

README informational file for SPAMALIZE

Table of Contents:

- I. Introduction
 - A. File formats supported.
 - B. File naming conventions
 - C. File locations

- II. Installation Instructions
 - A. Simple (Single-OS environment)
 - B. Unix
 - C. Windows95/98/NT
 - D. MacIntosh
 - E. Calling sequence for SPAMALIZE
 - 1. Introduction
 - 2. Unix
 - 3. Windows95/98/NT
 - 4. MacIntosh
 - F. Installation Patches

- III. RunTime IDL for SPAMALIZE
 - A. Unix
 - 1. Creating a RunTime program
 - 2. Installing a RunTime License
 - 3. Calling the RunTime program
 - B. Windows98
 - 1. Creating a RunTime program
 - 2. Installing a RunTime License
 - 3. Calling the RunTime program

- IV. Encouragement and Disclaimers

I. Introduction:

A. File formats supported

SPAMALIZE can read, analyze, and write medical image files. It is menu-driven, requiring little if any command-line interaction. SPAMALIZE was originally designed to analyze PET and MRI data, but has evolved into a GUI-driven environment versatile enough to read in many imaging formats. Formats which have been used successfully include:

- PET (CTI/ECAT 933, CTI/ECAT 953B, GE/Advance)
- ANALYZE-formatted images (e.g. from AIR, SPM, etc.)
- MRI
- Raw, a.k.a. flat a.k.a. unformatted
- fMRI
- CT
- TIFF (for autoradiographical images)

Code exists to read/write these formats. Code for other formats may be added as needed. Images from several different files and/or formats may be used simultaneously by various specialized routines, which

create additional arrays to store the images. This ability is limited only by the amount of memory (RAM) available and the size of the data set.

B. File naming conventions:

Programs which are primarily for displaying images in windows, or which are primarily composed of widgets for a user interface, tend to be named "spw_***.pro", while programs whose primary purpose is to perform a task with little user input tend to be named "spam_***.pro". Frequently there are pairs of similarly named programs: the "spw_" program gets input and parameters from the user, and the "spam_" program performs the desired task.

The data I/O is separate from the data analysis. All image data are stored in an array, "img_arr". Associated image subheader info is stored in the array "sub_header", and main_header info is stored in the array "main_header". These arrays are all COMMON arrays, declared from the main program (SPAMALIZE) so they are available to all subroutines that declare the appropriate COMMON variables. Any type of image array can be stored in img_arr. All quantitation should be performed by the I/O routines, so "img_arr" contains fully quantified values. SPAMALIZE sub-headers and main-header contain enough empty space so they may be modified if necessary to accommodate most types of images.

See the file, "Catalogue_of_spam", for a brief description of individual programs and functions, as well as a more detailed explanation of how SPAMALIZE functions. Most individual programs have fairly detailed documentation within the source code. In particular, there is usually a one-line "Purpose", a longer "Abstract", a "Calling Sequence", and an explanation of parameters and keywords within each program.

C. File locations:

At the LfAN, IDL/SPAMALIZE files are kept in the directory:

/local/progs/spamalize/

which is called simply "/spam_dir/" in this document.

There are several subdirectories:

/spam_dir/src/	"spam_*.pro" and "spw_*.pro" source files.
/spam_dir/src/aux_progs/	auxiliary SPAMALIZE routines.
/spam_dir/src/help/	help files used by SPAMALIZE.
/spam_dir/data/	data files needed by SPAMALIZE.
/spam_dir/temp/	directory where some output files get written.

There are other non-IDL files which are required for some routines. These include:

1) Shell-Scripts

- mostly used for PET reconstruction, scatter-correction, etc.
- found in /d2/pccommon/_terry/scripts
- reference other programs, mostly written in C.
- if you need these, ask SPAMALIZES's author.

2) Sharable-object routines

- mostly used for reading CTI-formatted PET images.
- found in /d2/pccommon/_terry/spam/aux_progs/
- cti_matrix_io.so is a sharable-object file which can read both CTI-formatted sinograms and image files. Sub-routines are put into a sharable library and accessed with the IDL "call_external" command. See the IDL user's guide, chapter 18. You will also need:
"matrix.h", "cti_matrix_io.h", and "cti_matrix_io.c".
You may need to recompile "cti_matrix_io.c".

II. Installation Instructions:

If you are running SPAMALIZE in a single-environment OS (like only Windows) then you can use the "Simple" installation approach in section A, and ignore everything else about installation.

If you want to install SPAMALIZE to run on more than OS, then you will need the full-blown treatment outlined in the rest of the sections. Scan the list below to find the computer you are using (Unix, Windows, Mac) to find the specific instructions.

After you have installed SPAMALIZE, you need to tell IDL how to find SPAMALIZE, so look at the next section (D. Calling Sequence:) to find instructions specific to your computer platform.

This may look complicated, but it is not! The installation instructions appear lengthy because there are explicit instructions for each Operating System (OS), as well as for a Full or RunTime IDL license. The actual steps for each OS/license combination are fairly brief; you get to skip 60% of the following text.

A. Simple (Single-OS environment)

1. Open the file "spamalize_simple.pro" and follow the instructions there. This is designed for Windows95/98/2000/etc., but can be used as a template for other OS's.

B. UNIX Installation Instructions:

0. Substitute your own directory structure for mine, i.e. wherever you see "/spam_dir/" in the following discussion, substitute the directory where you want SPAMALIZE to live. At the LfAN, "/spam_dir/" = "/local/progs/spamalize/" .

1. Obtain the code:

Either obtain a tar-ball file of SPAMALIZE, or if you have access to the development site, simply copy the main SPAMALIZE directory and all of its subdirectories. Put these directories together in the directory of your choice, maintaining the directory structure. Either un-tar or copy them. The disk where you put the directory "/spam_dir/temp/" should be large enough to contain any image files that might get written there, and should have its write-permissions set so that anybody who uses SPAMALIZE can write to it. Otherwise, a crash will most likely result.

2. Peruse the following files to glean helpful tips:

/spam_dir/install_spam/README	(instructions for installing SPAMALIZE)
/spam_dir/install_spam/catalogue_of_spam	(Catalogue of most SPAMALIZE programs.)
/spam_dir/src/help/*	(help files, manuals for some SPAMALIZE programs.)

3. Make a shortcut to call SPAMALIZE easily. Make one of the following aliases:

- For a Full license:

```
alias spam 'spam_dir/src/spam__unix'
```

- For a RunTime license:

```
alias spam 'spam_dir/src/spam__unix_rt'
```

Or, make a simple shell-script file with the same command as above.

4. Tell IDL how to find SPAMALIZE:

Edit one of the following the shell scripts so that the directories reflect your directory structure. If you have a Full license and all the source code (normal setup):

```
/spam_dir/src/spam__unix  
/spam_dir/src/spamalize_startup.pro
```

If you have a RunTime license and the SPAMALIZE .sav file:

```
/spam_dir/src/spam__unix_rt
```

5. Change all text directory names to something that makes sense at your site.

Note that if you are only running IDL for Unix and have no intention of running e.g. IDL for Windows95, you don't need to change any of the Windows defaults. Edit the relevant parts of the following file, depending on your OS:

/spam_dir/src/spamalize.pro

For each OS you intend to use, change (or add to) the list of directories. Specify directory names for:

dir_spam
dir_prog
dir_help
dir_data

Modify the following file, which contains directory shortcuts and graphics-related parameters:

/spam_dir/data/spamalize_defaults_unix.txt

The file "spamalize_defaults_unix.txt" is used so that users can modify the defaults at their own site. This is especially useful for users with a RunTime license, because without a text-file containing the defaults, the defaults have to be "cast in stone" when the RunTime application is created.

Using the preferences file "../progs/spamalize_defaults_unix.txt" means that you can build up a set of preferred settings over time and not have to figure out what they were every time you upgrade your version of SPAMALIZE.

For the full colored glory of certain SPAMALIZE buttons and menus, take the IDL menu-related items from TRO's .Xdefaults file:

/export/home/oakes/.Xdefaults

6. Start SPAMALIZE:

Type: spam

You should get a menu that gives you access to all of SPAMALIZE's canned data analysis routines.

C. Windows98 (or Windows2000, WindowsNT) Installation Instructions:

0. Substitute your own directory structure for mine, i.e. wherever you see "C:\spam_dir\" in the following discussion, substitute the directory where you want SPAMALIZE to live. At the LfAN, "C:\spam_dir\" = "W:\local\progs\spamalize\" .

1. Obtain the code:

You will need to copy 6 entire directories to start using SPAMALIZE:

C:\spam_dir\src\ (main directory for SPAMALIZE programs)
C:\spam_dir\src\aux_progs\ (auxiliary IDL/SPAMALIZE programs)
C:\spam_dir\src\help\ (help programs, manuals)
C:\spam_dir\data\ (data files needed by SPAMALIZE)
C:\spam_dir\install_spam\ (installation instructions)
C:\spam_dir\temp\ (temp files, logfiles, etc. get written here)

You may be able to copy the all of them in one fell swoop by copying the parent directory, "C:\spam_dir\". Put these directories together in a single directory, named something like:

C:\RSI\spamalize\

The directory you choose for "C:\spam_dir\temp\" should be large enough to contain any image files that might get written there, and should have its write-permissions set so that anybody who uses SPAMALIZE can write to it. Otherwise, a crash will most likely result.

For PC/Windows98, I suggest putting these directories in something like:

```
C:\RSI\spamalize\  
C:\RSI\spamalize\src\  
C:\RSI\spamalize\data  
C:\RSI\spamalize\temp
```

2. Peruse the following files to glean helpful tips:

```
C:\spam_dir\src\README           (instructions for installing SPAMALIZE)  
C:\spam_dir\src\catalogue_of_spam (Catalogue of most SPAMALIZE programs.)  
C:\spam_dir\src\help\*          (help files, manuals for some SPAMALIZE programs.)
```

3. Change all default directory names to something that makes sense at your site.

Note that if you are only running IDL for Windows98 and have no intention of running e.g. IDL for Unix, you don't need change any of the Unix defaults. Edit the following files so any directory names correspond to your directories.

a) C:\spam_dir\src\spamalize.pro

Go to approximately line 108, and edit the string that looks like:

```
-----  
spam_dir_list=['C:\RSI\ld152\spam\src\spamalize.pro', $ ;Standard IDL installation  
              'W:\local\progs\spamalize\src\spamalize.pro', $ ;LfAN users  
              'D:\RSI\spam_dev\src\spamalize.pro', $ ;TRO at home  
              'C:\RSI\spam_developer_key.txt']      ;developer key (TRO LfAN)  
-----
```

Change the top line (Standard IDL installation) to reflect where your version of SPAMALIZE lives. Then go down to approximately line 108, which looks like:

```
-----  
1:BEGIN      ;*** LfAN directory environment: ***  
spam_dir = 'W:\local\progs\spamalize\  
dir_spam = spam_dir+'src\  
dir_prog = spam_dir+'src\aux_progs\  
dir_help = spam_dir+'src\help\  
dir_data = spam_dir+'data\  
-----
```

and change the value of "spam_dir" to your SPAMALIZE directory.

b) C:\spam_dir\src\spam__os_def.pro

You may want to edit a few of the setup preferences for individual users at the end of this file, but it is not necessary for starters.

c) C:\spam_dir\data\spamalize_defaults_win95.txt

The file "spamalize_defaults_win95.txt" is used so that users can modify the defaults at their own site. (It will work for Windows95, Windows98, and Windows2000.) This is especially useful for users with a RunTime license, because without a text-file containing the defaults, the defaults have to be "cast in stone" when the RunTime application is created. Change directory names to something that might be useful for you. Make sure to remove non-valid directories (i.e. the LfAN defaults). Set any directories you are not sure about to an empty space.

4. Tell IDL how to find SPAMALIZE:

Run the executable program IDLDE (located in your IDL main directory).

Go to File->Preferences->Path. Add the SPAMALIZE main directory:

C:\spam_dir\

Click the box to indicate you want to search all subdirectories.

If the only IDL application you want to run is SPAMALIZE, you can make it start automatically when you start IDL. From the IDLDE menu, select

File -> Preferences -> Startup.

At the "Startup File" entry, browse for

C:\spam_dir\src\spamalize.pro

Select "Apply" to make this the startup file.

If you do not want to have SPAMALIZE be the startup file, make a shortcut from the file

"C:\spam_dir\src\spam__win.bat".

Calling this program will start IDL and will feed SPAMALIZE into it.

Or, once you have your IDL path set to include the SPAMALIZE directories, you can just type "SPAMALIZE" on the command-line.

D. MacIntosh Installation Instructions:

Follow the general plan for Windows/98 for steps 1 & 2. When you get to step 3, edit the file

spam_dir\data\spamalize_defaults_win95.txt

Revert back to the Windows/98 scheme for Steps 4 & 5.

E. Calling Sequence:

1. Introduction:

There are several ways to call SPAMALIZE:

- The easiest way is to add the SPAMALIZE directory to your IDL file path via the Preferences menu in the IDLDE environment. After you add the directory ".../spam_dir/", click the box to the left of the directory name, to include the subdirectories.

- If you want to call SPAMALIZE as the IDL startup file, select

".../spam_dir/src/spamalize_startup.pro"

from the Preferences menu. This is only a good idea if the only IDL application you will use is SPAMALIZE. Do NOT do this at the LfAN.

- If you want to compile and run SPAMALIZE from within the IDLDE environment, open, compile, and run the file ".../spam_dir/src/spamalize.pro".

- If you are currently in the SPAMALIZE main directory, you can enter IDL and type "SPAMALIZE".

The primary SPAMALIZE code is contained in .../spam_dir/ (unix), which is the same as W:\local\progs\spamalize\ (Windows/PC). All Unix machines and Windows95/PCs machines should reference this. Every attempt is made to ensure that the code used by the Unix machines is identical to and compatible with the PC version, primarily by having then run the IDENTICAL CODE.

2. Unix:

Call from the shell script "spam__unix", containing the command:

```
idl /local/progs/spamalize/src/spamalize_startup
```

The file "spamalize_startup.pro" is technically not a procedure, but rather a "main" program, which is analogous to a batch-file. This construct is the only way to call idl from the command line and start up a series of programs. It is a short program, which does the following:

```
spam_dir = '/local/progs/spamalize/src/'
if (!VERSION.OS_FAMILY EQ 'unix') then !PATH = !PATH+ ':' +spam_dir
SPAMALIZE
```

the last line calls the actual program (SPAMALIZE.PRO). This command can be an alias in your .cshrc file:

```
alias spam '/local/progs/spamalize/src/spam__unix'
```

It is tricky to set SPAMALIZE as the default when starting idl; calling SPAMALIZE as the IDL startup is not usually a good idea, since sometimes you will want to call IDL without SPAMALIZE.

3. Windows95/98/2000 (also Windows NT, Linux emulator):

Run IDLDE (the interactive version with the fancy menu). This is usually located in

```
C:\RSI\IDL52\IDLDE
```

Go to File->Preferences->Path. Add the directory:

```
W:\local\progs\spamalize\
```

Click the box to indicate you want to search all subdirectories.

If you want to have SPAMALIZE start automatically when you start up IDL:

Go to File->Preferences->Startup. Add the following:

```
IDL Main Directory: C:\RSI\IDL52
```

```
Startup file: W:\local\progs\spamalize\src\spamalize.pro
```

4. Macintosh:

Follow general scheme for Windows95.

F. Installation patches, etc.

1) There is a bug in the IDL routine STR_MID prior to IDLv5.3, which you will have to fix in your IDL distribution code. Change line 93:

```
arr[count] = strmid(str, spos, strlen(str)) ;Last element
```

to:

```
slen = strlen(str) & slen=slen[0]
```

```
arr[count] = strmid(str, spos, slen) ;Last element
```

Note that this frequently looks like a bug in STR_SEP.

III. Run Time IDL for SPAMALIZE

A RunTime IDL program is a pre-compiled version without the source code. The main advantage is that a RunTime license may be significantly more affordable than a Full license. Also, this is a good way to distribute a program if you don't want to give away your source code. At the LfAN, a RunTime version of SPAMALIZE was used before the University of Wisconsin acquired a campus-wide IDL license. If you need a RunTime version of SPAMALIZE, ask Terry Oakes. Otherwise, you can ignore this entire section.

A. Unix

1. Making a RinTime version of SPAMALIZE for Unix:

Run the C-shell script,

```
/d2/pccommon/_terry/spam/spam__unix_rt_create
```

which performs the following:

- a) Starts IDL
- b) Runs some IDL code (spamalize_rt_unix_setup) to extend the IDL !PATH variable.
- c) .COMPILE spamalize_rt_unix
It should finish in a fraction of a second.
- d) RESOLVE_ALL
This will take ~30 seconds to complete.
You must fix any errors found in the code before proceeding.
- e) SAVE, /ROUTINES, FILENAME='spamalize_rt_unix.sav'
The file will wind up in /d2/pccommon/_terry/spam/spamalize_rt_unix.sav
(Or wherever you were when you entered IDL).
- f) Exit IDL
- g) move the file to a new home:

```
mv /d2/pccommon/_terry/spam/spamalize_rt_unix.sav  
/d2/pccommon/_terry/spam_rt_unix/spamalize_rt_unix.sav
```
- h) Make sure the permission is set properly:

```
chmod 755 /d2/pccommon/_terry/spam_rt_unix/spamalize_rt_unix.sav
```

2. Installing an IDL RunTime license on a Unix box:

The idea is to have only a single installation of IDL, and to have all IDL licenses access this installation while maintaining their own unique license.

a. Setting up the license file (you may need to be root):

- 1) Make a directory accessible to the box called something like:

```
/disk1/opt/rsi/license
```

where "/disk1/opt" is wherever you usually put new or special programs.
- 2) Copy the current license file from the IDL license server (lan175)
to the new license directory:

```
cp /ultra1/opt/rsi/license/license.dat .
```

b. Set IDL environment variables:

- 1) Edit the file "/export/home/.cshrc_g" (you will need to be root).
- 2) scroll down the list until you find the "if" statement for your host machine.
- 3) add the following lines in this order:

```
setenv LM_LICENSE_FILE /disk1/opt/rsi/license/license.dat  
source /ultra1/opt/rsi/idl_5.2/bin/idl_setup
```
- 4) if you are adding a Run-Time license, add the following line:

```
alias spam '/d2/pccommon/_terry/spam/spam__unix_rt'
```

c. Make sure the environment variables get made:

- 1) check to make sure that the .csh script exists:

```
/d2/pccommon/_terry/spam/spam__unix_rt
```

3. Running the RunTime version from a Unix box:

a. Run the following shell-script:

spam__unix_rt

which is located in the SPAMALIZE main directory. At the LfAN, this is:

/d2/pccommon/_terry/spam/spam__unix_rt

- b. Make sure the script is executable by you.
- c. You might want to make an alias for this and put it in your .cshrc file.
Note that at the LfAN, the appropriate alias for "spam" gets made in the .cshrc_g script, depending on what machine you happen to be logged into.

B. Windows

1. Making a RunTime version of SPAMALIZE for Windows/95/98/2000:

a. Make sure IDLDE on the PC does NOT use a Start-Up file. Disable Startup File if necessary.

b. Make sure the IDL path includes

C:\spam_dir\src\

C:\spam_dir\data\.

c. Run the file:

N:_terry\spam\spam__win_rt_create.bat

which contains the single line:

C:\RSI\IDL52\idlde @N:_terry\spam\spamalize_rt_win_setup.pro

which does the following:

- 1) Starts IDL
- 2) Runs some IDL code (spamalize_rt_win_setup) which does:
 - .COMPILE spamalize_rt_unix
It should finish in a fraction of a second.
 - RESOLVE_ALL
This will take ~30 seconds to complete.
You must fix any errors found in the code before proceeding.
 - SAVE, /ROUTINES, FILENAME='N:_terry\spam_rt_pc\spamalize_rt_pc.sav'

I made a desktop shortcut for N:_terry\spam\spam__win_rt_create.bat, so it is now really easy to make a new RunTime version of SPAMALIZE.

2. Installing an IDL RunTime license on a Windows/95/98/2000 box:

a. Install the hasp:

You only need to install the hardware hasp if you cannot obtain an IDL license from the pool of licenses available over the net from DoIT. If your computer has an internet card (i.e. you can get mail and surf the web) then you don't need a hasp and you can skip this step. Most computers at the LfAN can skip this step.

- 1) Turn off the PC and unplug the power cord. Yes, you really do need to unplug the power cord.
- 2) Install the hasp on the back. Screw it in securely.
- 3) Plug in the PC, turn it on, and log in.
- 4) I have not been able to get the license manager to run properly if there is anything else plugged into the hasp, even though RSI's documentation claims this should not be a problem.

b. Install IDL Software:

- 1) Put IDL software CD into the CD reader. (You may have to forgo music for a brief period of time.)
- 2) Select "Install" from the pop-up menu.
- 3) Select "Yes" or "Next" or whatever until you get to the part where it asks if you want a "Full", "Compact" or "Custom" installation.
- 4) Select "Compact", which is appropriate for IDL RunTime.
- 5) Enter the license information for that particular hasp, software CD.

(You might need to start IDL to get the license manager window.)
6) Restart the PC to activate the hasp.

c. Run SPAMALIZE:

1) Make a shortcut to:

N:_terry\spam_rt_pc\lib\hook\spamalize_rt_pc.exe

2) Copy (move/drag) the shortcut-file to your desktop, rename it "SPAMALIZE".

3. Running the RunTime version from a Windows/95/98/2000box:

a. Make a desktop shortcut to the following file:

N:_terry\spam_rt_pc\lib\hook\spamalize_rt_pc.sav

If you have SPSS installed, you may need to make the link to:

N:_terry\spam_rt_pc\lib\hook\spamalize.bat

b. Double-click on the link.

IV. Encouragement and Disclaimers

If you use SPAMALIZE and find it helpful, please let the author know! SPAMALIZE can be used free of charge by anybody. However, bearing in mind that there is no such thing as a free lunch, please consider including the author of SPAMALIZE on the first couple of published papers, abstracts, etc. which use SPAMALIZE to perform a significant portion of the data analysis. The author enjoys hearing feedback, and would also be happy to modify SPAMALIZE routines for individuals with interesting applications.

DISCLAIMER: Expect no support unless you have made arrangements with the author. You are urged to contact the author prior to using SPAMALIZE. Programs are updated and added on an ongoing basis, and certain programs may be "under construction" or unsuitable for specific applications. SPAMALIZE is updated as bugs are reported or as needs develop. When you download SPAMALIZE, you get a snapshot of whatever the author was working on at the time.

Anybody may use SPAMALIZE, but the author takes no responsibility for the results. It is the responsibility of each user to check the code, the input data, and the results for appropriateness. In particular, do not use SPAMALIZE to analyze data critical for human subject diagnosis or care.

Terrence R. Oakes, Ph.D.
Lab for Affective Neuroscience
Department of Psychology
Rm 371 Brogden Psychology Bldg.
1202 W. Johnson St.
Madison, WI 53706
U.S.A.

oakes@psyphw.psych.wisc.edu
<http://psyphz.psych.wisc.edu/~oakes>

tel (608) 262-9944
fax (608) 265-2875