

# Dicom Toolkit 0.7.3

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Dicom File I/O for GNU Octave.

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To download a copy of the GNU Octave Dicom package, please visit <https://gnu-octave.github.io/octave-dicom/>.

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# 1 Installing and loading

The Dicom toolkit must be installed and then loaded to be used.

It can be installed in GNU Octave directly from octave-forge, or can be installed in an off-line mode via a downloaded tarball.

The toolkit has a dependency on the GDCM library (<https://gdcm.sourceforge.net/>), so it must be installed in order to successfully install the Dicom toolkit.

For fedora: `yum install gdcm-devel`

For ubuntu: `apt install libgdcm2-dev`

The toolkit must be then be loaded once per each GNU Octave session in order to use its functionality.

## 1.1 Online Direct install

With an internet connection available, the Dicom package can be installed from octave-forge using the following command within GNU Octave:

```
pkg install -forge dicom
```

The latest released version of the toolkit will be downloaded and installed.

## 1.2 Off-line install

With the Dicom toolkit package already downloaded, and in the current directory when running GNU Octave, the package can be installed using the following command within GNU Octave:

```
pkg install dicom-0.7.3.tar.gz
```

## 1.3 Loading

Regardless of the method of installing the Dicom toolkit, in order to use its functions, the toolkit must be loaded using the pkg load command:

```
pkg load dicom
```

The toolkit must be loaded on each GNU Octave session.

## 2 Basic Usage Overview

Dicom files consist of metadata and image data within a file. The Dicom toolkit provides functions to read and write dicom data.

```

%% read the meta information from a dicom file
> info = dicominfo (file_in_loadpath('imdata/simple-test.dcm'));
info =
    scalar structure containing the fields:
        Filename = a.dcm
        FileModDate = 04-Feb-2017 02:08:31
        FileMetaInformationVersion =
            0 1
        MediaStorageSOPClassUID = 1.2.840.10008.5.1.4.1.1.7
        MediaStorageSOPInstanceUID = 1.2.826.0.1.3680043.2.1143.4379544382488839209812957878553810312
        TransferSyntaxUID = 1.2.840.10008.1.2
        ImplementationClassUID = 1.2.826.0.1.3680043.2.1143.107.104.103.115.2.6.3
        ImplementationVersionName = GDCM 2.6.3
        SourceApplicationEntityTitle = GDCM
        ImageType = DERIVED \SECONDARY
        SOPClassUID = 1.2.840.10008.5.1.4.1.1.7
        SOPInstanceUID = 1.2.826.0.1.3680043.2.1143.4379544382488839209812957878553810312
        StudyDate = 20170203
        StudyTime = 210831.360586
        Modality = OT
        ConversionType = WSD
        NominalScannedPixelSpacing =
            1
            1
        StudyInstanceUID = 1.2.826.0.1.3680043.2.1143.1282184104726305239898701219563360204
        SeriesInstanceUID = 1.2.826.0.1.3680043.2.1143.938526508174485815508079931697619862
        SamplesPerPixel = 1
        PhotometricInterpretation = MONOCHROME1
        Rows = 10
        Columns = 5
        BitsAllocated = 8
        BitsStored = 8
        HighBit = 7
        PixelRepresentation = 0
        RescaleIntercept = 0
        RescaleSlope = 1
        RescaleType = US
        PixelData = not assigned

%% read the image data
> image = dicomread(file_in_loadpath('imdata/simple-test.dcm'))
image =
    0 0 0 0 0
    0 0 0 0 0
    0 0 0 0 0
    0 0 0 0 0

```

```
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
```

Help for each function can be displayed by `help thefunctionname`  
ie:

```
help dicominfo
```

## 3 Function Reference

The functions currently available in the Dicom toolkit are described below;

### 3.1 Dicom Functions

#### 3.1.1 dicomCollection

```
collection = dicomCollection(directory)
collection = dicomCollection(DICOMDIR)
collection = dicomCollection(_, propertyname, propertyvalue ...)
```

Read a directory or DICOMDIR file and return a table or struct of the referenced files.

#### Inputs

*directory* - directory to read.

*DICOMDIR* - dicom DICOMDIR file to read.

*propertyname, propertyvalue* - Optional property name/value pairs.

Known properties:

IncludeSubFolders

Boolean if set to true will also look in sub-folders when looking for dicom files

DisplayWaitbar

Boolean currently ignored in Octave

#### Outputs

*collection* - a table with fields Location and Value for each matched attribute.

collection will be a struct array or a table if a struct2table function exists, with fields of:

FileNames

StudyDateTime

SeriesDateTime

PatientName

PatientSex

Modality

Rows

Columns

Channels

Frames

StudyDescription

SeriesDescription

StudyInstanceUID

SeriesInstanceUID

#### Examples

```
[dirname, ~] = fileparts(file_in_loadpath("imdata/rtstruct.dcm"));

collection = dicomCollection(dirname);
```



### 3.1.2 dicomanon

```
dicomanon(file_in, file_out)
dicomanon(____, name, value)
```

Anonymize a DICOM format file by removing or replacing specific fields.

#### Inputs

*file\_in* is filename to read from.

*file\_out* is the filename to write to.

*name*, *value* optional name/value properties.

Known property names are:

keep            The value is a cell array of names to not remove during the anonymize procedure.

update          A structure of name/values to update rather than remove.

#### Outputs

None

**See also:** dicomread, dicomwrite, dicominfo.

### 3.1.3 dicomdict

```
dictionary_name = dicomdict ("get")
dicomdict ("factory")
dicomdict ("set", dictionary_name)
```

Get or set the active dicom data dictionary.

The first usage returns the filename of the dictionary that is currently being used. Using "factory" resets the dictionary to the default. Using "set" allows setting the dictionary for future operations. In this case, the dictionary file *dictionary\_name* can be anywhere in the path.

#### Inputs

*code* - string value of 'get', 'set' or 'factory'.

*dictionary\_name* - name of dictionary file to use

#### Outputs

*dictionary\_name* - name of dictionary file currently set for dictionary

#### Examples

Get current dicom dict path:

```
> f = dicomdict('get')
f = octavedicom.dic
```

Set a new dictionary:

```
> dicomdict('set', 'anewdictfile.txt')
```

**See also:** dicomread, dicomwrite.

### 3.1.4 dicomdisp

```
dicomdisp (filename)
dicomdisp (filename, [propertyname, propertyvalue ...])
```

Read and display the metadata from a DICOM file.

## Inputs

*filename* - dicomfilename to display.

*propertyname*, *propertyvalue* - property pairs for options to the display function.

Currently the only known property is 'dictionary' to specify a non default dict to use.

## Outputs

None

**See also:** dicomread, dicominfo.

### 3.1.5 dicomfind

```
attrinfo = dicomfind(filename, attribute)
```

```
attrinfo = dicomfind(info, attribute)
```

Find the location and value of an attribute in a dicom file or info structure.

## Inputs

*filename* - filename to open.

*info* - dicominfo struct.

*attribute* - attribute name to find.

## Outputs

*attrinfo* - a table with fields Location and Value for each matched attribute.

The Location value will be the attribute position in dot notation to show its position in dicom info structure.

## Examples

```
filename = file_in_loadpath("imdata/rtstruct.dcm");
```

```
info = dicomfind(filename, "ROINumber");
```

### 3.1.6 dicominfo

```
info = dicominfo (filename)
```

```
info = dicominfo (filename, "dictionary", dictionary-name)
```

```
dicominfo (___, options)
```

Get all metadata from a DICOM file, excluding any actual image. *info* is a nested struct containing the data.

If the *dictionary* argument is used, the given *dictionary-name* is used for this operation, otherwise, the dictionary set by *dicomdict* is used.

## Inputs

*filename* - name of file to read.

'*dictionary*' - string constant of 'dictionary'.

*dictionary-name* - filename of dictionary to use.

*options* - a string in format of 'optionname=value', or property/value pair 'optionname', value: *truncate=n* where n is the number of characters to limit the dump output display to n for each value.

## Outputs

*info* - struct of fields read from the dicom file.

## Examples

Read the metadata of a dicomfile:

```
> info = dicominfo(file_in_loadpath('imdata/simple-test.dcm'))
info =
scalar structure containing the fields:
Filename = a.dcm
FileModDate = 04-Feb-2017 02:08:31
FileMetaInformationVersion =
0 1
MediaStorageSOPClassUID = 1.2.840.10008.5.1.4.1.1.7
MediaStorageSOPInstanceUID = 1.2.826.0.1.3680043.2.1143.4379544382488839209812957878
TransferSyntaxUID = 1.2.840.10008.1.2
ImplementationClassUID = 1.2.826.0.1.3680043.2.1143.107.104.103.115.2.6.3
ImplementationVersionName = GDCM 2.6.3
SourceApplicationEntityTitle = GDCM
ImageType = DERIVED \\\SECONDARY
SOPClassUID = 1.2.840.10008.5.1.4.1.1.7
SOPInstanceUID = 1.2.826.0.1.3680043.2.1143.4379544382488839209812957878553810312
StudyDate = 20170203
StudyTime = 210831.360586
Modality = OT
ConversionType = WSD
NominalScannedPixelSpacing =
1
1
StudyInstanceUID = 1.2.826.0.1.3680043.2.1143.1282184104726305239898701219563360204
SeriesInstanceUID = 1.2.826.0.1.3680043.2.1143.9385265081744858155080799316976198629
SamplesPerPixel = 1
PhotometricInterpretation = MONOCHROME1
Rows = 10
Columns = 5
BitsAllocated = 8
BitsStored = 8
HighBit = 7
PixelRepresentation = 0
RescaleIntercept = 0
RescaleSlope = 1
RescaleType = US
PixelData = not assigned
```

**See also:** `dicomread`, `dicomdict`.

### 3.1.7 dicomlookup

```
keyword = dicomlookup(group, element)
[group, element] = dicomlookup(keyword)
```

Lookup an attribute in the DICOM data dictionary.

*keyword* = `dicomlookup(group, element)` will look in the current dicom dictionary for a specified *group* and *element* tag and returns string name of the attribute.

`[group, element] = dicomlookup (keyword)` will look in the current dicom dictionary for a specified *keyword* string and returns the *group* and *element* for keyword.

## Inputs

*keyword* - string keyword name to look up a group, element value.

*group* - group value to look up (string or integer).

*element* - element value to look up (string or integer).

## Outputs

*keyword* - string keyword name to looked up from a group, element value.

*group, element* - group and element value looked up from keyword.

## Outputs

Look up tag name for 0x10 0x10:

```
> name = dicomlookup(0x10,0x10)
name = PatientName
```

Look up tag group and element value:

```
> [grp, elm] = dicomlookup('TransferSyntaxUID')
grp = 2
elm = 16
```

**See also:** dicomdict.

### 3.1.8 dicomread

*image* = dicomread (*filename*)

*image* = dicomread (*structure*)

*image* = dicomread (\_\_\_, *propertyname*, *propertyvalue*)

[*image*, *cmap*] = dicomread (\_\_\_)

Load the image from a DICOM file.

## Inputs

*filename* - a string giving the filename.\*

*structure* - a structure with a field **Filename** (such as returned by **dicominfo**).

*propertyname*, *propertyvalue* - property name (string), property value for additional properties to function.

Known properties are:

**frames**      Either 'all' (default), a scalar frame value or vector of frame values.

**UseRVHeuristic**

Value is currently silently ignored.

## Outputs

*image* - An integer or float matrix will be returned, the number of bits will depend on the file. The image may be two or three dimensional, depending on the content of the file.

*cmap* - Cx3 colormap associated with the image. Each row is a 3 element RGB triplet ion the range of 0 .. 1. If the image does not have a color map, colormap is []

## Examples

Load the image data of a dcm file:

```
> image = dicomread(file_in_loadpath('imdata/simple-test.dcm'))
image =
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
0 0 0 0 0
```

Load the 1st and 10th frame of image data from a dcm file:

```
> file = file_in_loadpath('imdata/US-PAL-8-10x-echo.dcm');
> X = dicomread (file, 'frames;', [1, 10]);
```

**See also:** `dicominfo`.

### 3.1.9 dicomuid

`uuid = dicomuid ()`  
Generate a DICOM unique id .

#### Inputs

None

#### Outputs

`uuid` is a unique id string.

## Examples

Get a new uid:

```
> uid = dicomuid ()
uid = 1.2.826.0.1.3680043.2.1143.3114589836670200378351641061429967573
```

### 3.1.10 dicomupdate

`info = dicomupdate(fileinfo, attribute, value)`  
`info = dicomupdate(info, attrinfo)`

Update a dicom struct with new values

#### Inputs

`info` - `dicominfo` struct.

`attribute` - attribute name to find and change value of.

`value` - attribute value to set.

`attrinfo` - a table with fields Location and Value for each matched attribute to change.

#### Outputs

`info` - `dicominfo` struct.

## Examples

```
filename = file_in_loadpath("imdata/rtstruct.dcm");
info = dicominfo(filename);

% update specific values
finfo = dicomfind(info, "ROINumber");
finfo.Value{1} = 10;
info = dicomupdate(info, finfo);

% update all matching
info = dicomupdate(info, "ROINumber", 100);
```

### 3.1.11 dicomwrite

```
dicomwrite(im, filename)
dicomwrite(im, filename, info)
Write a DICOM format file to filename.
```

#### Inputs

*im* - image data or empty matrix, [], if only metadata save is required  
*filename* - filename to write dicom to. if [], then function runs in verbose trial mode.  
*info* - struct, like that produced by dicominfo

#### Examples

Create a dicom file using default info, and the supplied data:

```
> wdata = uint8 (10*rand (10,10));
> dicomwrite (wdata, 'test.dcm');
```

Create a dicom file using data and meta info:

```
> wdata = dicomread(file_in_loadpath('imdata/CT-MON02-16-ankle.dcm'));
> info = dicominfo(file_in_loadpath('imdata/CT-MON02-16-ankle.dcm'));
> dicomwrite(wdata, info);
```

**See also:** dicomread, dicominfo.

### 3.1.12 images.dicom.decodeUID

```
uidinfo = images.dicom.decodeUID(uid)
Look up information about a uid string
```

#### Inputs

*uid* - dicom uid string.

#### Outputs

*uidinfo* - a structure with fields of Value, Name and Type.  
 Additional fields may be present in the case of a Transfer Syntax type uid.

#### Examples

```
> info = images.dicom.decodeUID("1.2.840.10008.1.1");
info =
  scalar structure containing the fields:
```

```
Value = 1.2.840.10008.1.1
Name = Verification SOP Class
Type = SOP Class
```

### 3.1.13 images.dicom.parseDICOMDIR

```
info = images.dicom.parseDICOMDIR(filename)
```

Parse a DICOMDIR file and return the information as a struct.

#### Inputs

*filename* - filename to open.

#### Outputs

*info* - A struct containing the directory information from a DICOMDIR file

The info structure will be an array of Patients, with an array of Studies with an array of Series with an array of Images.

Each element will contain a Payload field.

#### Examples

```
filename = file_in_loadpath("imdata/DICOMDIR");

info = images.dicom.parseDICOMDIR(filename);
```

### 3.1.14 isdicom

```
yesno = isdicom(filename)
```

Return true if *filename* is a valid DICOM file.

#### Inputs

*filename* - name of file to read.

#### Outputs

*yesno* - logical value of true if filename is a dicom file.

**See also:** dicomdict, dicominfo, dicomread, dicomwrite.

# Appendix A GNU General Public License

Version 3, 29 June 2007

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