Matlab General Purpose File Input and Output (I/O) Summary
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Getting data into and out of Matlab can be challenging because there are so many possible ways in which the data can be formatted in files. Fortunately, Matlab provides a variety of sophisticated functions for reading and writing data files. Using these functions can range from easy to difficult. This document briefly describes the most commonly used Matlab I/O functions. The material in this handout was largely taken from Matlab's online and built in help files.

load/save – These functions load and save work spaces or specified variables in Matlab's proprietary, system independent format. They are great for intermediate results and Matlab output that is going to be or is being used again in Matlab.

uiimport/importdata – The *uiimport* function opens a dialog that allows the user to specify how the data in a file is to be imported. It uses the *importdata* function which provides similar functionality for non-interactive programs. Both of these functions will try to determine the file type and use the appropriate "helper" function (see the table at the end of this document) to read it.

dlmread/dlmwrite/csvread – These are intermediate level functions that provide a combination of efficiency and flexibility when reading delimited ASCII (text) files. The *csvread* function is a special case of *dlmread* that reads coma separated value (csv) files commonly generated by other programs. The *dlmread* function can read files with values separated by tabs, spaces and other delimiters.

textread/strread – The *textread* function is a flexible routine designed to read ASCII (text) and/or numeric data files. The *strread* is similar but it reads from a string or cell array of strings, not a file. Both functions accept parameters that modify their behavior. These functions return the data read into the object you specify. These functions effectively give you the "best of both worlds" because they let you read in mixed character (text) and numeric data with one command like high level routines while allowing you to modify their behavior to fit your particular application. Mathworks now recommends *textscan* be used in place of *textread* and *strread*.

textscan – The *textscan* function is essentially an improved version of *textread*. It provides maximum power and flexibility and the cost of requiring the specification numerous options. It is generally the best function to use to read an ASCII (text) data file having complex formatting.

wk1read/wk1write/xlsread/xlswrite – These specialized functions allow data to be read directly from and written directly to Lotus123 and Excel files.

fscanf/sscanf/fprintf/sprintf – These low level routines that provide maximum flexibility (particularly when combined with looking ahead and rewinding files) for reading ASCII (text) files with particularly hard to read formatting. These functions are derived from C language functions having the same names,

but behave slightly differently. The difference between the *f* and *s* versions is that the *f* versions deal with files, while the *s* versions with strings. One trick that can be useful with these functions is to read the file one line at time into a string and then analyze and "dissemble" the string using the *sscanf* or other string functions.

fgetl/fgets – Both these functions read an line from an ASCII (text) file. The difference between them is that *fgetl* includes the line terminator \r\n (Windows) or \n (Unix/Linux) in the returned string while *fgets* does not. These functions are often used in loops in which the read string is analyzed and dissembled to retrieve the desired data.

fread/fwrite – These functions read and write binary (also called unformatted or non-ASCII) data. The data is read and written exactly as it exists in RAM or on the disk. Great care must be taken to match the data specified when the data is written to that specified when the data is read or the result will be nonsense. The advantage of reading and writing data in binary form is generally speed, minimal file sizes and maximum precision.

Recognized File Formats

Matlab has a variety of specialized functions for reading particular file formats. The following table shows the file formats that the software is capable of reading and the recommended command (function) for reading each format. Links refer to the Mathwork's website as of 8/6/08.

File Format	Extension	File Content	Read Command	Returns
Text	MAT	Saved MATLAB workspace	load	Variables in file
	CSV	Comma-separated numbers	csvread	Double array
	DAT	Formatted text	importdata	Double array
	DLM	Delimited text	dlmread	Double array
	TAB	Tab-separated text	dlmread	Double array
Scientific Data	CDF	Data in Common Data Format	cdfread	Cell array of CDF records
	FITS	Flexible Image Transport System data	fitsread	Primary or extension table data
	HDF4	Data in Hierarchical Data Format, version 4	hdfread	HDF 4 or HDF-EOS 2 data set
	HDF5	Data in Hierarchical Data Format, version 5	hdf5read	HDF5 or HDF-EOS 5 data set

File Format	Extension	File Content	Read Command	Returns
Spreadsheet	XLS	Microsoft® Excel® worksheet	xlsread	Double or cell array
	WK1	Lotus 123 worksheet	wk1read	Double or cell array
Image	BMP	BMP image	imread	True color or indexed image
	CUR	Cursor image	imread	Indexed image
	GIF	GIF image	imread	Indexed image
	HDF4	HDF4 image	imread	True color, grayscale, or indexed image(s)
	ICO	Icon image	imread	Indexed image
	JPEG	JPEG image	imread	True color or grayscale image
	PBM	PBM image	imread	Grayscale image
	PCX	PCX image	imread	Indexed image
	PGM	PGM image	imread	Grayscale image
	PNG	PNG image	imread	True color, grayscale, or indexed image
	PPM	PPM image	imread	True color image
	RAS	SUN raster image	imread	True color or indexed
	TIFF	TIFF image	imread	True color, grayscale, or indexed image(s)
	XWD	XWD image	imread	Indexed image
Video (all platforms)	AVI	AVI movie	aviread	MATLAB movie
Video (Windows® and Mac® platforms)	AVI	AVI movie	mmreader	True color image(s)
	MPG	MPEG 1	mmreader	True color image(s)
	MPEG	MPEG 1 and MPEG 2 videos	mmreader	True color image(s)
Video (Windows platform only)	ASF	Windows Media video	mmreader	True color image(s)
	ASX	Windows Media video	mmreader	True color image(s)
	WMV	Windows Media video	mmreader	True color image(s)

File Format	Extension	File Content	Read Command	Returns
Video (Mac platform only)	3GP	3GPP mobile video	mmreader	True color image(s)
	3G2	3GPP2 mobile video	mmreader	True color image(s)
	DV	Digital video stream	mmreader	True color image(s)
	MP4	MPEG-4 video	mmreader	True color image(s)
	M4V	MPEG-4 video	mmreader	True color image(s)
	MOV	Quicktime movie	mmreader	True color image(s)
Audio file	AU	NeXT/SUN sound	auread	Sound data and sample rate
	SND	NeXT/SUN sound	auread	Sound data and sample rate
	WAV	Microsoft WAVE sound	wavread	Sound data and sample rate

Sources

Matlab Tech Note 1402 – Reading Data Files with Text Headers with MATLAB
Matlab Tech Note 1403 – Reading Data Files into MATLAB
Matlab Tech Note 1602 – File I/O Guide
Matlab Help Entry – Input/Output::Programming Tips (Matlab)
Individual Function Help Entries