ echo -e "deb http://packages.humanoids.kit.edu/trusty/main trusty main\ndeb http://
↪packages.humanoids.kit.edu/trusty/testing trusty testing" | sudo tee /etc/apt/
↪sources.list.d/armarx.list
```

```
# Add MSeg signing key and package server
$ sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys 04FF7B61
$ sudo add-apt-repository "deb https://repo.christian-dreher.name/ trusty main"
# Update lists
$ sudo apt update
```

Now MSeg can be installed. This command will download roughly 300 MiB, resulting in about 1 GiB after installation.

```
# Download and install MSeg and all its dependencies
$ sudo apt install mseg
```

1.3 Initialisation

After the installation, both ArmarX and MSeg need to be initialised.

```
# Run armarx for the first time. You will be prompted to add a line to
# .bashrc for autocompletion. Accept with y
$ armarx
# Source .bashrc as indicated
$ source ~/.bashrc
# Download the MSeg datasets of labelled whole-body motion recordings
$ msegdata fetch
```

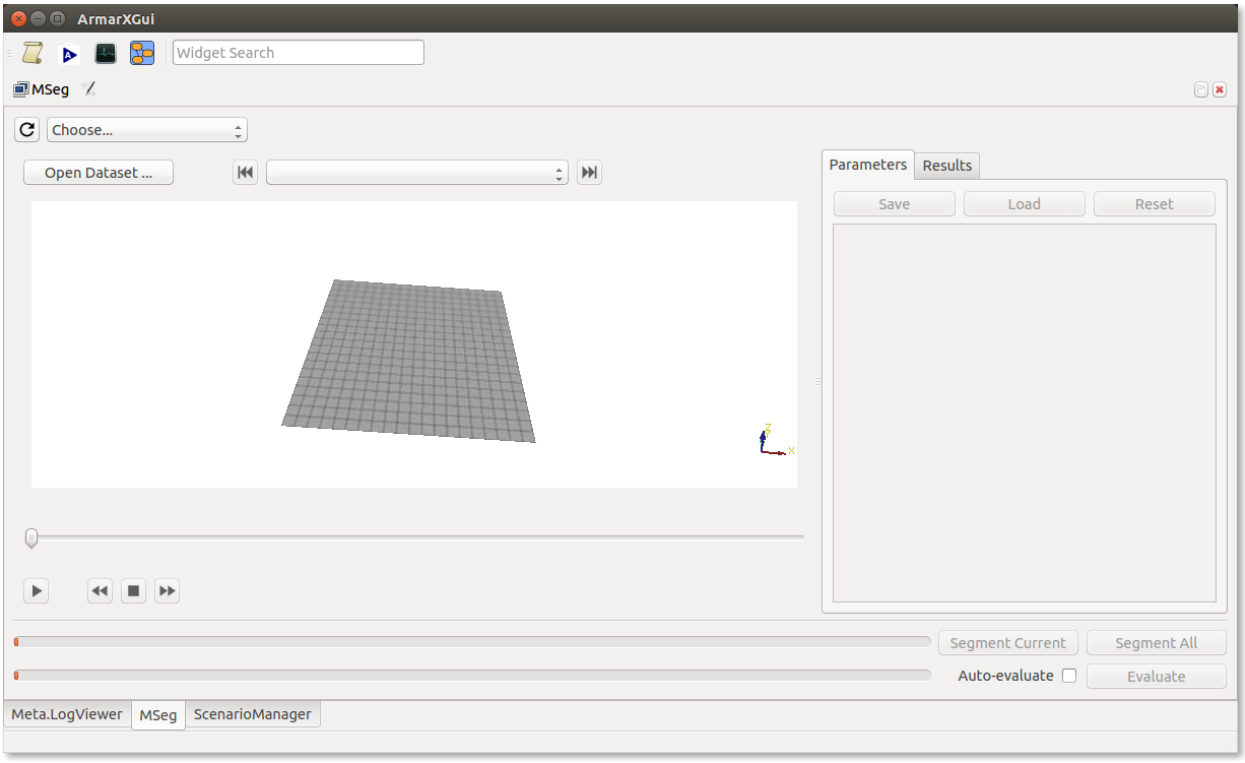
Now we're ready for the first run.

```
# First, we need to start ArmarX
$ armarx start
# Now we need to start the MSeg core module
$ msegcm start
# Eventually, launch the ArmarX GUI
$ armarx gui
```

The GUI will now load and eventualy, a popup should appear.

- You may check the checkbox `Do not show again`.
- Push the `Open empty GUI` button.
- You can now use the MSeg GUI by clicking on `Add Widget | MSeg`.

The MSeg GUI should now show up like this:



1.4 How to Proceed

With MSeg being set up, you can proceed with integrating your own motion segmentation algorithm in *C++*, *Java*, *Python* or *MATLAB*.

CHAPTER 2

Integrate a C++ Algorithm

This guide will show you how to setup your workspace to integrate your own C++ motion segmentation algorithm using the C++ PLI. It is assumed that you either followed the *quickstart guide* or you compiled the *MSeg Core Module* and the *C++ PLI* from source.

2.1 Install the Skeleton Project

We will use the `mseggen` terminal tool to install a skeleton project.

```
# Define the base directory where the project directory should be located
$ export $PROJECT_BASE_DIR=~/projects
# Run the generation tool to create the skeleton.
# If your algorithm requires training, add the --train flag
$ mseggen -b $PROJECT_BASE_DIR --cpp ExampleAlgorithm
```

2.2 Compiling the Algorithm

Your project should now look similar to this (If you changed the algorithm name the paths will be slightly altered):

```
$PROJECT_BASE_DIR/
`--- examplealgorithm
    |--- build/
    |--- source/
    |    |--- examplealgorithm.cpp
    |    |--- examplealgorithm.h
    |    `--- main.cpp
    `--- CMakeLists.txt
```

To compile the skeleton, we change into the build folder and run the corresponding commands like this:

```
# Change into the build folder
$ cd $PROJECT_BASE_DIR/examplealgorithm/build
# Run CMake
$ cmake ..
# Run make
$ make
```

You may get warnings about unused parameters, but eventually, the project should compile.

2.3 Run the Algorithm

To run the algorithm, both ArmarX and the MSeg core module must be running. You can then start the algorithm like this:

```
# Change into the build folder
$ cd $PROJECT_BASE_DIR/examplealgorithm/build
# Run the algorithm
$ ./examplealgorithm
```

You should now see an output like this:

```
user@machine:~/projects/examplealgorithm/build$ ./examplealgorithm
Connecting to MSeg core module...
Connection established
ExampleAlgorithm ready
```

You can stop the algorithm with `Ctrl` + `C` at any time.

2.4 How to Proceed

You can now start implementing your algorithm. You may also want to get more familiar with the *SegmentationAlgorithm API reference*, the *MSeg GUI* and the *msegcm, msegdata, and mseggen terminal tools*.

CHAPTER 3

Integrate a Java Algorithm

This guide will show you how to setup your workspace to integrate your own Java motion segmentation algorithm using the Java PLI. It is assumed that you either followed the *quickstart guide* or you compiled the *MSeg Core Module* and the *Java PLI* from source.

3.1 Install the Skeleton Project

We will use the `mseggen` terminal tool to install a skeleton project.

```
# Define the base directory where the project directory should be located
$ export $PROJECT_BASE_DIR=~/projects
# Run the generation tool to create the skeleton.
# If your algorithm requires training, add the --train flag
$ mseggen -b $PROJECT_BASE_DIR --java ExampleAlgorithm
```

3.2 Compiling the Algorithm

Your project should now look similar to this (If you changed the algorithm name the paths will be slightly altered):

```
$PROJECT_BASE_DIR/
`--- examplealgorithm
    |--- build/
    |--- lib/
    |--- src/
    |    `--- ExampleAlgorithm.java
    `--- build.xml
```

To compile the skeleton, we change into the project root folder and run *ant*:

```
# Change into the build folder
$ cd $PROJECT_BASE_DIR/examplealgorithm
# Run ant
$ ant
```

3.3 Run the Algorithm

To run the algorithm, both ArmarX and the MSeg core module must be running. You can then start the algorithm like this:

```
# Change into the build folder
$ cd $PROJECT_BASE_DIR/examplealgorithm/build
# Run the algorithm
$ java -jar examplealgorithm.jar
```

You should now see an output like this:

```
user@machine:~/projects/examplealgorithm/build$ java -jar examplealgorithm.jar
Connecting to MSeg core module...
Connection established
ExampleAlgorithm ready
```

You can stop the algorithm with `Ctrl` + `C` at any time.

3.4 How to Proceed

You can now start implementing your algorithm. You may also want to get more familiar with the *SegmentationAlgorithm API reference*, the *MSeg GUI* and the *msegcm, msegdata, and mseggen terminal tools*.

CHAPTER 4

Integrate a Python Algorithm

This guide will show you how to setup your workspace to integrate your own Python motion segmentation algorithm using the Python PLI. It is assumed that you either followed the *quickstart guide* or you compiled the *MSeg Core Module* from source and set up the *Python PLI*.

4.1 Install the Skeleton Project

We will use the `mseggen` terminal tool to install a skeleton project.

```
# Define the base directory where the project directory should be located
$ export $PROJECT_BASE_DIR=~/projects
# Run the generation tool to create the skeleton.
# If your algorithm requires training, add the --train flag
$ mseggen -b $PROJECT_BASE_DIR --python ExampleAlgorithm
```

4.2 Run the Algorithm

To run the algorithm, both ArmarX and the MSeg core module must be running. You can then start the algorithm like this:

```
# Change into the project folder
$ cd $PROJECT_BASE_DIR/examplealgorithm
# Run the algorithm
$ python examplealgorithm.py
```

You should now see an output like this:

```
user@machine:~/projects/examplealgorithm$ python examplealgorithm.py
Connecting to MSeg core module...
Connection established
ExampleAlgorithm ready
```

You can stop the algorithm with `Ctrl` + `C` at any time.

4.3 How to Proceed

You can now start implementing your algorithm. You may also want to get more familiar with the *SegmentationAlgorithm API reference*, the *MSeg GUI* and the *msegcm, msegdata, and mseggen terminal tools*.

CHAPTER 5

Integrate a MATLAB Algorithm

This guide will show you how to setup your workspace to integrate your own MATLAB motion segmentation algorithm using the MATLAB PLI. It is assumed that you either followed the *quickstart guide* or you compiled the *MSeg Core Module* from source and set up the *MATLAB PLI*.

5.1 Install the Skeleton Project

We will use the `mseggen` terminal tool to install a skeleton project.

```
# Define the base directory where the project directory should be located
$ export $PROJECT_BASE_DIR=~/projects
# Run the generation tool to create the skeleton.
# If your algorithm requires training, add the --train flag
$ mseggen -b $PROJECT_BASE_DIR --matlab ExampleAlgorithm
```

5.2 Run the Algorithm

To run the algorithm, both ArmarX and the MSeg core module must be running. You can then start the algorithm like this:

```
# Change into the project folder
$ cd $PROJECT_BASE_DIR/examplealgorithm
# Run the algorithm
$ ./main
```

Note: The `main` executable *cannot* be started from within MATLAB.

Running the algorithm from the terminal, you should now see an output like this:

```
user@machine:~/projects/examplealgorithm$ ./main
Initialising MATLAB
Connecting to MSeg core module...
Connection established
ExampleAlgorithm ready
```

You can stop the algorithm with `Ctrl` + `C` at any time.

5.3 How to Proceed

You can now start implementing your algorithm. You may also want to get more familiar with the *SegmentationAlgorithm API reference*, the *MSeg GUI* and the *msegcm, msegdata, and mseggen terminal tools*.

CHAPTER 6

Compile the MSeg Core Module from Source

This guide will show how to compile the MSeg core module from source on a 64 bit Ubuntu machine.

Note: It is *strongly recommended* to use the MSeg core module with Ubuntu 14.04, as it eases the installation process drastically. If this should be a problem, consider using a virtual machine like VirtualBox and install Ubuntu 14.04 there.

6.1 Preconditions

- Freshly installed Ubuntu 14.04.5 LTS x64 "trusty" [64-bit PC (AMD64) desktop image]
- `sudo` privileges
- Approx. hard disk size required: 1 GiB (Make sure to have enough space if you want to install additional software like IDEs or MATLAB)

6.2 Setup Environment Variables and Installation Directories

Open a terminal (`Ctrl` + `Shift` + `T`) and set the needed environment variables and create the installation directory.

```
# Add ARMARX_INSTALL_DIR to .bashrc
$ echo "export ARMARX_INSTALL_DIR=$HOME/armarx" >> ~/.bashrc
# Source .bashrc
$ source ~/.bashrc
# Add MSEG_INSTALL_DIR to .bashrc
$ echo "export MSEG_INSTALL_DIR=$ARMARX_INSTALL_DIR/MSeg" >> ~/.bashrc
# Source .bashrc
$ source ~/.bashrc
# Create ArmarX install directory
$ mkdir -p $ARMARX_INSTALL_DIR
```

6.3 Dependencies

In this step, all needed dependencies will be installed. Where repositories are available, they will be used. Otherwise, they will be compiled from source.

6.3.1 Standard Ubuntu Packages

Install the following packages:

```
$ sudo apt install astyle cmake cmake-qt-gui cppcheck curl doxygen \
freeglut3-dev g++ git gsl-bin ivy lcov libalglib-dev libboost-all-dev \
libcoin80-dev libcv-dev libcvaux-dev libdb5.1-dev libdc1394-22-dev \
libeigen3-dev libgraphviz-dev libgsl0-dev libgstreamer-plugins-base0.10-dev \
libhighgui-dev libjsoncpp-dev libnlopt-dev libopencv-dev libopencv-gpu-dev \
libopencv-photo-dev libopencv-stitching-dev libopencv-superres-dev \
libopencv-ts-dev libopencv-videostab-dev libpcre3-dev libqwt-dev \
libsoqt4-dev libsqlite3-dev libssl-dev libtinyxml-dev libv4l-dev mcpp \
mongodb openjdk-7-jdk python-argcomplete python-docutils python-psutil \
python-setuptools zeroc-ice35
```

6.3.2 Packages from H2T Package Server

Add the H2T key and install additional packages.

```
# Add H2T key and add repositories
$ curl https://packages.humanoids.kit.edu/h2t-key.pub | sudo apt-key add -
$ echo -e "deb http://packages.humanoids.kit.edu/trusty/main trusty main\ndeb http://
↪packages.humanoids.kit.edu/trusty/testing trusty testing" | sudo tee /etc/apt/
↪sources.list.d/armarx.list
# Update lists
$ sudo apt update
# Install additional packages
$ sudo apt install ivt ivtrecognition mmmcore simox
```

6.3.3 Install MMMTools from Source

MMMTools is used for the visualisation of motion data. Unfortunately, it is not available as binary and has to be compiled from source.

```
# Get source code
$ git clone https://gitlab.com/mastermotormap/mmmtools.git $ARMARX_INSTALL_DIR/
↪mmmtools
# Go into the source folder of MMMTools
$ cd $ARMARX_INSTALL_DIR/mmmtools
# Create build directory and go into it
$ mkdir build && cd build
# Run CMake
$ cmake ..
# Compile. Use 'make -j4' to use 4 cores
$ make
```

6.4 Setup ArmarXCore

In this step, ArmarXCore will be compiled from source and setup. We start with fetching the source code and compiling it.

```
# Get source code
$ git clone https://gitlab.com/ArmarX/ArmarXCore $ARMARX_INSTALL_DIR/ArmarXCore
# Go to build directory
$ cd $ARMARX_INSTALL_DIR/ArmarXCore/build
# Run CMake
$ cmake ..
# Compile. Use 'make -j4' to use 4 cores
$ make
```

ArmarXCore should be compiled now. Now add the binary directory to `$PATH` to ease working with it.

```
$ echo "export PATH=\"$ARMARX_INSTALL_DIR/ArmarXCore/build/bin:\$PATH\"" >> ~/.bashrc
$ source ~/.bashrc
```

We also need to install the Python packages.

```
# Go into python scripts directory
$ cd $ARMARX_INSTALL_DIR/ArmarXCore/etc/python
# Run setup
$ python setup.py develop --user
```

With everything being setup, we can now start ArmarX. Config files needed later will be created then.

```
# Run armarx for the first time. You will be prompted to add a line to
# .bashrc for autocompletion. Accept with y
$ armarx
# Source .bashrc as indicated
$ source ~/.bashrc
# Run armarx again since the previous step just modified the .bashrc file
$ armarx start
```

The config file now got created. Run the following command and apply the changes below.

```
# Open config file
$ gedit ~/.armarx/default.cfg
```

Changes:

```
++ Ice.MessageSizeMax=10240
   Ice.Default.Locator=IceGrid/Locator:tcp -p 12454 -h localhost
   IceGrid.Registry.Client.Endpoints=tcp -p 12454

   ArmarX.MongoHost=localhost
   ArmarX.MongoPort=12455

   #Put your custom ArmarX Packages in this list, e.g. so that the gui can find their␣
↪plugins.
-- ArmarX.AdditionalPackages=
++ ArmarX.AdditionalPackages=MSeg
```

Save and close the config file. Finally, restart ArmarX.

```
# Restart ArmarX
$ armarx reset
```

6.5 Setup ArmarXGui

We will now proceed to install the ArmarXGui. Again we start with fetching the source code and compiling it.

```
# Get source code
$ git clone https://gitlab.com/ArmarX/ArmarXGui $ARMARX_INSTALL_DIR/ArmarXGui
# Go to build directory
$ cd $ARMARX_INSTALL_DIR/ArmarXGui/build
# Run CMake
$ cmake ..
# Compile. Use 'make -j4' to use 4 cores
$ make
```

You should now be able start the GUI.

```
# Start ArmarX GUI
$ armarx gui
```

The GUI will now load and eventualy, a popup should appear.

- You may check the checkbox `Do not show again`.
- Push the `Open empty GUI` button.

Close the GUI for now using the × button.

6.6 Setup the MSeg Core Module

In this step the MSeg core module will be compiled and setup.

6.6.1 Compile the MSeg Core Module

Once more, fetch the source code and compile.

```
# Get source code
$ git clone https://gitlab.com/h2t/kit-mseg/core.git $MSEG_INSTALL_DIR
# Go into the MSeg installation directory
$ cd $MSEG_INSTALL_DIR
# Get the most recent stable version
$ git checkout 1.1-stable
# Create the build folder and go into it
$ mkdir build && cd build
# Run cmake
$ cmake ..
# Compile. Use 'make -j4' to use 4 cores
$ make
```

Now that the project is compiled, we proceed to add the `mseg*` terminaltool to `$PATH`:

```
$ echo "export PATH=\"$MSEG_INSTALL_DIR/etc/scripts/:\$PATH\"" >> ~/.bashrc
$ source ~/.bashrc
```

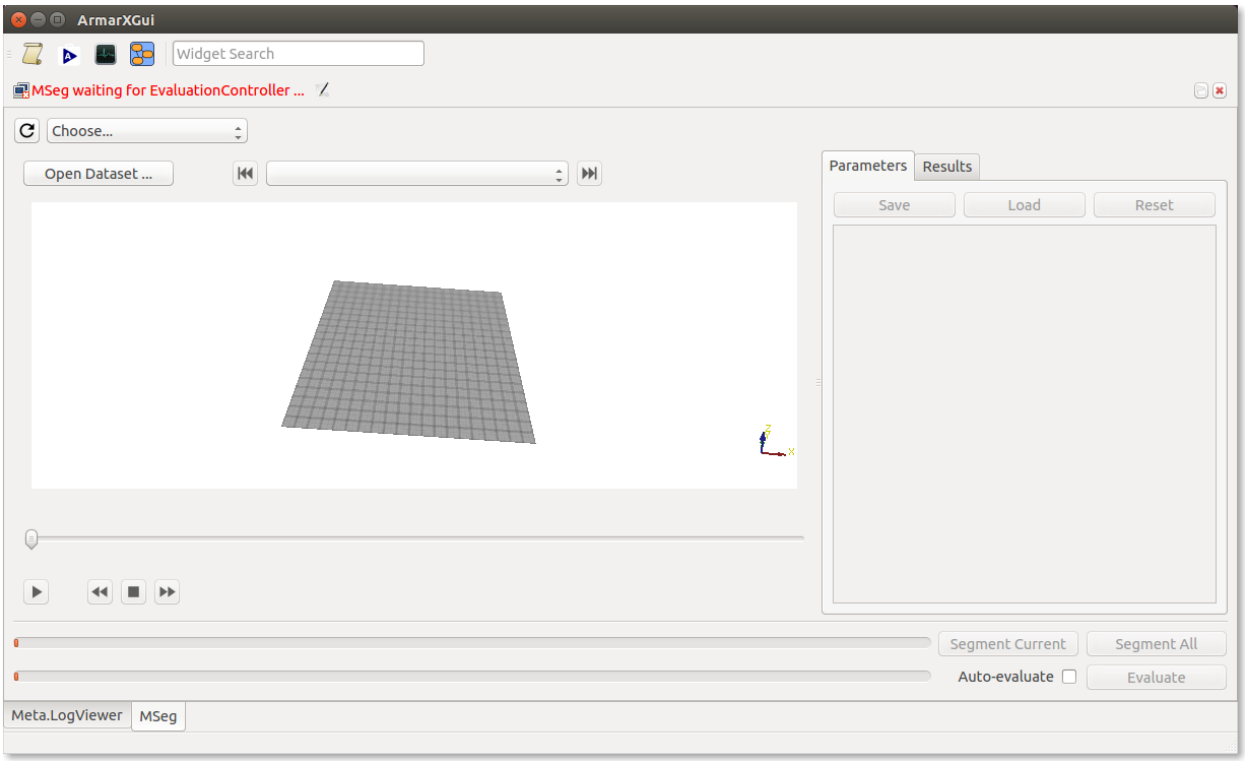
We can now start the ArmarX GUI and MSeg. Firstly, make sure that ArmarX is running: `armarx status`. If the output is similar to the output below, start ArmarX as indicated using `armarx start`.

```
# An output similar to this is shown when 'armarx status' is called
# and ArmarX is not running:
Exception while initializing Ice:
Ice.ConnectionRefusedException:
Connection refused
IceGrid is not running
Try starting it with 'armarx start'
```

Launch the GUI: `armarx gui`. You can now use the MSeg GUI by clicking on `Add Widget | MSeg`.

6.6.2 Start the Core Module

When you open the MSeg GUI you should see a window similar to this:



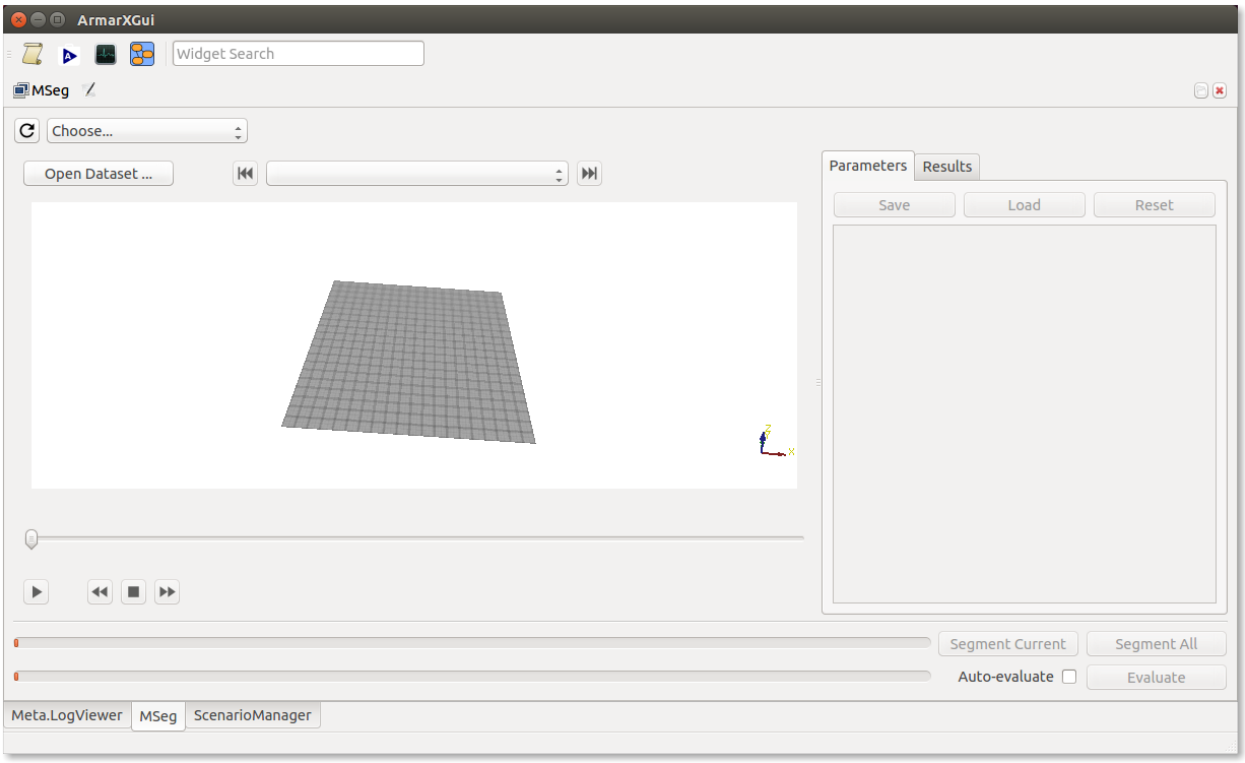
Note the red text which says:

> MSeg waiting for EvaluationController and SegmentationController

Both the `EvaluationController` and the `SegmentationController`, as well as the `DataExchange`, which is not listed here, are components that form the core module. In order for the GUI to work, these components have to be started.

```
# Start the core module
$ msegcm start
```

The components of the core module are now running. If you now head back to the MSeg GUI, you should see that the warning showed before disappeared.



Remember to start these components every time you reboot your computer. Also, when a component crashes, it may be required to restart them using `msegcm restart`. You will be notified if components need to be restarted by the red text as shown in the first graphic.

6.7 How to Proceed

With the core module being set up, you can now proceed to *compile a PLI* which is needed to offer an API to communicate with the core module in the programming language the motion segmentation algorithm is implemented in. Supported programming languages are C++, Python, Java and MATLAB.

CHAPTER 7

Compile a PLI from Source

This guide will show you how to compile a PLI from source for C++, Python, Java or MATLAB. It is assumed that the MSeg core module was installed as described in the *guide about compiling the MSeg core module from source*.

7.1 Programming Language Specific Prerequisites

Some PLIs require certain prerequisites which will be elaborated in the following.

7.1.1 C++, Python and Java

Nothing specific to consider.

7.1.2 MATLAB

We need to install the MATLAB Python libraries so the PLI can access the MATLAB engine.

```
# Change to the MATLAB installation's script folder
$ cd $MATLAB_HOME/extern/engines/python
# Run the install script
$ python setup.py install --user
```

7.2 Setup PLIs

Run one of these `make`-commands, depending on which PLI you want to use.

```
# Change into the MSeg build directory
$ cd $MSEG_INSTALL_DIR/build
# Use this target to build the C++ PLI
```

```
$ make plicpp
# Use this target to build the Python PLI
$ make plipython
# Use this target to build the Java PLI
$ make plijava
# Use this target to build the MATLAB PLI
$ make plimatlab
# Use this target to build all PLIs
$ make plis
```

7.3 Setup Bundled Algorithms

You can try the motion segmentation algorithms bundled with MSeg to see how they use the PLI APIs. The source codes are located in `$MSEG_INSTALL_DIR/source/algorithms`.

You can compile them with:

```
# Change into the MSeg build directory
$ cd $MSEG_INSTALL_DIR/build
# Use this target to build all algorithms
# (Requires that all PLIs were built)
$ make algorithms
# Use this target to build the ZVC algorithm
# (Requires that the C++ PLI was built)
$ make algorithmzvc
# Use this target to build the SSAV algorithm
# (Requires that the Python PLI was built)
$ make algorithmssav
# Use this target to build the PCA algorithm
# (Requires that the Java PLI was built)
$ make algorithmpca
```

The compiled algorithms can then be found in `$MSEG_INSTALL_DIR/build/bin` (the executables or scripts start with "algorithm"). Before launching the algorithm, please make sure that both ArmarX and the MSeg core module are running, otherwise the algorithm will crash. Run `armarx status` to see if ArmarX is running, and `armarx start` to start it. Similary, use `msegcm status` to see the status of the components of MSeg core module, and `msegcm start` to start them.

7.4 How to Proceed

Now that both the MSeg core module and the PLI is setup, you can proceed with integrating your own motion segmentation algorithm in *C++*, *Java*, *Python* or *MATLAB*.

CHAPTER 8

Architectural Overview

Coming soon

CHAPTER 9

The `mseg*` Terminal Tools

MSeg ships with three terminal tools, namely:

- `msegcm` Control the MSeg core module
- `msegdata` Manage the datasets
- `mseggen` Help setting up new motion segmentation algorithm projects

Note: You can run `<command> --help` at any time to get a quick overview on the usage and synopsis. If you need more detail for a given subcommand, you can run `<command> <subcommand> --help` instead. *The usage of the tools may change with future versions of MSeg*. If the information on this page is contradicting the information given from the `--help`, *always rely on that help*.

9.1 `msegcm` Tool

With `msegcm`, the MSeg core module can be controlled.

9.1.1 Available subcommands

- `status`: Prints the status of the MSeg core module processes
- `start`: Start the MSeg core module processes
- `stop`: Stop the MSeg core module processes
- `restart`: Stop and start the MSeg core module processes

If an unexpected error leads to the crash of one or more processes, you will need to restart the MSeg core module using `msegcm restart`. A crash can be diagnosed if `msegcm status` indicates that the status of the MSeg core module is either "mixed" or "stopped".

Note: The MSeg core module cannot start properly if ArmarX is not running. You can query the status of ArmarX by running `armarx status`, and you can start it by running `armarx start`.

9.2 `msegdata` Tool

With `msegdata`, the datasets available with MSeg can be managed. The datasets are not included by default because newer datasets may still be useful for older versions of MSeg. The datasets are versioned separately for that reason.

9.2.1 Available subcommands

- `fetch`: Fetches the datasets and stores them locally into `~/.mseg/datasets` (This is a Git repository). This subcommand **must** be ran once to initialise the datasets (see *quickstart guide*)
- `update`: Updates the local datasets to the newest versions. Old versions will remain untouched

Note: If you are experienced with Git, then please note that `msegdata` is merely a façade for the corresponding Git repository (`~/.mseg/datasets`) of the datasets. If you prefer, you can use Git in first place instead of `msegdata`. You are *still* advised to at least run `msegdata fetch` to clone the Git repository into the correct location.

9.3 `mseggen` Tool

The `mseggen` command is a helper tool to kick-start a new motion segmentation algorithm project. It creates all source files (and build files, if appropriate) needed for a given programming language with well-commented stubs and dummy-implementations.

9.3.1 Synopsis

```
mseggen [--base-path BASE_PATH] [--train] (--cpp | --python | --java |
--matlab) <project-name>
```

- The option `--base-path` can be used to set the base path in which the project should be created. It defaults to the current working directory
- The flag `--train` is optional. If set, the code will be included to use the train API. If not set, those parts will be commented out
- The flags `--cpp`, `--python`, `--java` and `--matlab` are mutually exclusive. Exactly one of them must be set
- `<project-name>` is the name of the project, respectively the motion segmentation algorithm. It must me alphanumeric and start with a character

9.3.2 Examples

- To implement the PCA approach by Barbič in Java the usage would be: `mseggen --java PCABarbic`
- To implement a machine learning algorithm in Python, located in `~/projects`: `mseggen --base-path ~/projects --train --java MLApproach`

CHAPTER 10

The MSeg Graphical User Interface

Coming soon

CHAPTER 11

`SegmentationAlgorithm` Interface

All PLIs offer the class `SegmentationAlgorithm` which can be derived in order to communicate with the core module.

11.1 Properties

Properties of `SegmentationAlgorithm`.

11.1.1 `data`

Type: *DataExchangeProxy*

Description Proxy to exchange data between the PLI and the core module. This property is initialised by the corresponding PLI and must not be overwritten.

11.1.2 `name`

Type: String

Description: The name of the algorithm. The name must not be empty and must be alphanumeric and start with a character. Set this property in the constructor.

11.1.3 `requiresTraining`

Type: bool

Default: false

Description: Flag to indicate whether the algorithm should be trained. Set this property in the constructor.

11.1.4 trainingGranularity

Type: Granularity

Default: Granularity.Medium

Description: Used to filter the training ground truth data for the set granularity. Possible values are `Granularity.Fine`, `Granularity.Medium`, and `Granularity.Rough`. Set this property in the constructor. This property is only considered if `requiresTraining` is set to true.

11.2 Methods

Methods of `SegmentationAlgorithm`.

11.2.1 SegmentationAlgorithm() or __init__() or constructor.m

Signature: `SegmentationAlgorithm` ()

Description: Constructor. Set properties like `name`, `requiresTraining` or `trainingGranularity` here. Set algorithm parameters here.

11.2.2 train() or train.m

Signature: void `train` ()

Return: void

Description: This method will be called for each motion recording in the training dataset. You can fetch the current motion recording here using the `data` property and use it to train your variables.

11.2.3 resetTraining() or reset_training.m

Signature: void `resetTraining` ()

Return: void

Description: This method will be called after one part of the cross validation was executed. Make sure to reset all trained variables to not falsify the evaluation.

11.2.4 segment() or segment.m

Signature: void `segment` ()

Return: void

Description: This method will be called for each motion recording in the testing dataset.

11.2.5 registerBoolParameter()

Signature: void registerBoolParameter (String name, String description, bool defaultValue)

Return: void

Description: Registers a boolean parameter name with a default value of defaultValue to tweak in the GUI.

11.2.6 registerIntParameter()

Signature: void registerIntParameter (String name, String description, int defaultValue, int minimumValue = INT_MIN, int maximumValue = INT_MAX)

Return: void

Description: Registers an int parameter name with a default value of defaultValue to tweak in the GUI. The allowed range of values can be controlled with minimumValue and maximumValue.

11.2.7 registerFloatParameter()

Signature: void registerFloatParameter (String name, String description, float defaultValue, int decimals = 2, float minimumValue = -FLOAT_MAX, float maximumValue = FLOAT_MAX)

Return: void

Description: Registers a float parameter name with a default value of defaultValue to tweak in the GUI. The allowed range of values can be controlled with minimumValue and maximumValue. The precision (number of decimals) can be controlled with decimals.

11.2.8 registerStringParameter()

Signature: void registerStringParameter (String name, String description, String defaultValue)

Return: void

Description: Registers a String parameter name with a default value of defaultValue to tweak in the GUI.

11.2.9 registerJsonParameter()

Signature: void registerJsonParameter (String name, String description, JSON defaultValue)

Return: void

Description: Registers a JSON parameter name with a default value of defaultValue to tweak in the GUI.

11.2.10 `getBoolParameter()`

Signature: bool `getBoolParameter` (String `name`)

Return: bool

Description: Get a registered bool parameter by its `name`.

11.2.11 `getIntParameter()`

Signature: int `getIntParameter` (String `name`)

Return: int

Description: Get a registered int parameter by its `name`.

11.2.12 `getFloatParameter()`

Signature: float `getFloatParameter` (String `name`)

Return: float

Description: Get a registered float parameter by its `name`.

11.2.13 `getStringParameter()`

Signature: String `getStringParameter` (String `name`)

Return: String

Description: Get a registered String parameter by its `name`.

11.2.14 `getJsonParameter()`

Signature: JSON `getJsonParameter` (String `name`)

Return: JSON

Description: Get a registered JSON parameter by its `name`.

CHAPTER 12

`DataExchangeProxy` Interface

An instance of the `DataExchangeProxy` class is accessible via the `data` property of the derived *SegmentationAlgorithm* instance. It is used to communicate with the core module to exchange data.

12.1 Methods

Methods of `DataExchangeProxy`.

Method *getFrameCount()*

12.1.1 `getFrameCount()`

Signature: int `getFrameCount` ()

Return: int

Description: Returns the total number of frames for the current motion recording.

12.1.2 `getMMMFile()`

Signature: String `getMMMFile` ()

Return: String

Description: Returns the MMM file of the current motion recording as String. MMM is an XML format file which can be parsed with various XML readers or the already existing MotionReaderXML for C++.

12.1.3 `getGroundTruth()`

Signature: List<int> `getGroundTruth` ()

Return: List<int>

Description: Returns the ground truth for the current motion recording with the granularity determined by the `trainingGranularity` property of the derived SegmentationAlgorithm instance.

12.1.4 `getJointAnglesForFrame()`

Signature: List<float> `getJointAnglesForFrame` (int `frameNumber`)

Return: List<float>

Description: Returns the joint angles of the frame with the number `frameNumber` for the current motion recording.

12.1.5 `reportKeyFrame()`

Signature: void `reportKeyFrame` (int `frameNumber`)

Return: void

Description: Reports that the frame with the number `frameNumber` is a key frame where a segmentation occurs.

12.1.6 `reportKeyFrames()`

Signature: void `reportKeyFrames` (List<int> `frameNumbers`)

Return: void

Description: Reports that the list of frame numbers `frameNumbers` are key frames where segmentations occur.

CHAPTER 13

Data Type Mappings

Data types used in this documentation map to different data structures or constructs depending on the used programming language. The following table shows the corresponding mappings.

CHAPTER 14

Changelog

14.1 Version 1.1.1

Bugfixes

- Fix a CMake dependency problem (#81)

14.2 Version 1.1.0

Features

- Implement parameter save/load (#4)
- Allow exporting evaluation results as XML (#70)

Bugfixes

- Load motions in the background (#65)
- Disable segment current button (not yet implemented) (#67)
- Fix a bug where motions are loaded twice (#68)
- Disable segment and evaluate buttons while a new dataset ist being opened (#71)
- Fix an issue where thousands separators could cause crashes (#75)
- Fix issues with a more recent version of MMMTools (#80)

14.3 Version 1.0.2

Bugfixes

- Fix an issue where thousands separators could cause crashes (#75)

14.4 Version 1.0.1

Bugfixes

- Disable segment current button (not yet implemented) (#67)
- Fix a bug where motions are loaded twice (#68)

14.5 Version 1.0.0

Bugfixes

- Fix MATLAB dependency issues (#56)
- Fix stacktrace output for MATLAB exceptions (#59)
- Made everything locale independent (#33, #61)
- Fix various UI issues (#44, #60, #64)

14.6 Version 1.0.0-rc5

Features

- Improved error handling (#47, #49, #50)
- Refactor algorithm name handling (#48)
- Unify PLI output (#45)

14.7 Version 1.0.0-rc4

Features

- Add commands to `mseg` to start/stop/restart the core module (#37)
- Add subcommand to `mseg` to generate a Java skeleton project (#40)
- Include MATLAB PLI (#23)
- Add subcommand to `mseg` to generate a MATLAB skeleton project (#42)

Bugfixes

- Fix a bug where shutting down a Java algorithm would raise an exception

14.8 Version 1.0.0-rc3

Features

- Add `mseg` tool
- Add subcommand to `mseg` to generate a C++ skeleton project (#35)
- Add subcommand to `mseg` to generate a Python skeleton project (#36)

14.9 Version 1.0.0-rc2

Features

- Include ZVC algorithm (#25)
- Allow algorithms to require training data of a certain granularity (#27)

Bugfixes

- Fix an unimplemented method preventing Java PLI from compiling (#30, #31)

14.10 Version 1.0.0-rc1

- *Initial release candidate*

CHAPTER 15

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Version 2, June 1991

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