GNU Octave and Java

Some notes on using Octave (and Matlab) with Java

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This document is intended to be an additional source of information for the useful Java package, created by Michael Goffioul. Many suggestions and contributions from Philip Nienhuis are gratefully acknowledged. However only the author is responsible for any errors and omissions in this document.

1 Using Octave (and Matlab) with Java

Octave is an easy to use but powerful environment for mathematical calculations, which can easily be extended by packages. Its features are close to the commercial tool Matlab so that it can often be used as a replacement.

Java on the other hand offers a rich, object oriented and platform independent environment for many applications. The core Java classes can be easily extended by many freely available libraries.

This document refers to the package `java`, which is part of the GNU Octave project. This package allows you to access Java classes from inside Octave. Thus it is possible to use existing class files or complete Java libraries directly from Octave.

This description is based on the Octave package `java-1.2.8`. The `java` package usually installs its script files (.m) in the directory `.../share/Octave/packages/java-1.2.8` and its binary (.oct) files in `.../libexec/Octave/packages/java-1.2.8`.

You can get help on specific functions in Octave by executing the help command with the name of a function from this package:

```
Octave > help javaObject
```

You can view this help file in Octave by executing the info command with just the word java:

```
Octave > doc java
```

Note on calling Octave from Java

The `java` package is designed for calling Java from Octave. If you want to call Octave from Java, you might want to use a library like `javaOctave` [http://kenai.com/projects/javaOctave] or `joPas` [http://jopas.sourceforge.net].

2 Available Functions

2.1 javaclasspath

`javaclasspath` [Function file]
STATIC = `javaclasspath` [Function file]
[*STATIC*, *DYNAMIC*] = `javaclasspath` [Function file]
PATH = `javaclasspath` (*WHAT*) [Function file]

Return the class path of the Java virtual machine as a cell array of strings.

If called without an input parameter:

- If no output variable is given, the result is simply printed to the standard output.
- If one output variable *STATIC* is given, the result is the static classpath.
- If two output variables *STATIC* and *DYNAMIC* are given, the first variable will contain the static classpath, the second will be filled with the dynamic claspath.

If called with a single input parameter *WHAT*:

If no output parameter is given:

- The result is printed to the standard output similar to the call without input parameter.

If the output parameter *PATH* is used:

- If *WHAT* is '-static' the static classpath is returned.
- If *WHAT* is '-dynamic' the dynamic classpath is returned.
- If *WHAT* is '-all' the static and the dynamic classpath are returned in a single cell array.

For the example two entries have been added to the static classpath using the file `classpath.txt`.

Example:

```
Octave > javaclasspath('-all')
   STATIC JAVA PATH

      z:/someclasses.jar
      z:/classdir/classfiles

   DYNAMIC JAVA PATH
      - empty -

Octave > javaaddclasspath('z:/dynamic');
Octave > ps = javaclasspath('-all')
ps =
{
  [1,1] = z:/someclasses.jar
  [1,2] = z:/classdir/classfiles
  [1,3] = z:/dynamic
```

```
}
```

See also: [javaaddpath], page 3, [javarmpath], page 3, [How to make Java classes available to Octave?], page 17.

2.2 javaaddpath

`javaaddpath` (*PATH*) [Function File]

Add *PATH* to the dynamic class path of the Java virtual machine. *PATH* can be either a directory where .class files can be found, or a .jar file containing Java classes. In both cases the directory or file must exist.

Example:

This example adds a Java archive and a directory containing *.class* files to the *classpath* and displays the current *classpath* list.

```
Octave > javaaddpath('C:/java/myclasses.jar');
Octave > javaaddpath('C:/java/classes');
Octave > javaclasspath;
ans =
{
  [1,1] = C:\java\myclasses.jar
  [1,2] = C:\java\classes
}
```

See also: [javaclasspath], page 2, [javarmpath], page 3, [How to make Java classes available to Octave?], page 17.

2.3 javarmpath

`javarmpath` (*PATH*) [Function File]

Remove *PATH* from the dynamic class path of the Java virtual machine. *PATH* can be either a directory where .class files can be found, or a .jar file containing Java classes.

Example: This example removes one of the directories added in the example for the `javaaddpath` function.

```
Octave > javarmpath('C:/java/classes');
Octave > javaclasspath
{
  [1,1] = C:\java\myclasses.jar
}
```

See also: [javaaddpath], page 3, [javaclasspath], page 2, [How to make Java classes available to Octave?], page 17.

2.4 javamem

`javamem` [Function File]

`[JMEM] = javamem` [Function File]

Show current memory status of the java virtual machine (JVM) & run garbage collector.

When no return argument is given the info is echoed to the screen. Otherwise, cell array *JMEM* contains *Maximum*, *Total*, and *Free* memory (in bytes).

All java-based routines are run in the JVM's shared memory pool, a dedicated and separate part of memory claimed by the JVM from your computer's total memory (which comprises physical RAM and virtual memory / swap space on hard disk).

The maximum available memory can be set using the file `java.opts` (in the same subdirectory where `javaaddpath.m` lives, see '`which javaaddpath`'. Usually that is: [/usr]/share/Octave/packages/java-1.2.8.

`java.opts` is a plain text file. It can contain memory related options, starting with `-X`. In the following exmaple, the first line specifies the initial memory size in megabytes, the second line specifies the requested maximum size:

```
-Xms64m
-Xmx512m
```

You can adapt these values if your system has limited available physical memory. When no `java.opts` file is present, the default assignments are depending on system hardware and Java version. Typically these are an initial memory size of *RAM/64* and a maximum memory size of *min(RAM/4, 1GB)*, where *RAM* is the amount of installed memory.

In the output of javamem *Total memory* is what the operating system has currently assigned to the JVM and depends on actual and active memory usage. *Free memory* is self-explanatory. During operation of java-based Octave functions the amounts of Total and Free memory will vary, due to java's own cleaning up and your operating system's memory management.

Example:

```
Octave > javamem
Java virtual machine (JVM) memory info:
Maximum available memory:          247 MB;
   (...running garbage collector...)
OK, current status:
Total memory in virtual machine:    15 MB;
Free memory in virtual machine:     15 MB;
2 CPUs available.

Octave > [MEM] = javamem()
MEM =
{
  [1,1] =  259522560
  [2,1] =  16318464
  [3,1] =  16085576
}
```

See also: [How can I handle memory limitations?], page 17.

2.5 javaArray

`ARRAY = javaArray (`*CLASS*`, [`*M*`, `*N*`, ...])` [Function File]
`ARRAY = javaArray (`*CLASS*`, `*M*`, `*N*`, ...)` [Function File]

Create a Java array of size `[M, N, ...]` with elements of class *CLASS*. *CLASS* can be a Java object representing a class or a string containing the fully qualified class name. The generated array is uninitialized, all elements are set to null if *CLASS* is a reference type, or to a default value (usually 0) if *CLASS* is a primitive type.

Example: This example creates a (2 x 2) array of Java *String* objects and assigns a value to one of the elements. Finally it displays the type of *a*.

```
Octave > a = javaArray('java.lang.String', 2, 2);
Octave > a(1,1) = 'Hello';
Octave > a
a =
<Java object: java.lang.String[][]>
```

2.6 javaObject

`OBJECT = javaObject (`*CLASS*`, [`*ARG1*`, ..., `*ARGN*`])` [Function File]

Create a Java object of class *CLASS*, by calling the class constructor with the given arguments *ARG1*, ..., *ARGN*. The *CLASS* name should be given in fully qualified string form (including any package prefix). In Matlab you should avoid to use the import statement and the short form of object creation.

Example: This example demonstrates two ways to create a Java `StringBuffer` object. The first variant creates an uninitialized *StringBuffer* object, while the second variant calls a constructor with the given initial `String`. Then it displays the type of `o`, and finally the content of the `StringBuffer` object is displayed by using its `toString` method.

```
Octave > o = javaObject('java.lang.StringBuffer');
Octave > o = javaObject('java.lang.StringBuffer', 'Initial');
Octave > o
o =
<Java object: java.lang.StringBuffer>
Octave > o.toString
ans = Initial
```

Equivalent to the `java_new` function. For compatibility with Matlab is is recommended to use the `javaObject` function.

See also: [java_new], page 5.

2.7 java_new

`OBJECT = java_new (`*CLASS*`, [`*ARG1*`, ..., `*ARGN*`])` [Function File]

Create a Java object of class *CLASS*, by calling the class constructor with the given arguments *ARG1*, ..., *ARGN*. Equivalent to the `javaObject` function. For compatibility with Matlab is is recommended to use the `javaObject` function.

Example:

```
Octave > o = java_new('java.lang.StringBuffer', 'Initial');
Octave > o
o =
<Java object: java.lang.StringBuffer>
Octave > o.toString
ans = Initial
```

See also: [javaObject], page 5.

2.8 javaMethod

`RET = javaMethod (`*`OBJECT`*`, `*`NAME`*`[, `*`ARG1`*`, ..., `*`ARGN`*`])` [Function File]

Invoke the method *NAME* on the Java object *OBJECT* with the arguments *ARG1*, ... For static methods, *OBJECT* can be a string representing the fully qualified name of the corresponding class. The function returns the result of the method invocation. When *OBJECT* is a regular Java object, the structure-like indexing can be used as a shortcut syntax. For instance, the two statements in the example are equivalent.

Example:

```
Octave > ret = javaMethod(x, "method1", 1.0, "a string")
Octave > ret = x.method1(1.0, "a string")
```

See also: [javamethods], page 7.

2.9 java_invoke

`RET = java_invoke (`*`OBJECT`*`, `*`NAME`*`[, `*`ARG1`*`, ..., `*`ARGN`*`])` [Function File]

Invoke the method *NAME* on the Java object *OBJECT* with the arguments *ARG1*, ... For static methods, *OBJECT* can be a string representing the fully qualified name of the corresponding class. The function returns the result of the method invocation. Equivalent to the `javaMethod` function. When *OBJECT* is a regular Java object, the structure-like indexing can be used as a shortcut syntax. For instance, the two statements in the example are equivalent.

Example:

```
Octave > ret = java_invoke(x, "method1", 1.0, "a string")
Octave > ret = x.method1(1.0, "a string")
```

See also: [javamethods], page 7.

2.10 java_get

`VAL = java_get (`*`OBJECT`*`, `*`NAME`*`)` [Function File]

Get the value of the field *NAME* of the Java object *OBJECT*. For static fields, *OBJECT* can be a string representing the fully qualified name of the corresponding class.

When *OBJECT* is a regular Java object, the structure-like indexing can be used as a shortcut syntax. For instance, the two statements in the example are equivalent

Example:

```
Octave > java_get(x, "field1")
Octave > x.field1
```

See also: [javafields], page 8, [java_set], page 7.

2.11 java_set

`OBJECT = java_set (`*`OBJECT`*`, `*`NAME`*`, `*`VALUE`*`)` [Function File]

Set the value of the field *NAME* of the Java object *OBJECT* to *VALUE*. For static fields, *OBJECT* can be a string representing the fully qualified named of the corresponding Java class. When *OBJECT* is a regular Java object, the structure-like indexing can be used as a shortcut syntax. For instance, the two statements in the example are equivalent

Example:

```
Octave > java_set(x, "field1", val)
Octave > x.field1 = val
```

See also: [javafields], page 8, [java_get], page 6.

2.12 javamethods

`M = javamethods (`*`CLASSNAME`*`)` [Function File]

`M = javamethods (`*`OBJECT`*`)` [Function File]

Given a string with a Java class name *CLASSNAME* or a regular Java object *OBJECT*, this function returns a cell array containing descriptions of all methods of the Java class *CLASSNAME* respectively the class of *OBJECT*.

Examples: The first example shows how the methods of a class can be queried, while the second example works with the methods of a concrete instance of a class. Note that creation of a `java.lang.Double` object requires an initializer (in the example the value 1.2).

```
Octave > m = javamethods('java.lang.Double');
Octave > size(m)
ans =
  1 30

Octave > m{7}
ans = double longBitsToDouble(long)

Octave > o = javaObject('java.lang.Double', 1.2);
Octave > m = javamethods(o);
Octave > size(m)
ans =
  1 30

Octave > m{7}
ans = double longBitsToDouble(long)
```

See also: [javafields], page 8, [java_invoke], page 6.

2.13 javafields

`F = javafields (`*CLASSNAME*`)` [Function File]
`F = javafields (`*OBJECT*`)` [Function File]

Given a string with a Java class name *CLASSNAME* or a regular Java object *OBJECT*, this function returns a cell array containing the descriptions for all fields of the Java class *CLASSNAME* respectively the class of *OBJECT*.

Examples:

The first example shows how the fields of a class can be queried without creating an instance of the class.

```
Octave > f = javafields('java.lang.Double');
Octave > size(f)
ans =
  1 10

Octave > f{7}
ans = public static final int java.lang.Double.MAX_EXPONENT
```

The second example works with the fields of an instance of a class. Note that creation of a `java.lang.Double` object requires an initializer (in the example a value of 1.2 is specified).

```
Octave > o = javaObject('java.lang.Double', 1.2);
Octave > f = javafields(o);
Octave > size(f)
ans =
  1 10

Octave > f{7}
ans = public static final int java.lang.Double.MAX_EXPONENT
```

See also: [java_set], page 7, [java_get], page 6.

2.14 msgbox

`F = msgbox (`*MESSAGE*`)` [Function File]
`F = msgbox (`*MESSAGE*, *TITLE*`)` [Function File]
`F = msgbox (`*MESSAGE*, *TITLE*, *ICON*`)` [Function File]

Displays a *MESSAGE* using a dialog box. The parameter *TITLE* can be used to optionally decorate the dialog caption. The third optional parameter *ICON* can be either `'error'`, `'help'` or `'warn'` and selectes the corresponding icon. If it is omitted, no icon is shown.

Examples: The first example shows a dialog box without a caption text, whereas the second example specifies a caption text of its own. The third example also demonstrates how a character according to the TEX symbol set can be specified. It is important to include a space character after the symbol code and how to embed a newline character (ASCII code 10) into the string.

```
Octave > msgbox('This is an important message');
```

```
Octave > msgbox('Do not forget to feed the cat.', 'Remember');
Octave > msgbox(['I \heartsuit Octave!',10, ...
                 ' Even if I hate it sometimes.'], ...
                'I Confess','warn');
```

See also: [errordlg], page 9, [helpdlg], page 10, [warndlg], page 16.

2.15 errordlg

`F = errordlg (`*MESSAGE*`)` [Function File]
`F = errordlg (`*MESSAGE*`, `*TITLE*`)` [Function File]

Displays the *MESSAGE* using an error dialog box. The *TITLE* can be used optionally to decorate the dialog caption instead of the default title "Error Dialog".

Examples: The first example shows a dialog box with default caption, whereas the second example specifies a its own caption

```
Octave > errordlg('Oops, an expected error occured');
```


```
Octave > errordlg('Another error occured', 'Oops');
```

See also: [helpdlg], page 10, [inputdlg], page 10, [listdlg], page 13, [questdlg], page 14, [warndlg], page 16.

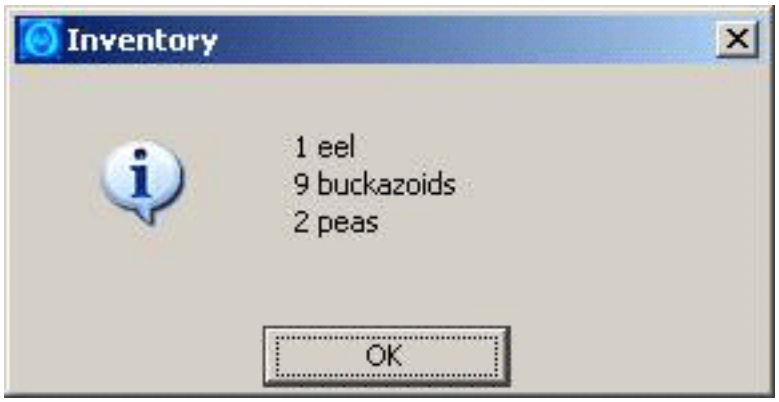
2.16 helpdlg

`F = helpdlg (`*MESSAGE*`)` [Function File]
`F = helpdlg (`*MESSAGE*`, `*TITLE*`)` [Function File]

Displays the *MESSAGE* using a help dialog box. The help message can consist of multiple lines, separated by a newline character. The *TITLE* can be used optionally to decorate the dialog caption bar instead of the default title "Help Dialog".

Examples: The first example shows a dialog box with default caption, whereas the next two examples specify their own caption. Note that if the backslash escape notation is used in a double quoted string, it is immediately replaced by Octave with a newline. If it is contained in a single quoted string, it is not replaced by Octave, but later by the dialog function.

```
Octave > helpdlg('This is a short notice');
Octave > helpdlg(['line #1',10,'line #2'], 'Inventory');
Octave > helpdlg("1 eel\n9 buckazoids\n2 peas", 'Inventory');
```



See also: [errordlg], page 9, [inputdlg], page 10, [listdlg], page 13, [questdlg], page 14, [warndlg], page 16.

2.17 inputdlg

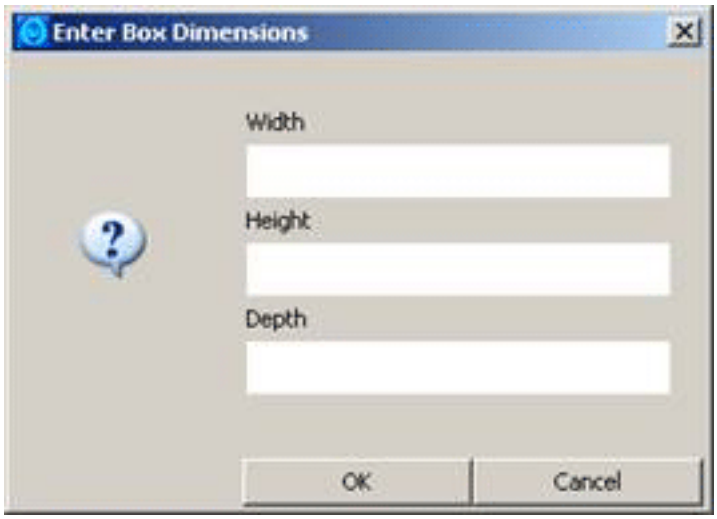
`C = inputdlg (`*PROMPT*`)` [Function File]
`C = inputdlg (`*PROMPT*`, `*TITLE*`)` [Function File]
`C = inputdlg (`*PROMPT*`, `*TITLE*`, `*ROWSCOLS*`)` [Function File]
`C = inputdlg (`*PROMPT*`, `*TITLE*`, `*ROWSCOLS*`, `*DEFAULTS*`)` [Function File]

Returns the user's inputs from a multi-textfield dialog box in form of a cell array of strings. If the user closed the dialog with the Cancel button, en empty cell array is returned. This can be checked with the *isempty* function. The first argument *PROMPT* is mandatory. It is a cell array with strings labeling each text field. The optional string *TITLE* can be used as the caption of the dialog. The size of the text fields can be defined by the argument *ROWSCOLS*, which can be either a scalar to define the number of columns used for each text field, a vector to define the number of rows for each text field individually, or a matrix to define the number of rows and

columns for each text field individually. It is possible to place default values into the text fields by supplying a cell array of strings for the argument *DEFAULTS*.

Examples: The first example shows a simple usage of the input dialog box without defaults.

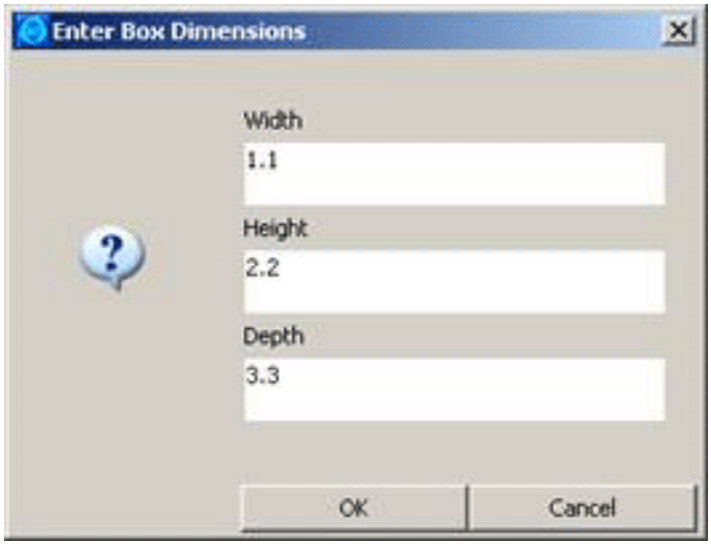
```
Octave > prompt = {'Width','Height','Depth'};
Octave > dims = inputdlg(prompt, 'Enter Box Dimensions');
Octave > volume = str2num(dims{1}) * ...
                  str2num(dims{2}) * str2num(dims{3});
```



The second example shows the application of a scalar for the number of rows and a cell array with default values.

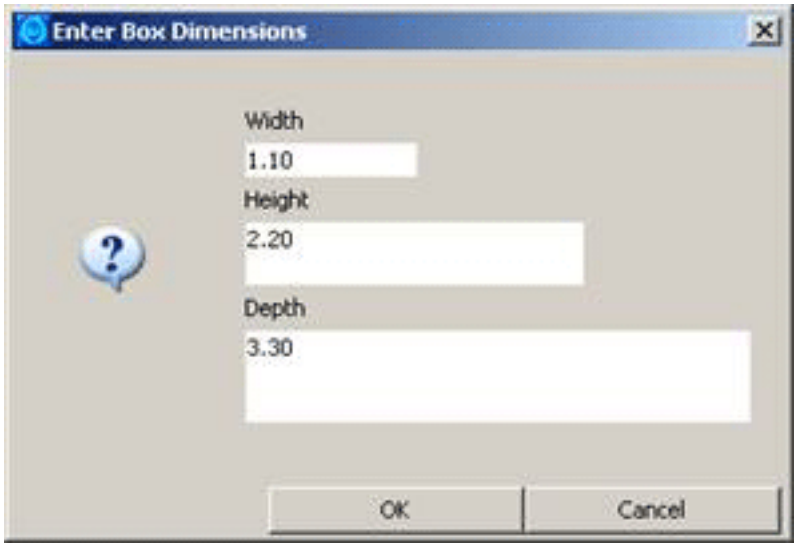
```
Octave > prompt = {'Width', 'Height', 'Depth'};
Octave > defaults = {'1.1', '2.2', '3.3'};
Octave > title = 'Enter Box Dimensions';
Octave > dims = inputdlg(prompt, title, 1, defaults);
Octave > dims
dims =
{
  [1,1] = 1.1
  [2,1] = 2.2
  [3,1] = 3.3
```

```
}
```



The third example shows the application of row height and column width specification..

```
Octave > prompt = {'Width', 'Height', 'Depth'};
Octave > defaults = {'1.1', '2.2', '3.3'};
Octave > rc = [1,10; 2,20; 3,30];
Octave > title = 'Enter Box Dimensions';
Octave > dims = inputdlg(prompt, title, rc, defaults);
```



See also: [errordlg], page 9, [helpdlg], page 10, [listdlg], page 13, [questdlg], page 14, [warndlg], page 16.

2.18 listdlg

`[SEL, OK] = listdlg (`*KEY*, *VALUE*`[,` *KEY*, *VALUE*, ...`])` [Function File]

This function returns the inputs from a list dialog box. The result is returned as a vector of indices and a flag. The vector *SEL* contains the 1-based indices of all list items selected by the user. The flag *OK* is 1 if the user closed the dialog with the OK Button, otherwise it is 0 and *SEL* is empty.. The arguments of this function are specified in the form of *KEY*, *VALUE* pairs. At least the `'ListString'` argument pair must be specified. It is also possible to preselect items in the list in order to provide a default selection.

The *KEY* and *VALUE* pairs can be selected from the following list:

`ListString`
: a cell array of strings comprising the content of the list.

`SelectionMode`
: can be either `'single'` or `'multiple'`.

`ListSize` a vector with two elements `[width, height]` defining the size of the list field in pixels.

`InitialValue`
: a vector containing 1-based indices of preselected elements.

`Name` a string to be used as the dialog caption.

`PromptString`
: a cell array of strings to be displayed above the list field.

`OKString` a string used to label the OK button.

`CancelString`
: a string used to label the Cancel button.

Example:

```
Octave > [s,ok] = listdlg('ListString', ...
                  {'An item', 'another', 'yet another'}, ...
                  'Name', 'Selection Dialog', ...
                  'SelectionMode', 'Multiple', ...
                  'PromptString',['Select an item...',10,'...or multiple items'])

Octave > imax = length(s);
Octave > for i=1:1:imax
Octave >   disp(s(i));
```

```
Octave > end
```

See also: [errordlg], page 9, [helpdlg], page 10, [inputdlg], page 10, [questdlg], page 14, [warndlg], page 16.

2.19 questdlg

`C = questdlg (`*MESSAGE*, *TITLE*`)` [Function File]
`C = questdlg (`*MESSAGE*, *TITLE*, *DEFAULT*`)` [Function File]
`C = questdlg (`*MESSAGE*, *TITLE*, *BTN1*, *BTN2*, *DEFAULT*`)` [Function File]

`C = questdlg (`*MESSAGE*, *TITLE*, *BTN1*, *BTN2*, *BTN3*, *DEFAULT*`)` [Function File]

Displays the *MESSAGE* using a question dialog box with a caption *TITLE*. The dialog contains two or three buttons which all close the dialog. It returns the caption of the activated button.

If only *MESSAGE* and *TITLE* are specified, three buttons with the default captions "Yes", "No", "Cancel" are used. The string *DEFAULT* identifies the default button, which is activated by pressing the ENTER key. It must match one of the strings given in *BTN1*, *BTN2* or *BTN3*. If only two button captions *BTN1* and *BTN2* are specified, the dialog will have only these two buttons.

Examples: The first example shows a dialog box with two buttons, whereas the next example demonstrates the use of three buttons.

```
Octave > questdlg('Select your gender', 'Sex', ...
                  'Male', 'Female', 'Female');
```


```
Octave > questdlg('Select your gender', 'Sex', ...
                  'Male', 'dont know', 'Female', 'Female');
```

See also: [errordlg], page 9, [helpdlg], page 10, [inputdlg], page 10, [listdlg], page 13, [warndlg], page 16.

2.20 warndlg

`F = warndlg (`*MESSAGE*`)` [Function File]
`F = warndlg (`*MESSAGE*`, `*TITLE*`)` [Function File]

Displays a *MESSAGE* using a warning dialog box. The *TITLE* can be used optionally to decorate the dialog caption instead of the default title "Warning Dialog".

Examples: The first example shows a dialog box with default caption, whereas the second example specifies a caption text of its own. The second example also demonstrates how a character according to the TEX symbol set can be specified. It is important to include a space character after the symbol code. The \n character can be used to start a new line. The third example shows an alternate way to embed the newline character (the newline character has the ASCII code 10) into the string. Please refer to the Octave manual for the difference between single and double quoted strings.

```
Octave > warndlg('An expected warning occured');
Octave > warndlg('I \heartsuit Octave!\nEven if I hate her sometimes.', ...
                 'Confession');
Octave > warndlg(['I \heartsuit Octave!',10, ...
                  ' Even if I hate her sometimes.'], ...
                 'I Confess');
```

See also: [errordlg], page 9, [helpdlg], page 10, [inputdlg], page 10, [listdlg], page 13, [questdlg], page 14.

3 FAQ - Frequently asked Questions

3.1 How to distinguish between Octave and Matlab?

Octave and Matlab are very similar, but handle Java slightly different. Therefore it may be necessary to detect the environment and use the appropriate functions. The following function can be used to detect the environment. Due to the persistent variable it can be called repeatedly without a heavy performance hit.

Example:

```
%%
%% Return: true if the environment is Octave.
%%
function ret = isOctave
  persistent retval; % speeds up repeated calls

  if isempty(retval)
    retval = (exist('Octave_VERSION','builtin') > 0);
  end

  ret = retval;
end
```

3.2 How to make Java classes available to Octave?

Java finds classes by searching a *classpath*. This is a list of Java archive files and/or directories containing class files. In Octave and Matlab the *classpath* is composed of two parts:

- the *static classpath* is initialized once at startup of the JVM, and
- the *dynamic classpath* which can be modified at runtime.

Octave searches the *static classpath* first, then the *dynamic classpath*. Classes appearing in the *static* as well as in the *dynamic classpath* will therefore be found in the *static classpath* and loaded from this location.
Classes which shall be used regularly or must be available to all users should be added to the *static classpath*. The *static classpath* is populated once from the contents of a plain text file named `classpath.txt` when the Java Virtual Machine starts. This file contains one line for each individual classpath to be added to the *static classpath*. These lines can identify single class files, directories containing class files or Java archives with complete class file hierarchies. Comment lines starting with a `#` or a `%` character are ignored.

The search rules for the file `classpath.txt` are:

- First, Octave searches for the file `classpath.txt` in your home directory, If such a file is found, it is read and defines the initial *static classpath*. Thus it is possible to build an initial static classpath on a 'per user' basis.
- Next, Octave looks for another file `classpath.txt` in the package installation directory. This is where `javaclasspath.m` resides, usually something like

`...\share\Octave\packages\java-1.2.8`. You can find this directory by executing the command

```
pkg list
```

If this file exists, its contents is also appended to the static classpath. Note that the archives and class directories defined in this file will affect all users.

Classes which are used only by a specific script should be placed in the *dynamic classpath*. This portion of the classpath can be modified at runtime using the `javaaddpath` and `javarmpath` functions.

Example:

```
Octave > base_path = 'C:/Octave/java_files';

Octave > % add two JARchives to the dynamic classpath
Octave > javaaddpath([base_path, '/someclasses.jar']);
Octave > javaaddpath([base_path, '/moreclasses.jar']);

Octave > % check the dynamic classpath
Octave > p = javaclasspath;
Octave > disp(p{1});
C:/Octave/java_files/someclasses.jar
Octave > disp(p{2});
C:/Octave/java_files/moreclasses.jar

Octave > % remove the first element from the classpath
Octave > javarmpath([base_path, '/someclasses.jar']);
Octave > p = javaclasspath;
Octave > disp(p{1});
C:/Octave/java_files/moreclasses.jar

Octave > % provoke an error
Octave > disp(p{2});
error: A(I): Index exceeds matrix dimension.
```

Another way to add files to the *dynamic classpath* exclusively for your user account is to use the file `.octaverc` which is stored in your home directory. All Octave commands in this file are executed each time you start a new instance of Octave. The following example adds the directory `octave` to Octave's search path and the archive `myclasses.jar` in this directory to the Java search path.

```
% content of .octaverc:
addpath('~/octave');
javaaddpath('~/octave/myclasses.jar');
```

3.3 How to create an instance of a Java class?

If your code shall work under Octave as well as Matlab you should use the function `javaObject` to create Java objects. The function `java_new` is Octave specific and does not exist in the Matlab environment.

Example 1, suitable for Octave but not for Matlab:

```
Passenger = java_new('package.FirstClass', row, seat);
```

Example 2, which works in Octave as well as in Matlab:

```
Passenger = javaObject('package.FirstClass', row, seat);
```

3.4 How can I handle memory limitations?

In order to execute Java code Octave creates a Java Virtual Machine (JVM). Such a JVM allocates a fixed amount of initial memory and may exoand this pool up to a fixed maximum memory limit. The default values depend on the Java version (see [javamem], page 3). The memory pool is shared by all Java objects running in the JVM. This strict memory limit is intended mainly to avoid that runaway applications inside web browsers or in enterprise servers can consume all memory and crash the system. When the maximum memory limit is hit, Java code will throw exceptions so that applications will fail or behave unexpectedly.

In Octave as well as in Matlab, you can specify options for the creation of the JVM inside a file named `java.opts`. This is a text file where you can enter lines containing `-X` and `-D` options handed to the JVM during initialization.

In Octave, the Java options file must be located in the directory where `javaclasspath.m` resides, i.e. the package installation directory, usually something like *...\share\Octave\packages\java-1.2.8*. You can find this directory by executing

```
pkg list
```

In Matlab, the options file goes into the *MATLABROOT/bin/ARCH* directory or in your personal Matlab startup directory (can be determined by a '`pwd`' command). *MATLABROOT* is the Matlab root directory and *ARCH* is your system architecture, which you find by issuing the commands '`matlabroot`' respectively '`computer('arch')`'.

The `-X` options allow you to increase the maximum amount of memory available to the JVM to 256 Megabytes by adding the following line to the `java.opts` file:

```
-Xmx256m
```

The maximum possible amount of memory depends on your system. On a Windows system with 2 Gigabytes main memory you should be able to set this maximum to about 1 Gigabyte.

If your application requires a large amount of memory from the beginning, you can also specify the initial amount of memory allocated to the JVM. Adding the following line to the `java.opts` file starts the JVM with 64 Megabytes of initial memory:

```
-Xms64m
```

For more details on the available `-X` options of your Java Virtual Machine issue the command '`java -X`' at the operating system command prompt and consult the Java documentation.

The `-D` options can be used to define system properties which can then be used by Java classes inside Octave. System properties can be retrieved by using the `getProperty()` methods of the `java.lang.System` class. The following example line defines the property *MyProperty* and assigns it the string `12.34`.

```
-DMyProperty=12.34
```

The value of this property can then be retrieved as a string by a Java object or in Octave:

```
Octave > javaMethod('java.lang.System', 'getProperty', 'MyProperty');
ans = 12.34
```

See also: [javamem], page 3.

3.5 How to compile the java package in Octave?

Most Octave installations come with the *java* package pre-installed. In case you want to replace this package with a more recent version, you must perform the following steps:

3.5.1 Uninstall the currently installed package *java*

Check whether the *java* package is already installed by issuing the `pkg list` command:

```
Octave > pkg list
Package Name  | Version | Installation directory
--------------+---------+----------------------
        java *|   1.2.8 | /home/octavio/octave/java-1.2.8
Octave >
```

If the *java* package appears in the list you must uninstall it first by issuing the command

```
Octave > pkg uninstall java
Octave > pkg list
```

Now the java package should not be listed anymore. If you have used the *java* package during the current session of Octave, you have to exit and restart Octave before you can uninstall the package. This is because the system keeps certain libraries in memory after they have been loaded once.

3.5.2 Make sure that the build environment is configured properly

The installation process requires that the environment variable `JAVA_HOME` points to the Java Development Kit (JDK) on your computer.

- Note that JDK is not equal to JRE (Java Runtime Environment). The JDK home directory contains subdirectories with include, library and executable files which are required to compile the *java* package. These files are not part of the JRE, so you definitely need the JDK.
- Do not use backslashes but ordinary slashes in the path.

Set the environment variable `JAVA_HOME` according to your local JDK installation. Please adapt the path in the following examples according to the JDK installation on your system. If you are using a Windows system that might be:

```
Octave > setenv("JAVA_HOME","C:/Java/jdk1.6.0_21");
```

Note, that on both system types, Windows as well as Linux, you must use the forward slash '/' as the separator, not the backslash '\'.

If you are using a Linux system this would look probably more like:

```
Octave > setenv("JAVA_HOME","/usr/local/jdk1.6.0_21");
```

3.5.3 Compile and install the package in Octave

If you have for example saved the package archive on your *z:* drive the command would be:

```
Octave> pkg install -verbose z:/java-1.2.8.tar.gz
```

or if you have Linux and the package file is stored in your home directory:

```
Octave > pkg install -verbose ~/java-1.2.8.tar.gz
```

The option `-verbose` will produce some lengthy output, which should not show any errors (maybe a few warnings at best).

You can then produce a list of all installed packages:

```
Octave > pkg list
```

This list of packages should now include the package *java*:

```
Octave > pkg list
Package Name  | Version | Installation directory
--------------+---------+----------------------
        java *|   1.2.8 | /home/octavio/octave/java-1.2.8
Octave >
```

3.5.4 Test the java package installation

The following code creates a Java string object, which however is automatically converted to an Octave string:

```
Octave > s = javaObject('java.lang.String', 'Hello OctaveString')
s = Hello OctaveString
```

Note that the java package automatically transforms the Java String object to an Octave string. This means that you cannot apply Java String methods to the result.

This "auto boxing" scheme seems to be implemented for the following Java classes:

- java.lang.Integer
- java.lang.Double
- java.lang.Boolean
- java.lang.String

If you instead create an object for which no "auto-boxing" is implemented, `javaObject` returns the genuine Java object:

```
Octave > v = javaObject('java.util.Vector')
v =
<Java object: java.util.Vector>
Octave > v.add(12);
Octave > v.get(0)
ans = 12
```

If you have created such a Java object, you can apply all methods of the Java class to the returned object. Note also that for some objects you must specify an initializer:

```
% not:
Octave > d = javaObject('java.lang.Double')
error: [java] java.lang.NoSuchMethodException: java.lang.Double
% but:
Octave > d = javaObject('java.lang.Double',12.34)
d = 12.340
```

3.6 Which TEX symbols are implemented in the dialog functions?

The dialog functions contain a translation table for TEX like symbol codes. Thus messages and labels can be tailored to show some common mathematical symbols or Greek characters. No further TEX formatting codes are supported. The characters are translated to their Unicode equivalent. However, not all characters may be displayable on your system. This depends on the font used by the Java system on your computer.

Each TEX symbol code must be terminated by a space character to make it distinguishable from the surrounding text. Therefore the string '`\alpha =12.0`' will produce the desired result, whereas '`\alpha=12.0`' would produce the literal text '*\alpha=12.0*'.

See also: [errordlg], page 9, [helpdlg], page 10, [inputdlg], page 10, [listdlg], page 13, [msgbox], page 8, [questdlg], page 14, [warndlg], page 16.

The table below shows each TEX character code and the corresponding Unicode character:

TEX code	Symbol	TEX code	Symbol	TEX code	Symbol
\alpha	'α'	\beta	'β'	\gamma	'γ'
\delta	'δ'	\epsilon	'ϵ'	\zeta	'ζ'
\eta	'η'	\theta	'θ'	\vartheta	'ϑ'
\iota	'ι'	\kappa	'κ'	\lambda	'λ'
\mu	'μ'	\nu	'ν'	\xi	'ξ'
\pi	'π'	\rho	'ρ'	\sigma	'σ'
\varsigma	'ς'	\tau	'τ'	\phi	'ϕ'
\chi	'χ'	\psi	'ψ'	\omega	'ω'
\upsilon	'υ'	\Gamma	'Γ'	\Delta	'Δ'
\Theta	'Θ'	\Lambda	'Λ'	\Pi	'Π'
\Xi	'Ξ'	\Sigma	'Σ'	\Upsilon	'ϒ'
\Phi	'Φ'	\Psi	'Ψ'	\Omega	'Ω'
\Im	'ℑ'	\Re	'ℜ'	\leq	'≤'
\geq	'≥'	\neq	'≠'	\pm	'±'
\infty	'∞'	\partial	'∂'	\approx	'≈'
\circ	'∘'	\bullet	'•'	\times	'×'
\sim	'∼'	\nabla	'∇'	\ldots	'…'
\exists	'∃'	\neg	'¬'	\aleph	'ℵ'
\forall	'∀'	\cong	'≅'	\wp	'℘'
\propto	'∝'	\otimes	'⊗'	\oplus	'⊕'
\oslash	'⊘'	\cap	'∩'	\cup	'∪'
\ni	'∋'	\in	'∈'	\div	'÷'
\equiv	'≡'	\int	'∫'	\perp	'⊥'
\wedge	'∧'	\vee	'∨'	\supseteq	'⊇'
\supset	'⊃'	\subseteq	'⊆'	\subset	'⊂'
\clubsuit	'♣'	\spadesuit	'♠'	\heartsuit	'♡'
\diamondsuit	'♢'	\copyright	'©'	\leftarrow	'←'
\uparrow	'↑'	\rightarrow	'→'	\downarrow	'↓'
\leftrightarrow	'↔'	\updownarrow	'↕'		

Table: TEX character codes and the resulting symbols.

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