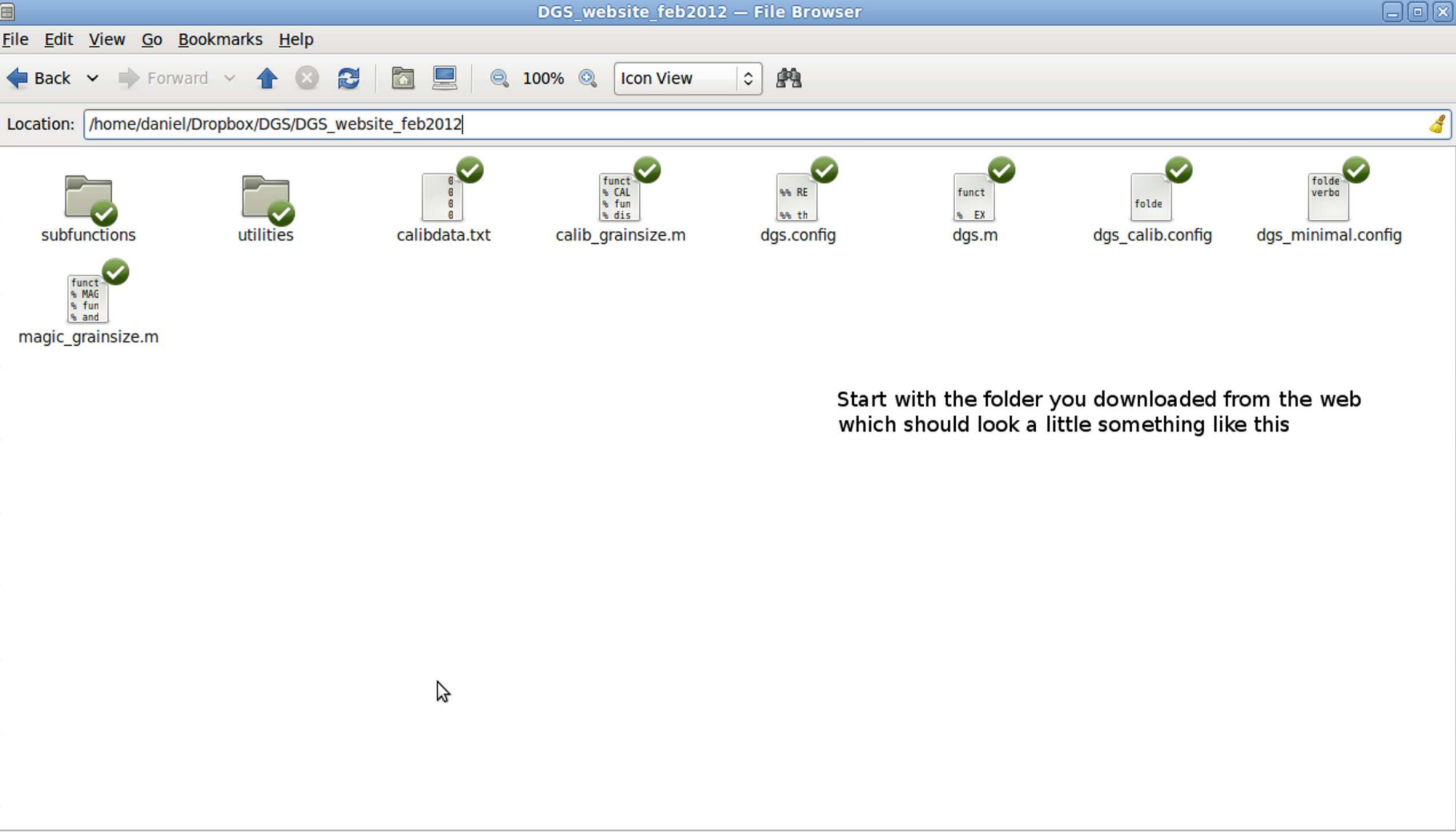
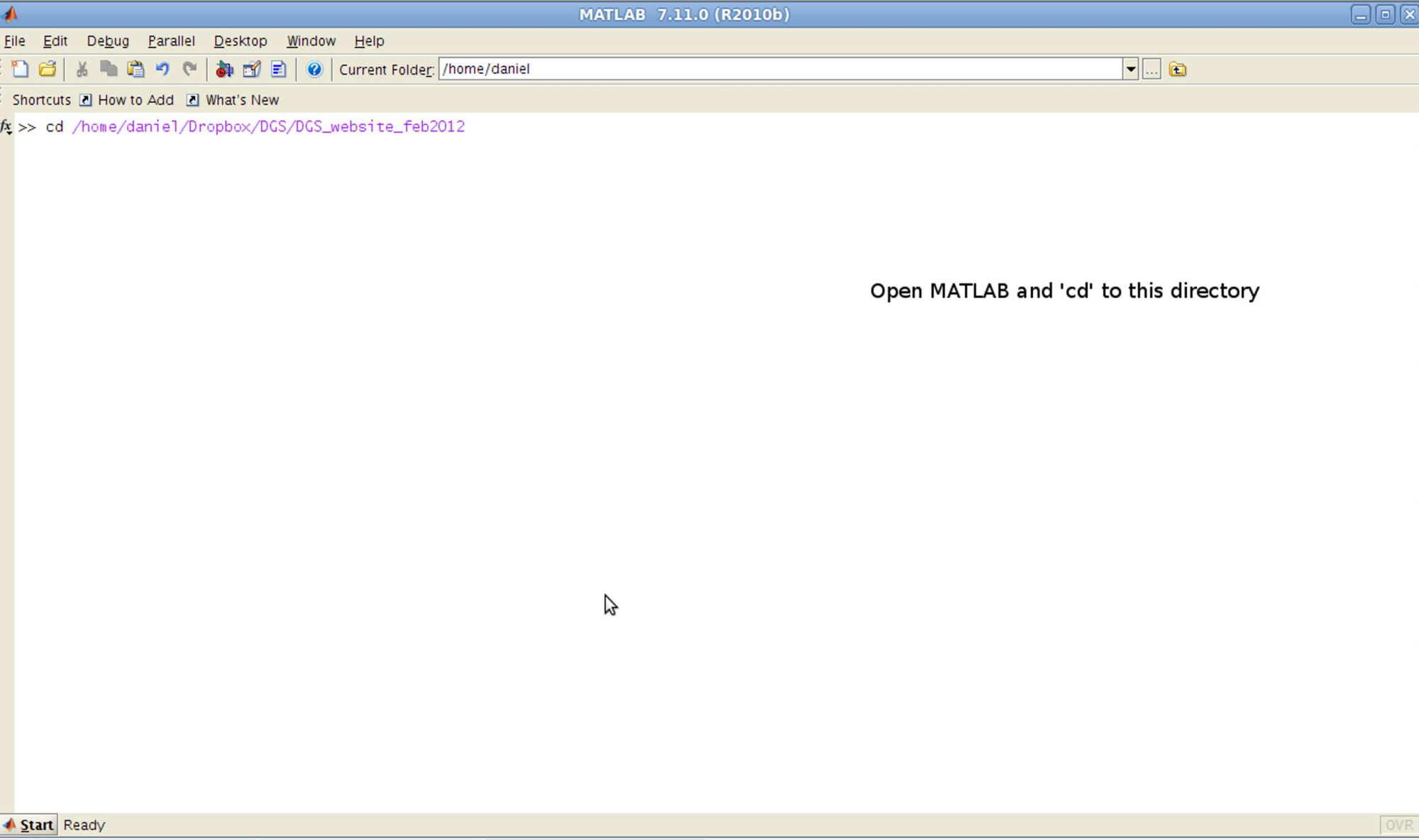
Digital Grain Size

Version 3, Feb 2012

Quick start guide for MATLAB


DGS_website_feb2012 — File Browser
File Edit View Go Bookmarks Help
Back Forward 100% Icon View
Location: /home/daniel/Dropbox/DGS/DGS_website_feb2012
subfunctions
utilities
calibdata.txt
calib_grainsize.m
dgs.config
dgs.m
dgs_calib.config
dgs_minimal.config
magic_grainsize.m
Start with the folder you downloaded from the web
which should look a little something like this


MATLAB 7.11.0 (R2010b)
File Edit Debug Parallel Desktop Window Help
Current Folder: /home/daniel
Shortcuts How to Add What's New
>> cd /home/daniel/Dropbox/DGS/DGS_website_feb2012
Open MATLAB and 'cd' to this directory
Start Ready
OVR

dgs_minimal.config (~/Dropbox/DGS/DGS_website_feb2012) - gedit

File Edit View Search Tools Documents Help

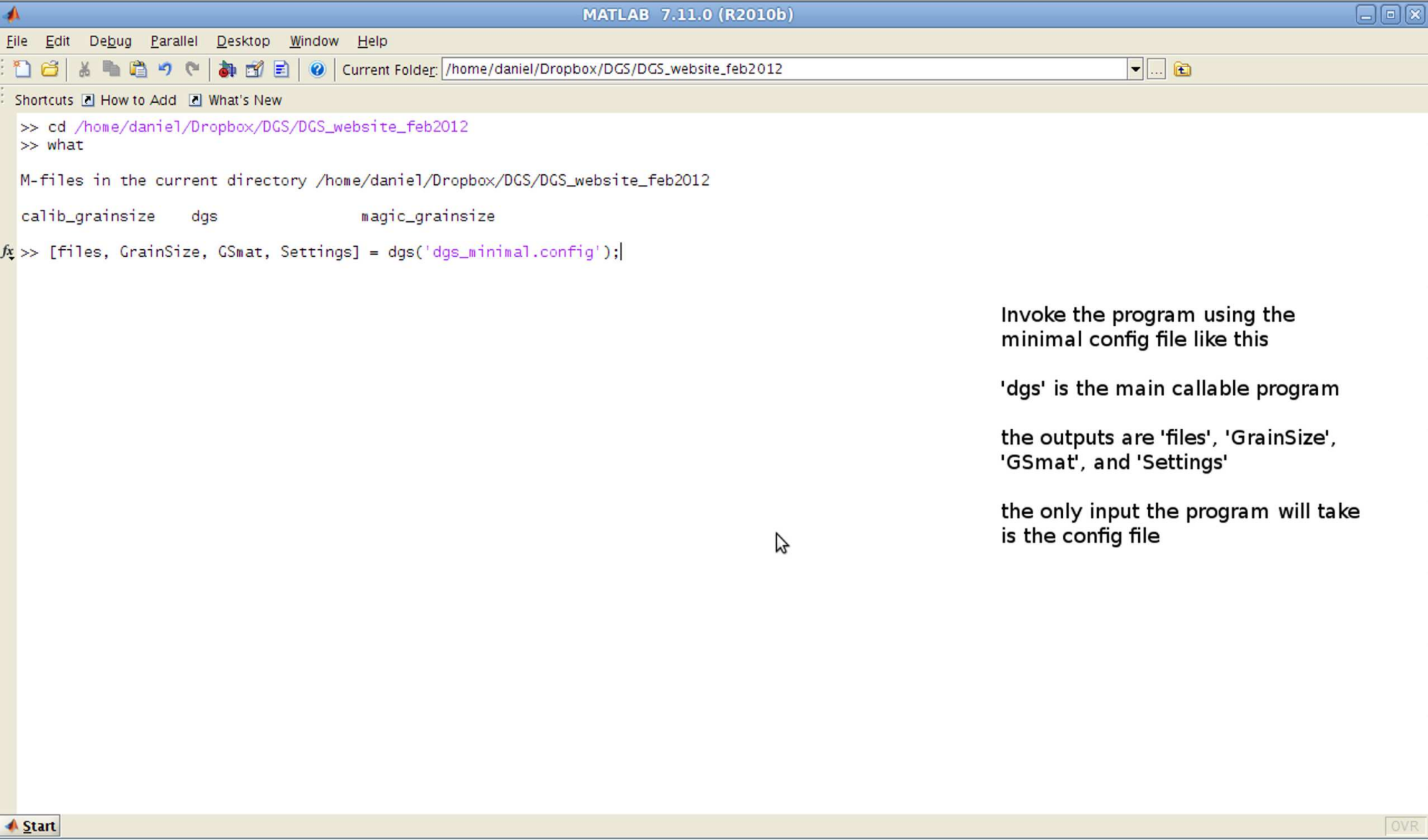
Open Save Undo

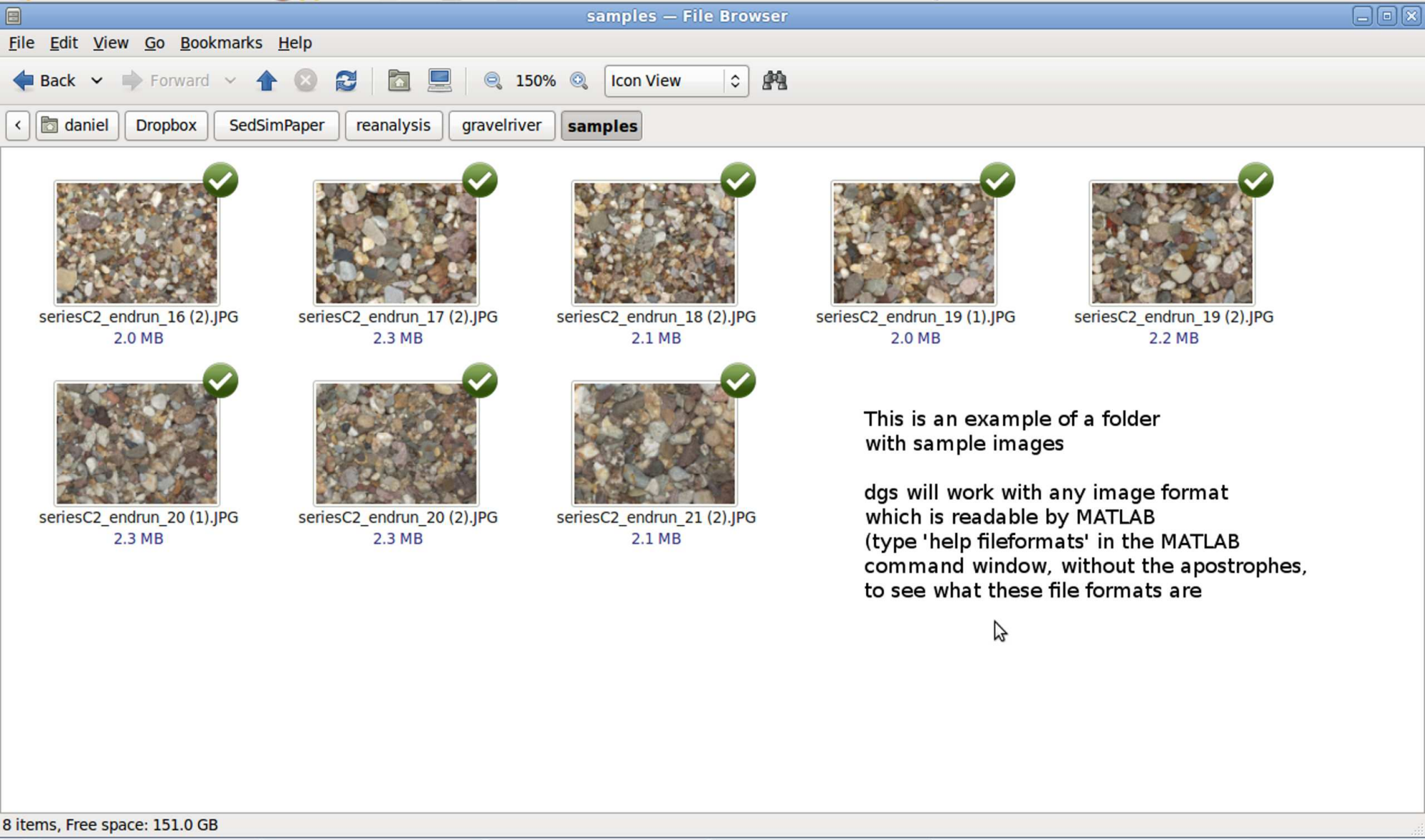
dgs_minimal.config

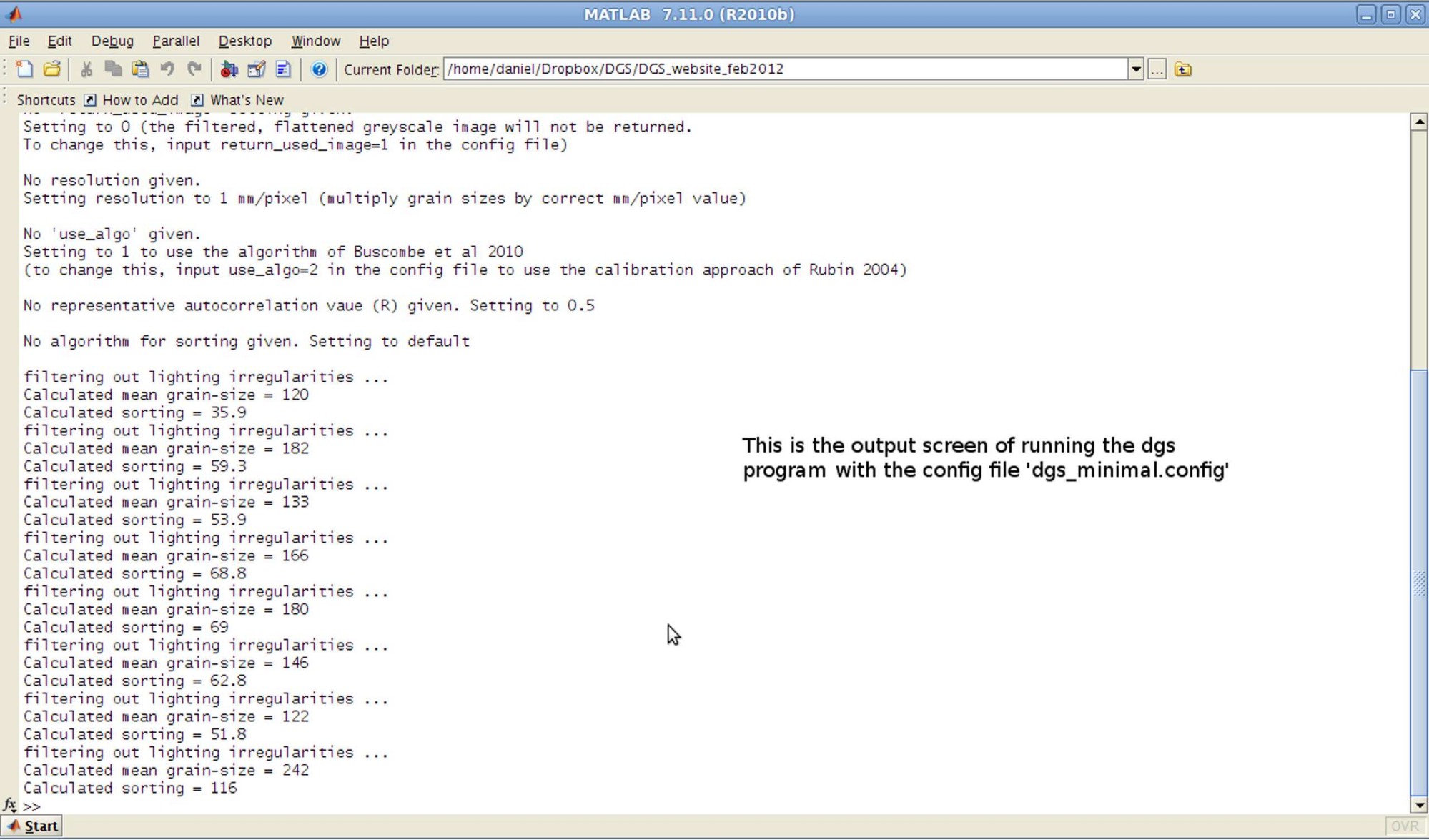
```
1 folder = '/home/daniel/Dropbox/SedSimPaper/reanalysis/gravelriver/samples';
2 verbose = 1;
```

EXAMPLE 1:
Using a minimal configuration file (dgs_minimal.config) which just contains the path to the folder where your sample images are saved, and the option 'verbose' is turned on (1, 0 would mean 'turn off'). The verbose option when turned on means more outputs are printed to screen

Plain Text Tab Width: 8 Ln 1, Col 74 INS


MATLAB 7.11.0 (R2010b)
File Edit Debug Parallel Desktop Window Help
Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012
Shortcuts How to Add What's New
>> cd /home/daniel/Dropbox/DGS/DGS_website_feb2012
>> what
M-files in the current directory /home/daniel/Dropbox/DGS/DGS_website_feb2012
calib_grainsize dgs magic_grainsize
>> [files, GrainSize, GSmat, Settings] = dgs('dgs_minimal.config');
Invoke the program using the minimal config file like this
'dgs' is the main callable program
the outputs are 'files', 'GrainSize', 'GSmat', and 'Settings'
the only input the program will take is the config file
Start
OVR


samples — File Browser
File Edit View Go Bookmarks Help
Back Forward 150% Icon View
daniel Dropbox SedSimPaper reanalysis gravelriver samples
seriesC2_endrun_16 (2).JPG
2.0 MB
seriesC2_endrun_17 (2).JPG
2.3 MB
seriesC2_endrun_18 (2).JPG
2.1 MB
seriesC2_endrun_19 (1).JPG
2.0 MB
seriesC2_endrun_19 (2).JPG
2.2 MB
seriesC2_endrun_20 (1).JPG
2.3 MB
seriesC2_endrun_20 (2).JPG
2.3 MB
seriesC2_endrun_21 (2).JPG
2.1 MB
This is an example of a folder
with sample images
dgs will work with any image format
which is readable by MATLAB
(type 'help fileformats' in the MATLAB
command window, without the apostrophes,
to see what these file formats are
8 items, Free space: 151.0 GB



This is the output screen of running the dgs program with the config file 'dgs_minimal.config'

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

Shortcuts How to Add What's New

```
Calculated mean grain-size = 242
Calculated sorting = 116
>> whos
  Name           Size              Bytes  Class     Attributes

  GSmat          1x8                  64  double
  GrainSize      1x8              239616  cell
  Settings       1x1                1774  struct
  files          1x1                 528  cell

>> files

files =

    [8x26 char]

>> files{1}

ans =

seriesC2_endrun_16 (2).JPG
seriesC2_endrun_17 (2).JPG
seriesC2_endrun_18 (2).JPG
seriesC2_endrun_19 (1).JPG
seriesC2_endrun_19 (2).JPG
seriesC2_endrun_20 (1).JPG
seriesC2_endrun_20 (2).JPG
seriesC2_endrun_21 (2).JPG

>> GSmat{1}
??? Cell contents reference from a non-cell array object.

>> GSmat

GSmat =

  119.9169  182.4657  132.8922  165.7560  179.5830  146.3407  122.3855  242.2357

>>
```

dgs is designed to cycle through folders of images
so the 'file' and 'GrainSize' outputs are always cellular arrays, one array per folder

'files' contains the list of image names which were processed

GSmat is not a cellular array: it is a numeric array of mean grain sizes corresponding to the images in 'files'. If more than one directory of images was processed, each row of GSmat will correspond to each of the directories in order

'GrainSize is a cellular array containing the grain size results...

Start

OVR

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

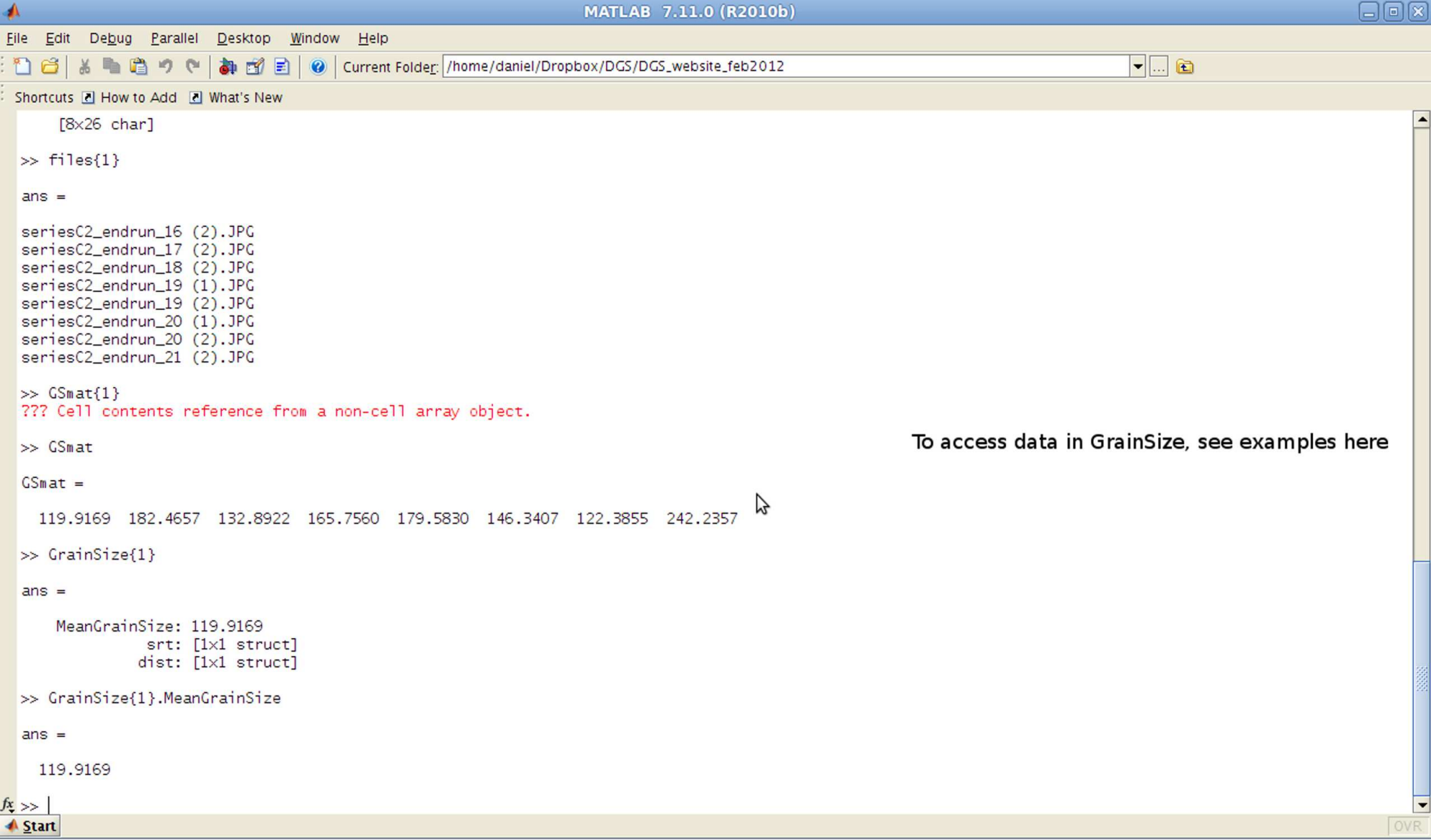
Shortcuts How to Add What's New

```
  files          1x1                528  cell

>> files

files =

    [8x26 char]

>> files{1}

ans =

seriesC2_endrun_16 (2).JPG
seriesC2_endrun_17 (2).JPG
seriesC2_endrun_18 (2).JPG
seriesC2_endrun_19 (1).JPG
seriesC2_endrun_19 (2).JPG
seriesC2_endrun_20 (1).JPG
seriesC2_endrun_20 (2).JPG
seriesC2_endrun_21 (2).JPG

>> GSmat{1}
??? Cell contents reference from a non-cell array object.

>> GSmat

GSmat =

  119.9169  182.4657  132.8922  165.7560  179.5830  146.3407  122.3855  242.2357

>> GrainSize{1}

ans =

    MeanGrainSize: 119.9169
              srt: [1x1 struct]
             dist: [1x1 struct]

>>
```

The contents of GrainSize will vary depending on the Settings in the config file but an example is shown here. MeanGrainSize is in units as per the input resolution (e.g. mm/pixel) or in pixels, default and if resolution=1

Start

OVR


MATLAB 7.11.0 (R2010b)
File Edit Debug Parallel Desktop Window Help
Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012
Shortcuts How to Add What's New
[8x26 char]
>> files{1}
ans =
seriesC2_endrun_16 (2).JPG
seriesC2_endrun_17 (2).JPG
seriesC2_endrun_18 (2).JPG
seriesC2_endrun_19 (1).JPG
seriesC2_endrun_19 (2).JPG
seriesC2_endrun_20 (1).JPG
seriesC2_endrun_20 (2).JPG
seriesC2_endrun_21 (2).JPG
>> GSmat{1}
??? Cell contents reference from a non-cell array object.
>> GSmat
GSmat =
119.9169 182.4657 132.8922 165.7560 179.5830 146.3407 122.3855 242.2357
>> GrainSize{1}
ans =
MeanGrainSize: 119.9169
srt: [1x1 struct]
dist: [1x1 struct]
>> GrainSize{1}.MeanGrainSize
ans =
119.9169
>>
To access data in GrainSize, see examples here
Start
OVR

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

Shortcuts How to Add What's New

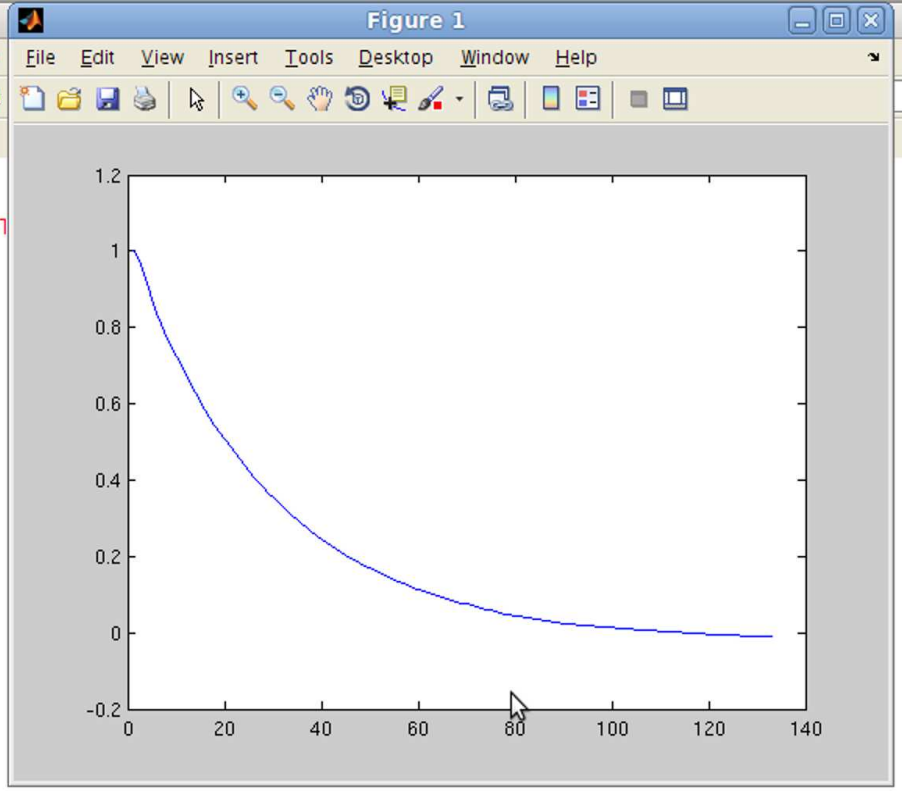
```
seriesC2_endrun_17 (2).JPG
seriesC2_endrun_18 (2).JPG
seriesC2_endrun_19 (1).JPG
seriesC2_endrun_19 (2).JPG
seriesC2_endrun_20 (1).JPG
seriesC2_endrun_20 (2).JPG
seriesC2_endrun_21 (2).JPG

>> GSmat{1}
??? Cell contents reference from a non-cell array object.

>> GSmat

GSmat =

  119.9169  182.4657  132.8922  165.7560  179.5830  146.3407  122.3855  242.2357

>> GrainSize{1}

ans =

    MeanGrainSize: 119.9169
              srt: [1x1 struct]
             dist: [1x1 struct]

>> GrainSize{1}.MeanGrainSize

ans =

  119.9169

>> GrainSize{1}.srt

ans =

    srt: 35.8979
      a: [1x133 double]

>>
```

GrainSize.srt contains the sorting value (same units as MeanGrainSize) and also 'a' which is the radially averaged correlogram for that sample to some determined lag

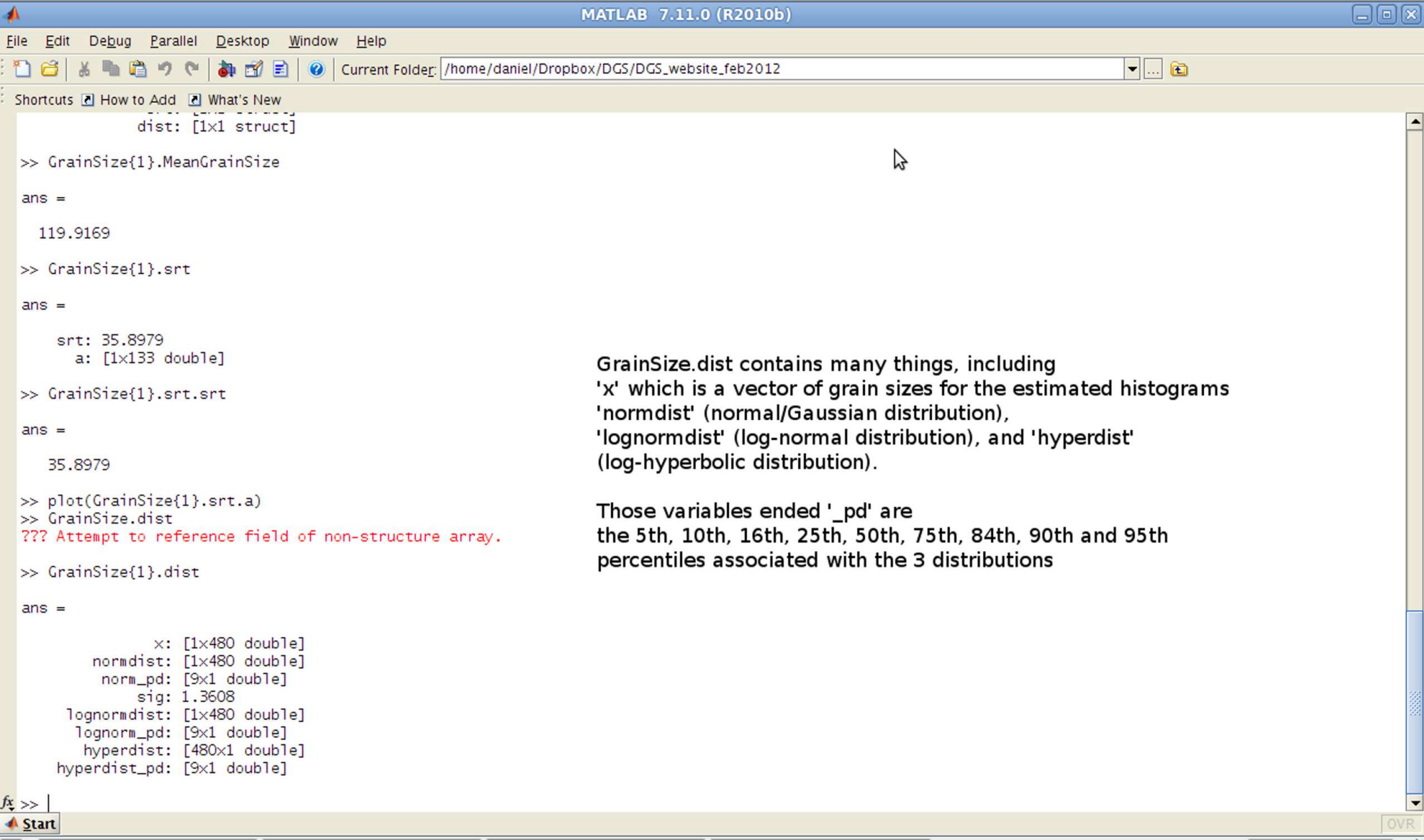
Start

OVR

```
>> GSmat{1}
??? Cell contents reference from a non-cel

>> GSmat

GSmat =

  119.9169  182.4657  132.8922  165.7560

>> GrainSize{1}

ans =

    MeanGrainSize: 119.9169
              srt: [1x1 struct]
             dist: [1x1 struct]

>> GrainSize{1}.MeanGrainSize

ans =

  119.9169

>> GrainSize{1}.srt

ans =

    srt: 35.8979
      a: [1x133 double]

>> GrainSize{1}.srt.srt

ans =

   35.8979

>> plot(GrainSize{1}.srt.a)
>>
```



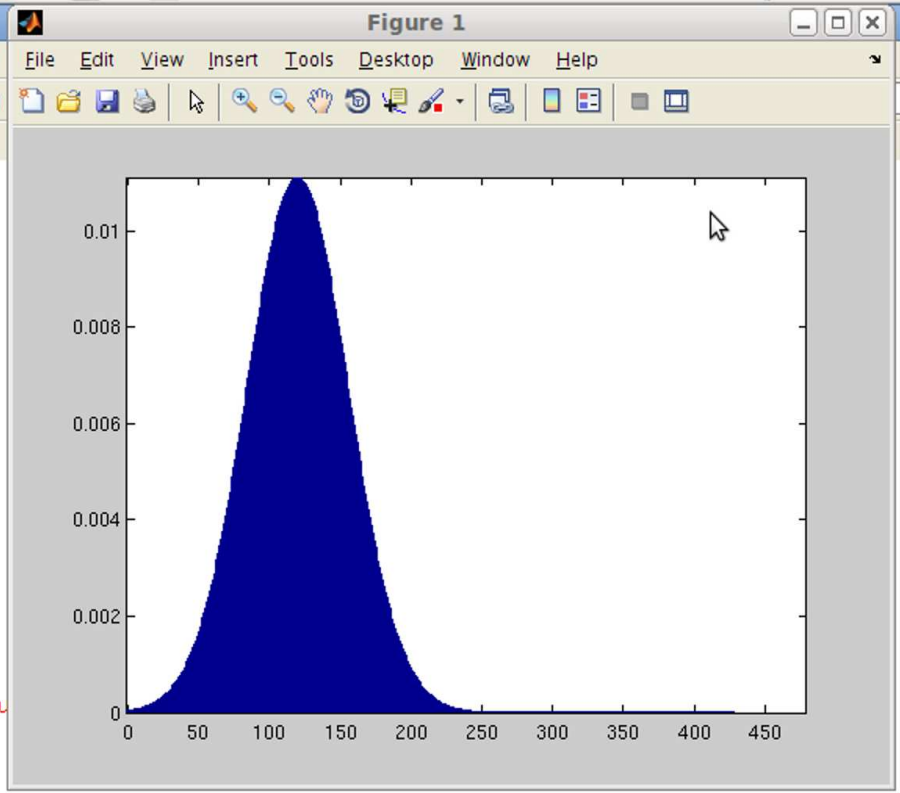
to plot the sample's 1D (radially-averaged) correlogram, do this



GrainSize.dist contains many things, including
'x' which is a vector of grain sizes for the estimated histograms
'normdist' (normal/Gaussian distribution),
'lognormdist' (log-normal distribution), and 'hyperdist'
(log-hyperbolic distribution).

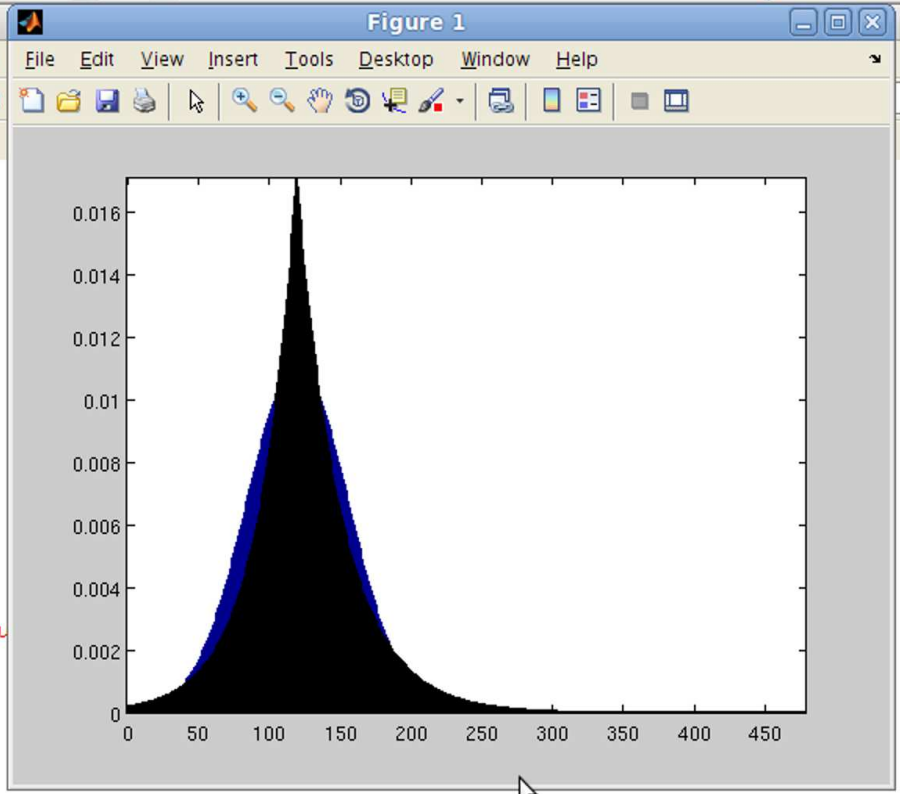
Those variables ended '_pd' are
the 5th, 10th, 16th, 25th, 50th, 75th, 84th, 90th and 95th
percentiles associated with the 3 distributions

```
>> GrainSize{1}.MeanGrainSize

ans =

  119.9169

>> GrainSize{1}.srt

ans =

    srt: 35.8979
      a: [1x133 double]

>> GrainSize{1}.srt.srt

ans =

   35.8979

>> plot(GrainSize{1}.srt.a)
>> GrainSize.dist
??? Attempt to reference field of non-stru

>> GrainSize{1}.dist

ans =

              x: [1x480 double]
        normdist: [1x480 double]
         norm_pd: [9x1 double]
             sig: 1.3608
     lognormdist: [1x480 double]
      lognorm_pd: [9x1 double]
       hyperdist: [480x1 double]
    hyperdist_pd: [9x1 double]

>> bar(GrainSize{1}.dist.x,GrainSize{1}.dist.normdist)
>> axis tight
>>
```

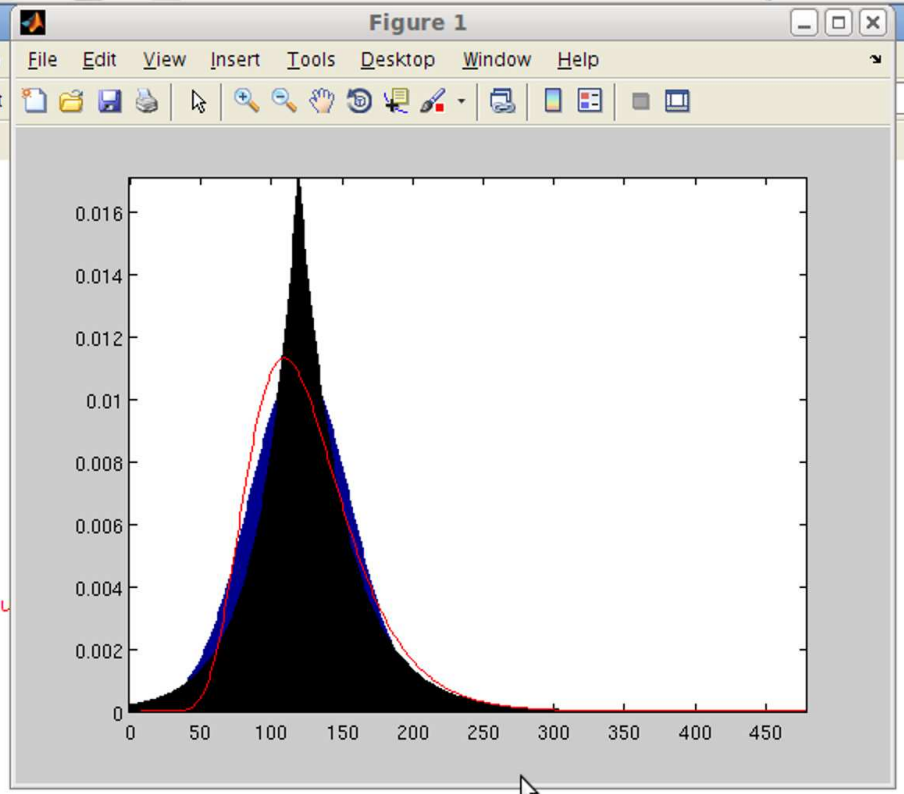


Here's an example plot of the normal distribution from a sample

```
  119.9169

>> GrainSize{1}.srt

ans =

    srt: 35.8979
      a: [1x133 double]

>> GrainSize{1}.srt.srt

ans =

   35.8979

>> plot(GrainSize{1}.srt.a)
>> GrainSize.dist
??? Attempt to reference field of non-stru

>> GrainSize{1}.dist

ans =

              x: [1x480 double]
        normdist: [1x480 double]
         norm_pd: [9x1 double]
             sig: 1.3608
     lognormdist: [1x480 double]
      lognorm_pd: [9x1 double]
       hyperdist: [480x1 double]
    hyperdist_pd: [9x1 double]

>> bar(GrainSize{1}.dist.x,GrainSize{1}.dist.normdist)
>> axis tight
>> hold on
>> bar(GrainSize{1}.dist.x,GrainSize{1}.dist.hyperdist,'r')
>> axis tight
>>
```



Here's a normal and a log-hyperbolic distribution from a sample overlain




```
  119.9169

>> GrainSize{1}.srt

ans =

    srt: 35.8979
      a: [1x133 double]

>> GrainSize{1}.srt.srt

ans =

   35.8979

>> plot(GrainSize{1}.srt.a)
>> GrainSize.dist
??? Attempt to reference field of non-stru

>> GrainSize{1}.dist

ans =

              x: [1x480 double]
        normdist: [1x480 double]
         norm_pd: [9x1 double]
             sig: 1.3608
     lognormdist: [1x480 double]
      lognorm_pd: [9x1 double]
       hyperdist: [480x1 double]
    hyperdist_pd: [9x1 double]

>> bar(GrainSize{1}.dist.x,GrainSize{1}.dist.normdist)
>> axis tight
>> hold on
>> bar(GrainSize{1}.dist.x,GrainSize{1}.dist.hyperdist,'r')
>> axis tight
>> plot(GrainSize{1}.dist.x,GrainSize{1}.dist.lognormdist,'r')
>>
```

Here's all three estimated distributions plotted

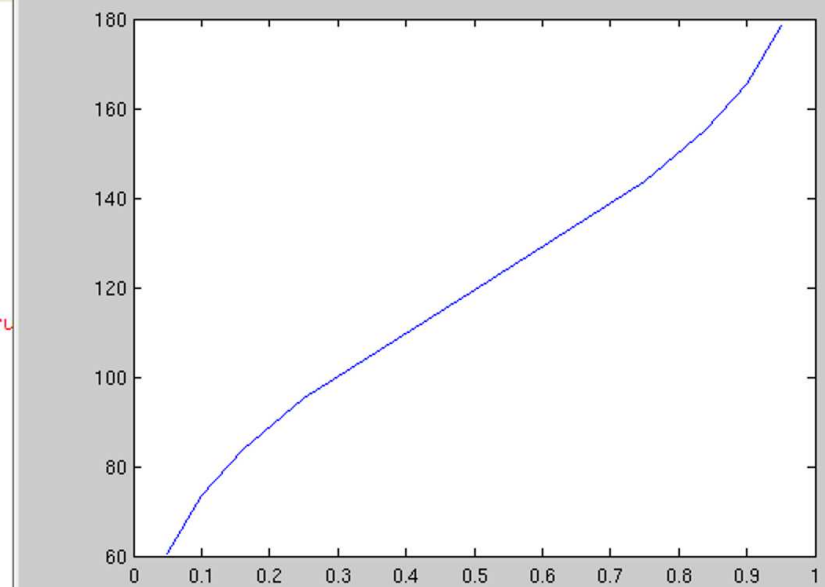
File Edit Debug Parallel Desktop Window Help

Shortcuts How to Add What's New

```
    srt: 35.8979
      a: [1x133 double]

>> GrainSize{1}.srt.srt

ans =

   35.8979

>> plot(GrainSize{1}.srt.a)
>> GrainSize.dist
??? Attempt to reference field of non-stru

>> GrainSize{1}.dist

ans =

              x: [1x480 double]
        normdist: [1x480 double]
         norm_pd: [9x1 double]
             sig: 1.3608
     lognormdist: [1x480 double]
      lognorm_pd: [9x1 double]
       hyperdist: [480x1 double]
    hyperdist_pd: [9x1 double]

>> bar(GrainSize{1}.dist.x,GrainSize{1}.dist.normdist)
>> axis tight
>> hold on
>> bar(GrainSize{1}.dist.x,GrainSize{1}.dist.hyperdist,'r')
>> axis tight
>> plot(GrainSize{1}.dist.x,GrainSize{1}.dist.lognormdist,'r')
>> close
>> plot([.05 .1 .16 .25 .5 .75 .84 .9 .95],GrainSize{1}.norm_pd)
??? Reference to non-existent field 'norm_pd'.

>> plot([.05 .1 .16 .25 .5 .75 .84 .9 .95],GrainSize{1}.dist.norm_pd)
>>
```

Figure 1

File Edit View Insert Tools Desktop Window Help



Here's a plot of percentiles from the normal distribution estimated from a sample

Start

OVR

dgs.config (~/Dropbox/DGS/DGS_website_feb2012) - gedit

File Edit View Search Tools Documents Help

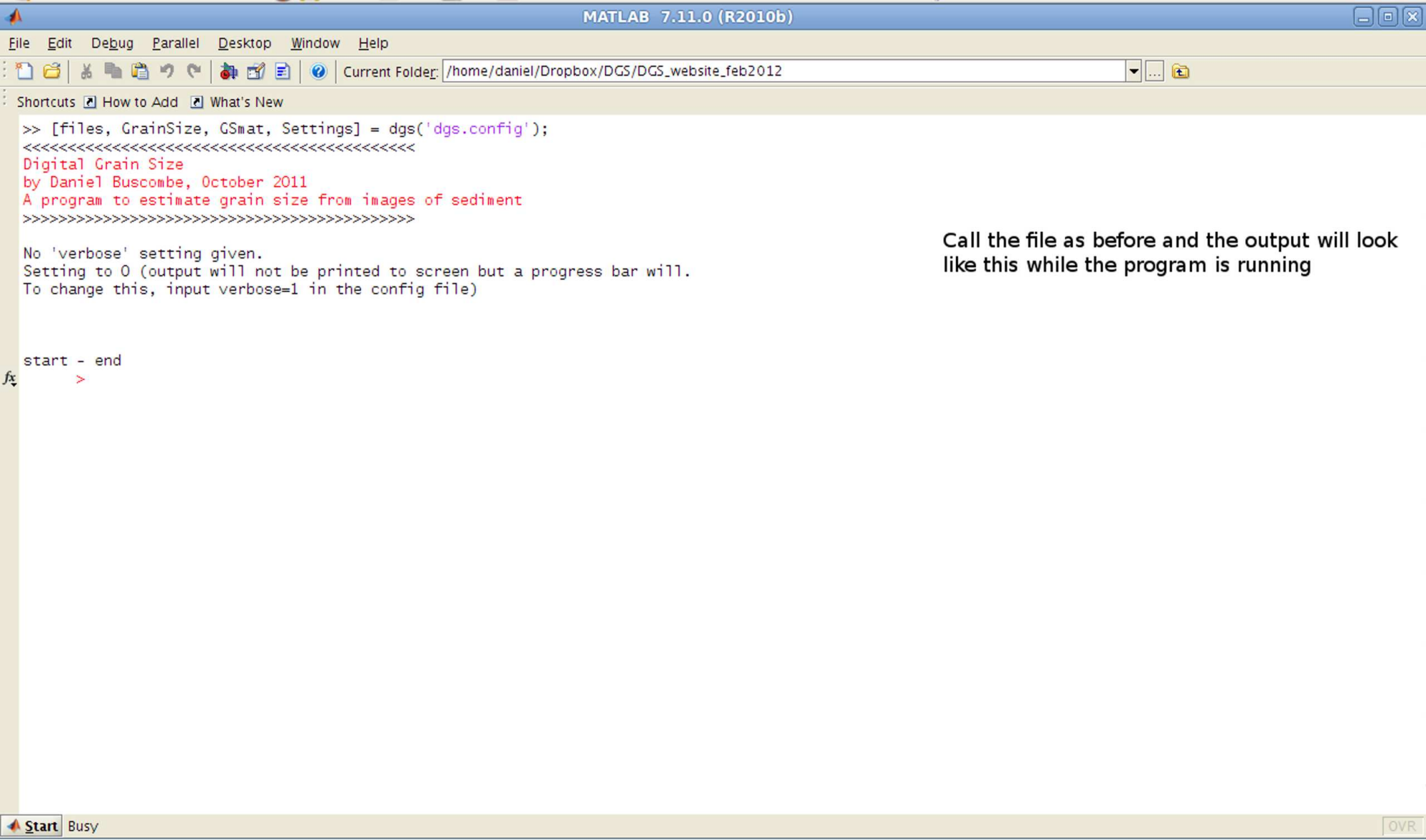
Open Save Undo

dgs.config

```
%% REQUIRED INPUTS

%% there are two options for pointing the program to the folder(s) on your computer which contains the images to be processed
%% option 1 is to hard-wire the full path to the folder. For just 1 directory, create a string e.g.:
folder = '/home/daniel/PRAA_MAY/cropped';

%% if more than 1 folder, create a cellular array with folders, e.g.:
%folder{1} = '/home/daniel/PRAA_MAY/Praa_DGS/08052011/s5/cropped';
%folder{2} = '/home/daniel/PRAA_MAY/Praa_DGS/08052011/s6/cropped';
%folder{3} = '/home/daniel/PRAA_MAY/Praa_DGS/08052011/s7/cropped';

%% option 3 is to leave the folder option out, or empty, or set to zero, e.g.
%folder = 0;

%res = 1;

%% 1 = spectral autocorrelation (recommended); 2 = spatial autocorrelation;
use_algo = 1;

%% if use_algo = 2, then you need a calibration file and the grain sizes it represents
%calibrationfile='/home/daniel/Desktop/website_nov2011/calibdata.txt';
%calibrationsizes=linspace(10,170,7);

%% FOR 'MAGIC'
%R = 0.5;

% sorting algo
% 1 = min of Gauss, expo, and cosine-expo
% 2 = expo
% 3 = cosine-exp
% 4 = Gaussian
sort=1;
```

EXAMPLE 2:
a full config file with specified options

Plain Text Tab Width: 8 Ln 40, Col 1 INS


MATLAB 7.11.0 (R2010b)
File Edit Debug Parallel Desktop Window Help
Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012
Shortcuts How to Add What's New
>> [files, GrainSize, GSmat, Settings] = dgs('dgs.config');
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
Digital Grain Size
by Daniel Buscombe, October 2011
A program to estimate grain size from images of sediment
>>
No 'verbose' setting given.
Setting to 0 (output will not be printed to screen but a progress bar will.
To change this, input verbose=1 in the config file)
start - end
>
Call the file as before and the output will look like this while the program is running
Start Busy
OVR

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

Shortcuts How to Add What's New

```
>> [files, GrainSize, GSmat, Settings] = dgs('dgs.config');
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
Digital Grain Size
by Daniel Buscombe, October 2011
A program to estimate grain size from images of sediment
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

No 'verbose' setting given.
Setting to 0 (output will not be printed to screen but a progress bar will.
To change this, input verbose=1 in the config file)



start - end
      > finished!
>> Settings

Settings =

              folder: '/home/daniel/PRAA_MAY/cropped'
           use_algo: 1
               sort: 1
             filter: 0
            flatten: 1
    return_used_image: 1
            verbose: 0
                res: 1
                  R: 0.5000

>> GrainSize{1}

ans =

    MeanGrainSize: 72.1260
        usedImage: [1669x1168 double]
              srt: [1x1 struct]
             dist: [1x1 struct]

>>
```

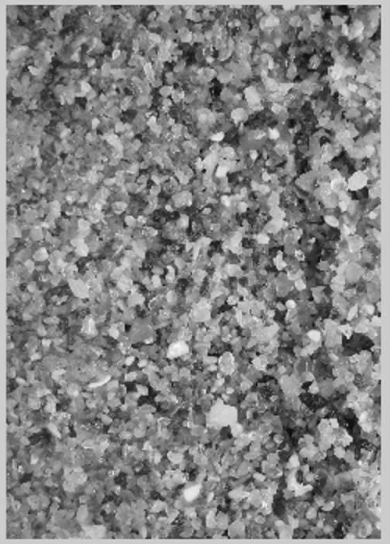
Check the input settings (which the program read from the config file)

and the contents of GrainSize which are the same as the example before except this time the image which was used by the program is returned ...

Start

OVR

```
Digital Grain Size
by Daniel Buscombe, October 2011
A program to estimate grain size from imag
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

No 'verbose' setting given.
Setting to 0 (output will not be printed t
To change this, input verbose=1 in the cor



start - end
      > finished!
>> Settings

Settings =

               folder: '/home/daniel/PRAA_
            use_algo: 1
                sort: 1
              filter: 0
             flatten: 1
    return_used_image: 1
             verbose: 0
                 res: 1
                   R: 0.5000

>> GrainSize{1}

ans =

    MeanGrainSize: 72.1260
        usedImage: [1669x1168 double]
              srt: [1x1 struct]
             dist: [1x1 struct]

>> imagesc(GrainSize{1}.usedImage), axis image off
>> colormap gray
>>
```



and here is an example how to view this image. This output option is provided if you want to check what the filter and/or flatten options do to the input sample images

dgs_calib.config (~/Dropbox/DGS/DGS_website_feb2012) - gedit

File Edit View Search Tools Documents Help

Open Save Undo

dgs_calib.config

```
1
2
3 folder = '/home/daniel/PRAA_MAY/cropped';
4
5 %% 1 = spectral autocorrelation (recommended); 2 = spatial autocorrelation;
6 use_algo = 2;
7
8 %% if use_algo = 2, then you need a calibration file and the grain sizes it represents
9 calibrationfile='calibdata.txt';
10 calibrationsizes=linspace(10,170,7);
11
12
13 %% IMAGE FILTERING
14 filter = 0; % 1 = yes, 0 = no
15
16 %% if filter=1, then you need to specify options
17 %filtoptions.boost = 3;
18 %filtoptions.CutOff = .2;
19 %filtoptions.order = 2;
20
21 flatten = 1; % 1 = yes, 0 = no
22
23 %% OUTPUTS
24 return_used_image = 0; % 1 = yes, 0 = no
25
26 verbose = 1;
27
28
29
```

EXAMPLE 3:
using the algorithm in original mode which requires a calibration to be carried out

in which case:
use_algo=2

Loading file '/home/daniel/Dropbox/DGS/DGS_website_feb2012/dgs_calib.config'... Plain Text Tab Width: 8 Ln 26, Col 1 INS

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

Shortcuts How to Add What's New

```
>> [files, GrainSize, GSmat, Settings] = dgs('dgs_calib.config')
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<
Digital Grain Size
by Daniel Buscombe, October 2011
A program to estimate grain size from images of sediment
>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

No resolution given.
Setting resolution to 1 mm/pixel (multiply grain sizes by correct mm/pixel value)


files =

    'IMG_1099.JPG_crop.tif'


GrainSize =

    [1x1 struct]


GSmat =

   72.6634


Settings =

              folder: '/home/daniel/PRAA_MAY/cropped'
           use_algo: 2
     calibrationfile: 'calibdata.txt'
    calibrationsizes: [10 36.6667 63.3333 90 116.6667 143.3333 170]
              filter: 0
             flatten: 1
   return_used_image: 0
             verbose: 1
                 res: 1

fx >>
```

Here's an example output from use of the program in 'calibration' mode. This example has processed just a single image in 1 directory, but like in previous examples as many images in as many directories as you wish is possible

Start

OVR

dgs_manyfolders.config (~/Dropbox/DGS/DGS_website_feb2012) - gedit

File Edit View Search Tools Documents Help

Open Save Undo

dgs_manyfolders.config

```
%% REQUIRED INPUTS

%% there are two options for pointing the program to the folder(s) on your computer which contains the images to be processed
%% option 1 is to hard-wire the full path to the folder. For just 1 directory, create a string e.g.:
%folder = '/home/daniel/PRAA_MAY/cropped';

%% if more than 1 folder, create a cellular array with folders, e.g.:
folder{1} = '/home/daniel/Dropbox/SedSimPaper/reanalysis/gravelriver/samples';
folder{2} = '/home/daniel/Dropbox/SedSimPaper/reanalysis/GC/samples';

%% option 3 is to leave the folder option out, or empty, or set to zero, e.g.
%folder = 0;

%res = 1;

%% 1 = spectral autocorrelation (recommended); 2 = spatial autocorrelation;
use_algo = 1;

%% if use_algo = 2, then you need a calibration file and the grain sizes it represents
%calibrationfile='/home/daniel/Desktop/website_nov2011/calibdata.txt';
%calibrationsizes=linspace(10,170,7);

%% FOR 'MAGIC'
%R = 0.5;

% sorting algo
% 1 = min of Gauss, expo, and cosine-expo
% 2 = expo
% 3 = cosine-exp
% 4 = Gaussian
sort=1;


%% IMAGE FILTERING
```

EXAMPLE 3:
processing many folders using the cellular folder option like this

Plain Text Tab Width: 8 Ln 10, Col 70 INS

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

Shortcuts How to Add What's New

```
files =

    [ 8x26 char]
    [11x20 char]


GrainSize =

  Columns 1 through 9

    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]              []
    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]    [1x1 struct]

  Columns 10 through 11

              []              []
    [1x1 struct]    [1x1 struct]


GSmat =

  119.9169  182.4657  132.8922  165.7560  179.5830  146.3407  122.3855  242.2357         0         0         0
   68.6232   56.3486   58.7504   65.3360   89.3966   55.0279  104.2541   92.3778   52.4083   63.0985   77.3067


Settings =

              folder: {'/home/daniel/Dropbox/SedSimPaper/reanalysis/gravelriver/samples'  '/home/daniel/Dropbox/SedSimPaper/reanalysis/GC/samples'}
           use_algo: 1
               sort: 1
             filter: 0
            flatten: 1
  return_used_image: 0
            verbose: 0
                res: 1
                  R: 0.5000

>>
```

Here's the output from the example with many folders which contains results in different cells for 'files' and 'GrainSize' and different rows for GSmat. Note that in GSmat there is a different row per folder of images. Zeros are present where folders contain unequal numbers of images

Start

OVR

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

Shortcuts How to Add What's New

```
ans =

S0535D2.tif_crop.tif
S0828D2.tif_crop.tif
S0828D3.tif_crop.tif
S1117D2.tif_crop.tif
S1158D3.tif_crop.tif
S1373D2.tif_crop.tif
S1375D1.tif_crop.tif
S1375D2.tif_crop.tif
S1468D1.tif_crop.tif
S1468D2.tif_crop.tif
S1470D3.tif_crop.tif

>> GSmat

GSmat =

  119.9169  182.4657  132.8922  165.7560  179.5830  146.3407  122.3855  242.2357         0         0         0
   68.6232   56.3486   58.7504   65.3360   89.3966   55.0279  104.2541   92.3778   52.4083   63.0985   77.3067

>> GrainSize{1}

ans =

    MeanGrainSize: 119.9169
              srt: [1x1 struct]
             dist: [1x1 struct]

>> GrainSize{2}

ans =

    MeanGrainSize: 68.6232
              srt: [1x1 struct]
             dist: [1x1 struct]

>>
```

Start

MATLAB 7.11.0 (R2010b)

File Edit Debug Parallel Desktop Window Help

Current Folder: /home/daniel/Dropbox/DGS/DGS_website_feb2012

Shortcuts How to Add What's New

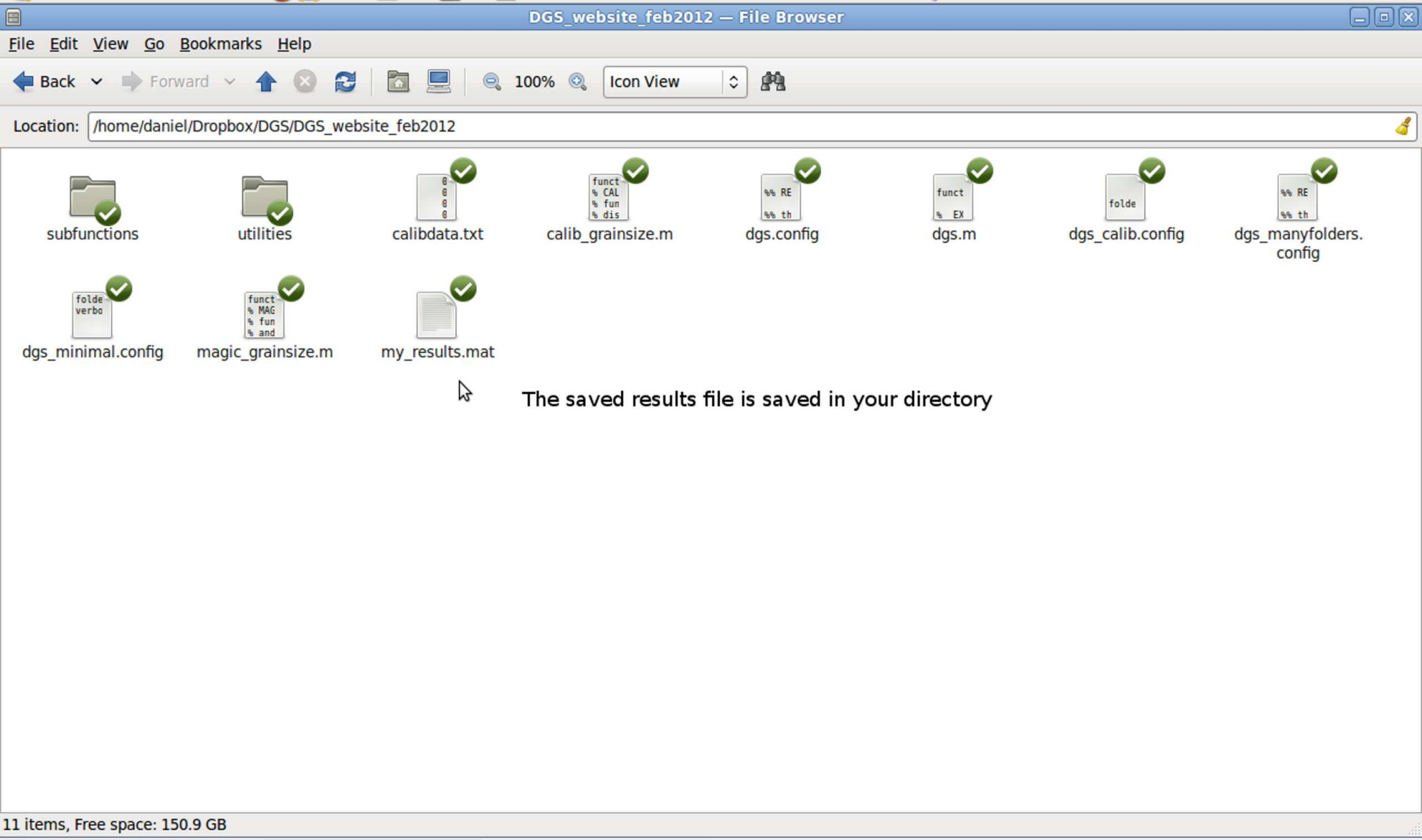
```
ans =

S0535D2.tif_crop.tif
S0828D2.tif_crop.tif
S0828D3.tif_crop.tif
S1117D2.tif_crop.tif
S1158D3.tif_crop.tif
S1373D2.tif_crop.tif
S1375D1.tif_crop.tif
S1375D2.tif_crop.tif
S1468D1.tif_crop.tif
S1468D2.tif_crop.tif
S1470D3.tif_crop.tif

>> GSmat

GSmat =

  119.9169  182.4657  132.8922  165.7560  179.5830  146.3407  122.3855  242.2357         0         0         0
   68.6232   56.3486   58.7504   65.3360   89.3966   55.0279  104.2541   92.3778   52.4083   63.0985   77.3067

>> GrainSize{1}

ans =

    MeanGrainSize: 119.9169
              srt: [1x1 struct]
             dist: [1x1 struct]

>> GrainSize{2}

ans =

    MeanGrainSize: 68.6232
              srt: [1x1 struct]
             dist: [1x1 struct]

>> save('my_results','files','GSmat','GrainSize','Settings')
>>
```

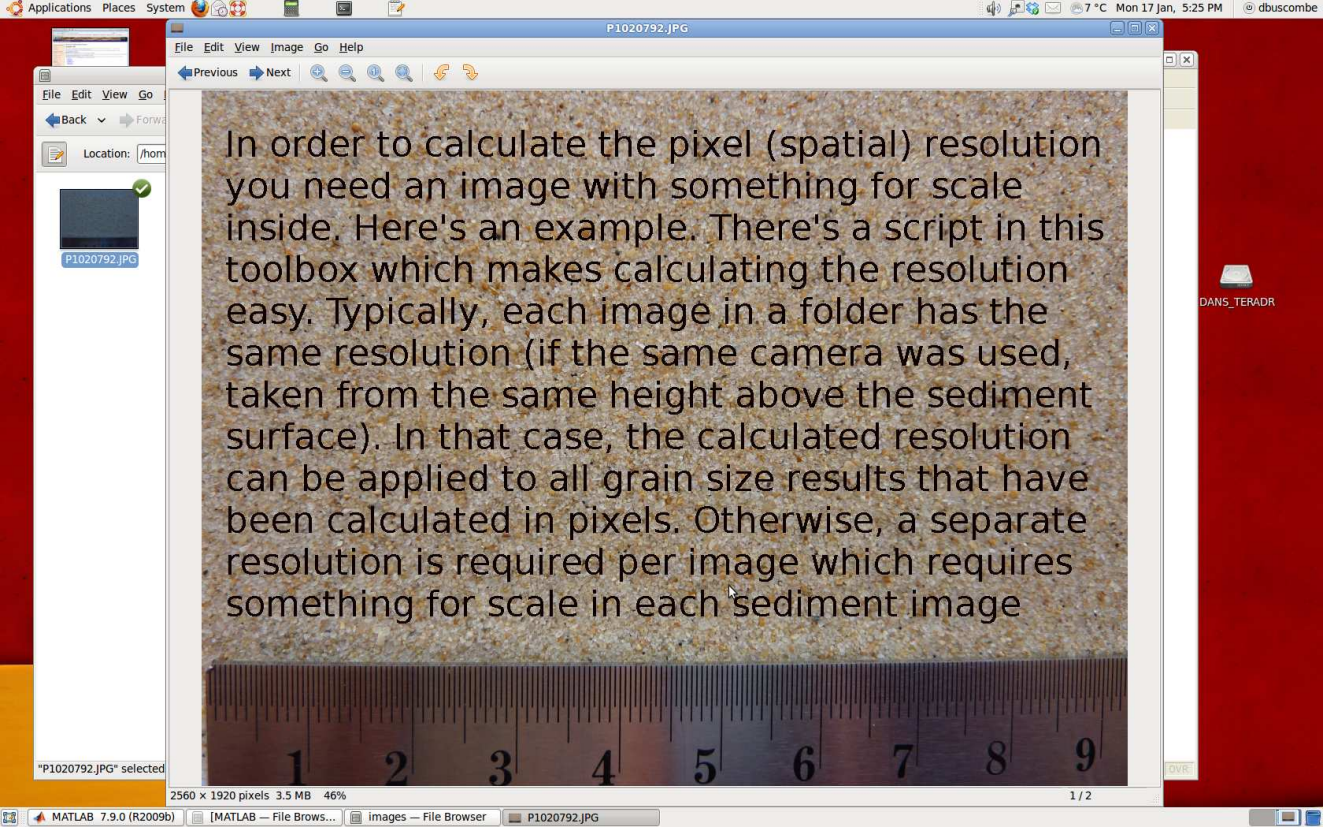
THE PROGRAM DOES NO SAVE THE OUTPUTS AUTOMATICALLY

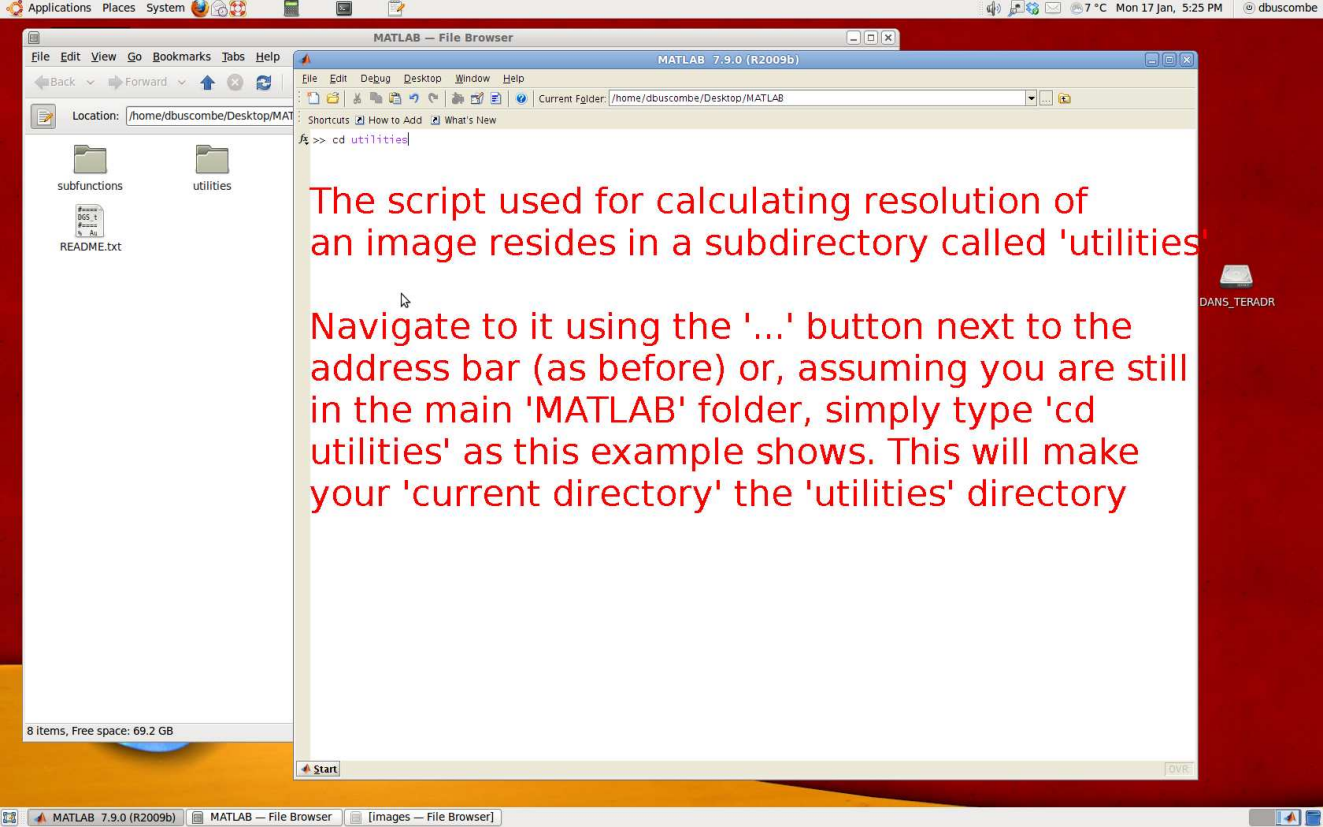
In order to save the data in matlab (.mat) format, use this as an example

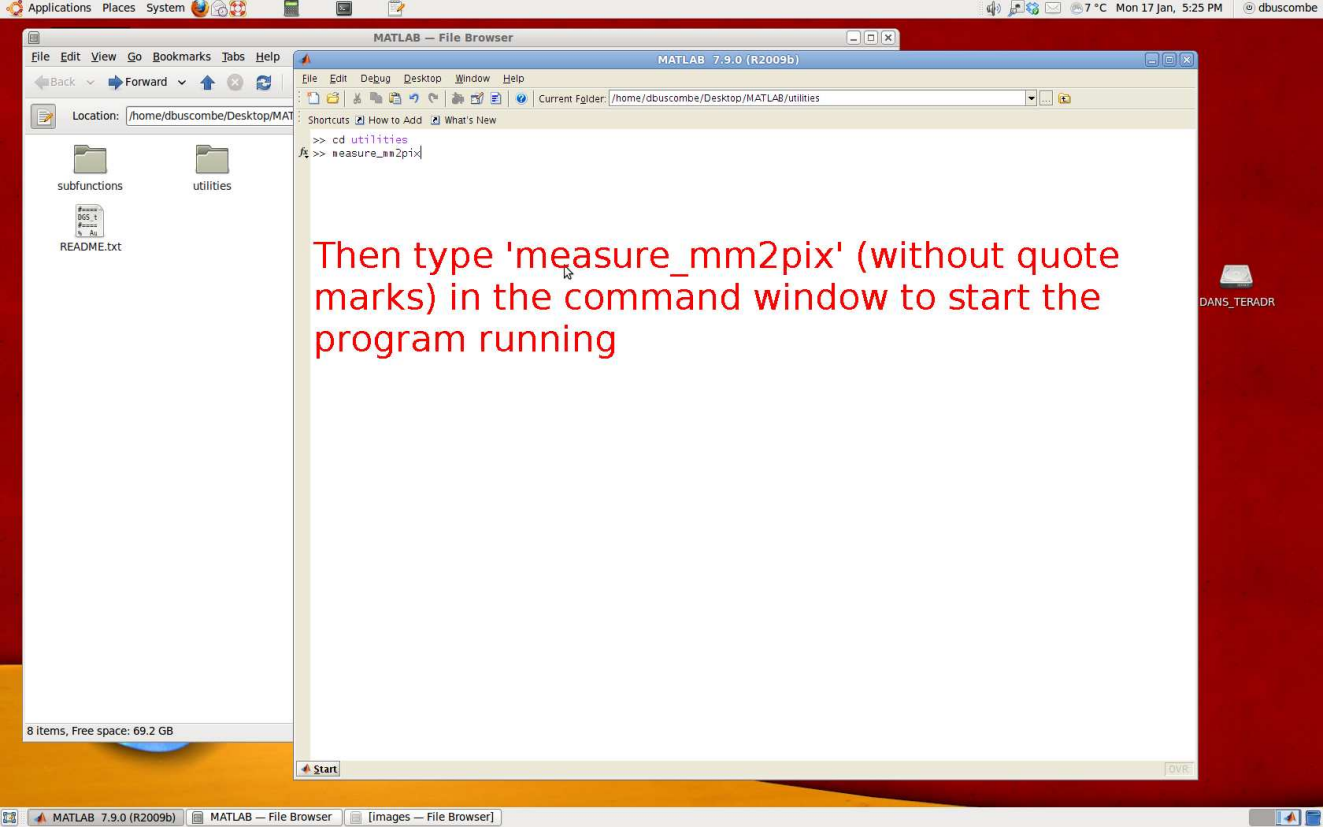
Start

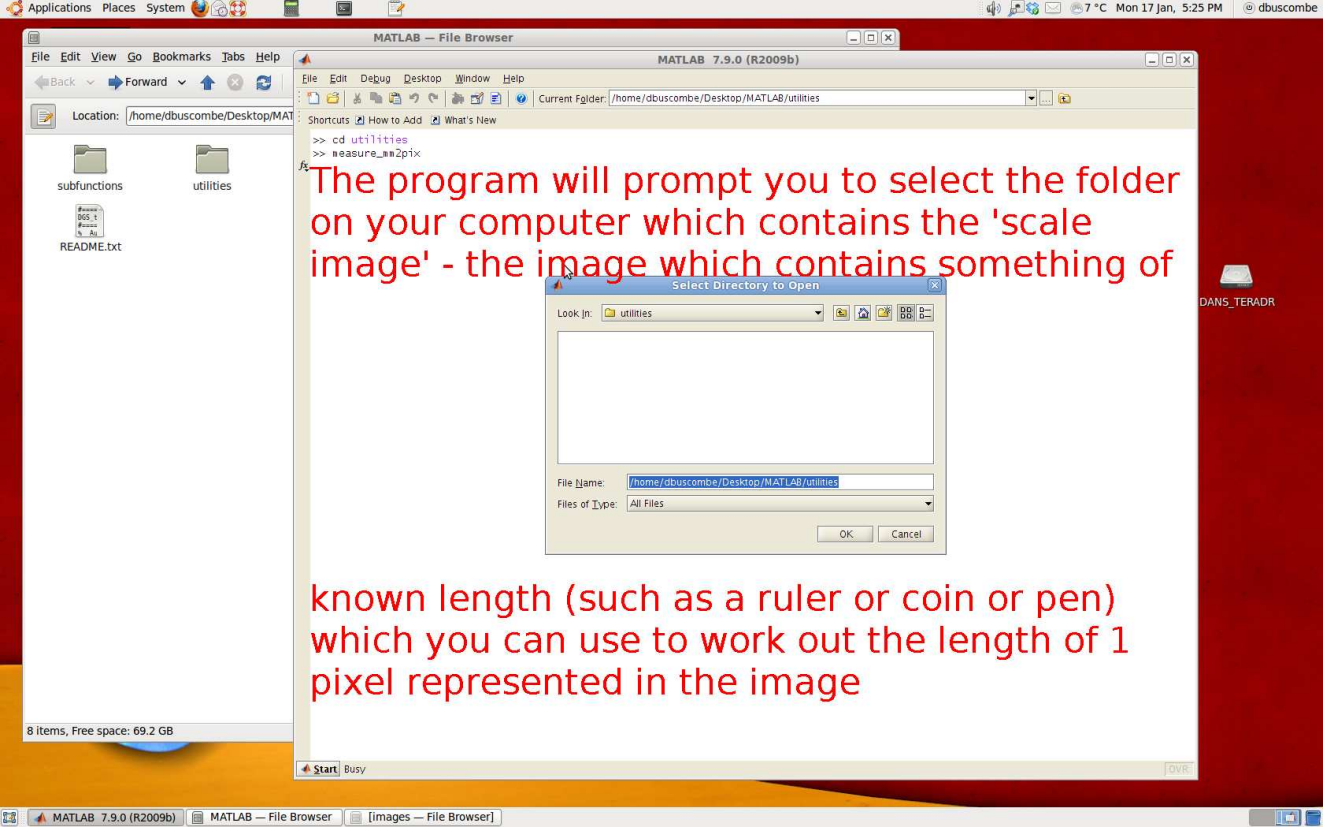
OVR

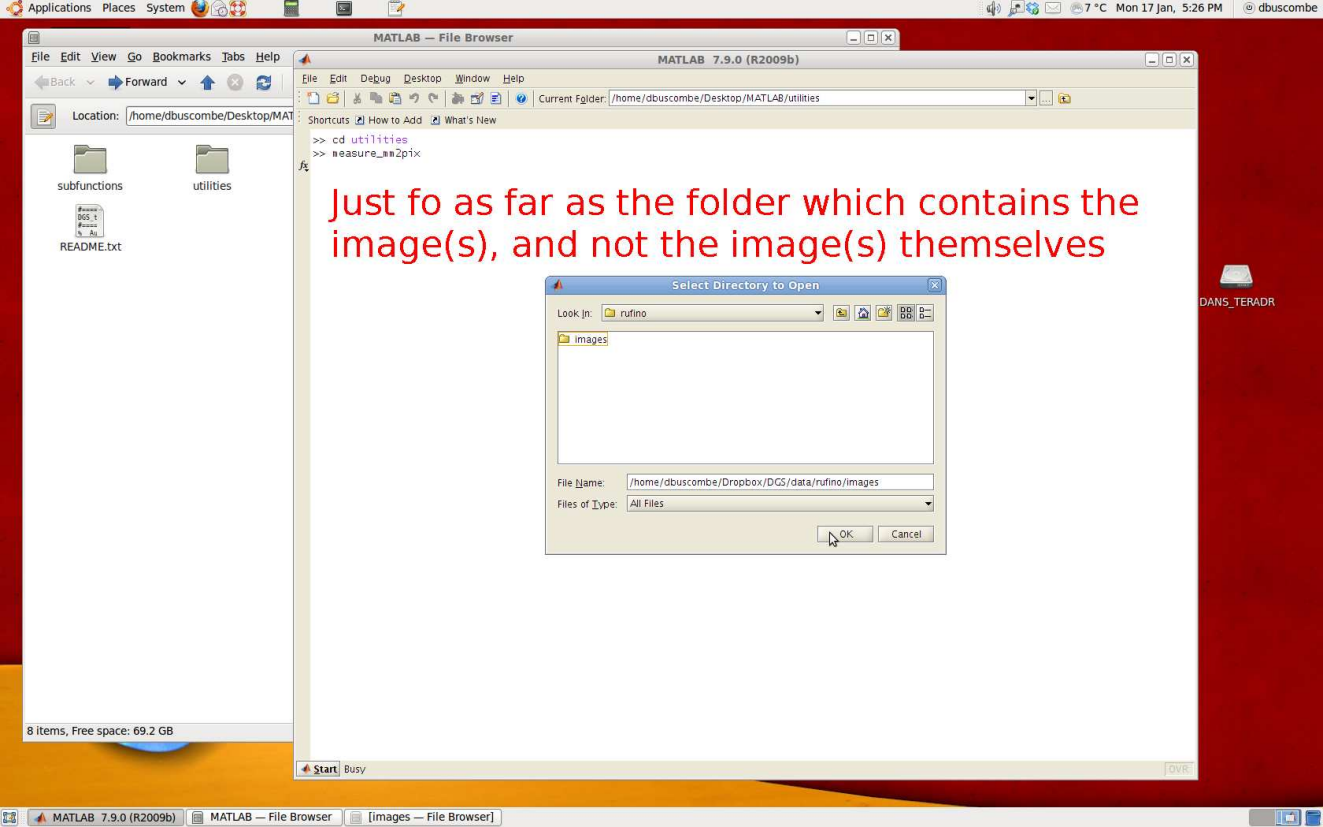

DGS_website_feb2012 — File Browser
File Edit View Go Bookmarks Help
Back Forward 100% Icon View
Location: /home/daniel/Dropbox/DGS/DGS_website_feb2012
subfunctions
utilities
calibdata.txt
calib_grainsize.m
dgs.config
dgs.m
dgs_calib.config
dgs_manyfolders.config
dgs_minimal.config
magic_grainsize.m
my_results.mat
The saved results file is saved in your directory
11 items, Free space: 150.9 GB

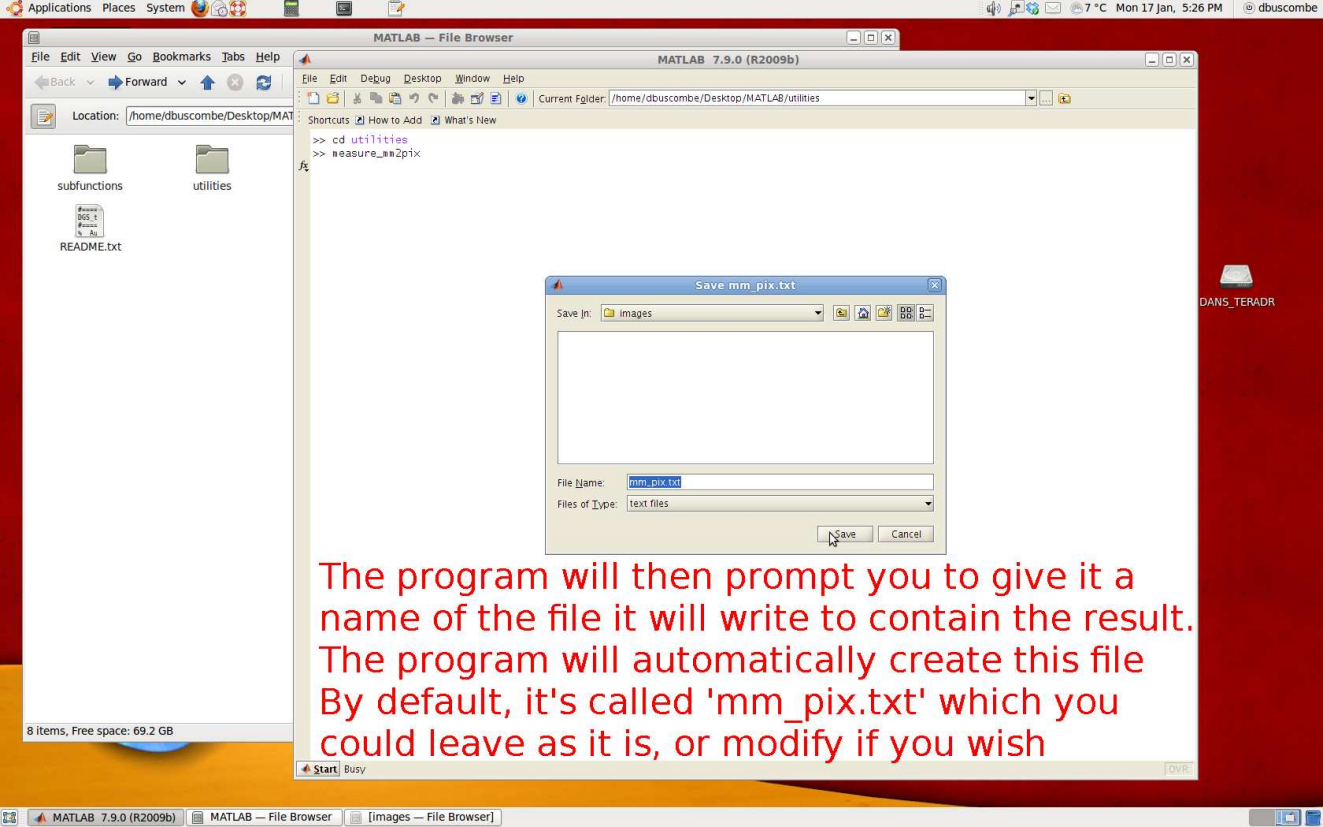

Applications Places System
7 °C Mon 17 Jan, 5:25 PM
dbuscombe
P1020792.JPG
File Edit View Image Go Help
Previous Next
File Edit View Go
Back
Location: /hom
P1020792.JPG
"P1020792.JPG" selected
DANS_TERADR
In order to calculate the pixel (spatial) resolution you need an image with something for scale inside. Here's an example. There's a script in this toolbox which makes calculating the resolution easy. Typically, each image in a folder has the same resolution (if the same camera was used, taken from the same height above the sediment surface). In that case, the calculated resolution can be applied to all grain size results that have been calculated in pixels. Otherwise, a separate resolution is required per image which requires something for scale in each sediment image
1 2 3 4 5 6 7 8 9
2560 x 1920 pixels 3.5 MB 46%
1 / 2
MATLAB 7.9.0 (R2009b)
[MATLAB — File Brows...
images — File Browser
P1020792.JPG

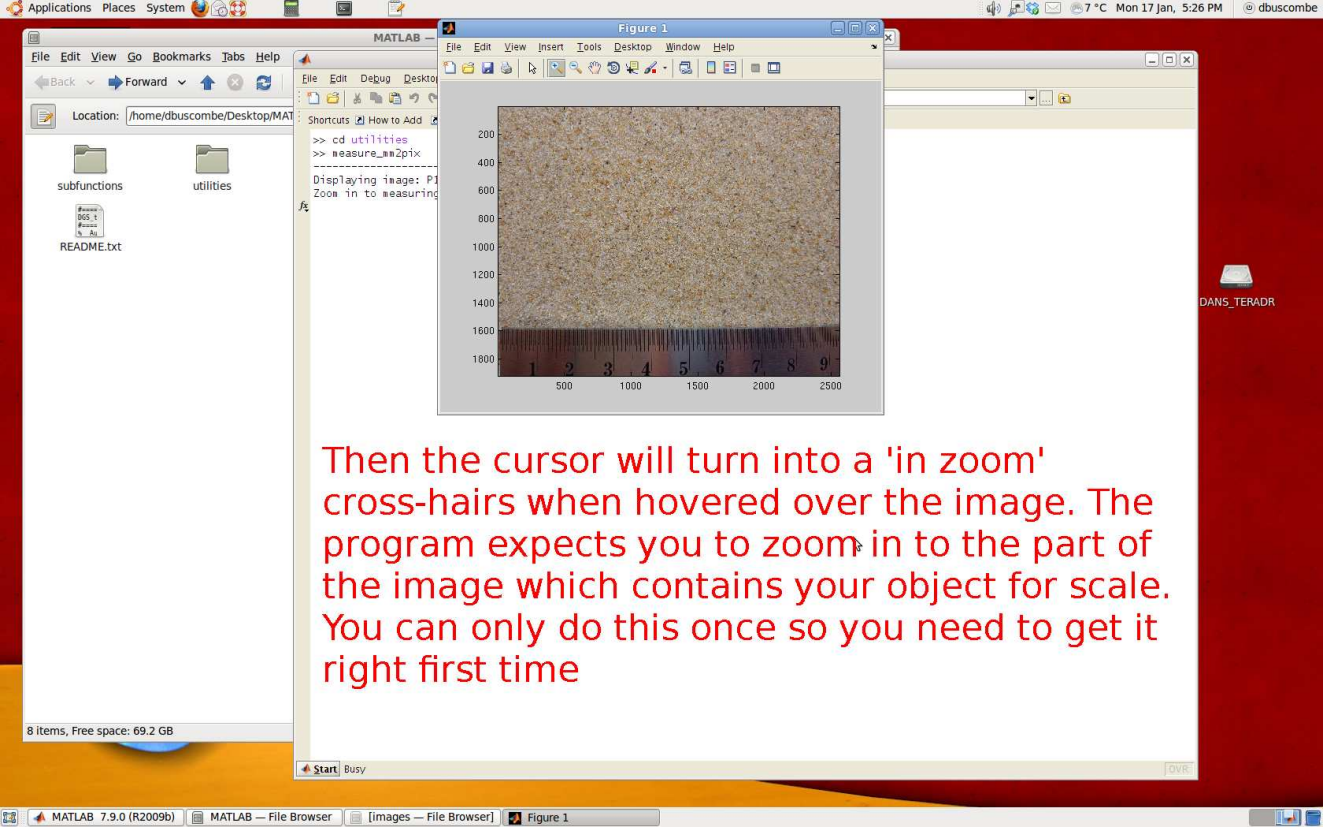

Applications Places System
7 °C Mon 17 Jan, 5:25 PM dbuscombe
MATLAB — File Browser
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
MATLAB 7.9.0 (R2009b)
File Edit Debug Desktop Window Help
Current Folder: /home/dbuscombe/Desktop/MATLAB
Shortcuts How to Add What's New
>> cd utilities
The script used for calculating resolution of an image resides in a subdirectory called 'utilities'
Navigate to it using the '...' button next to the address bar (as before) or, assuming you are still in the main 'MATLAB' folder, simply type 'cd utilities' as this example shows. This will make your 'current directory' the 'utilities' directory
Start
DANS_TERADR
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]

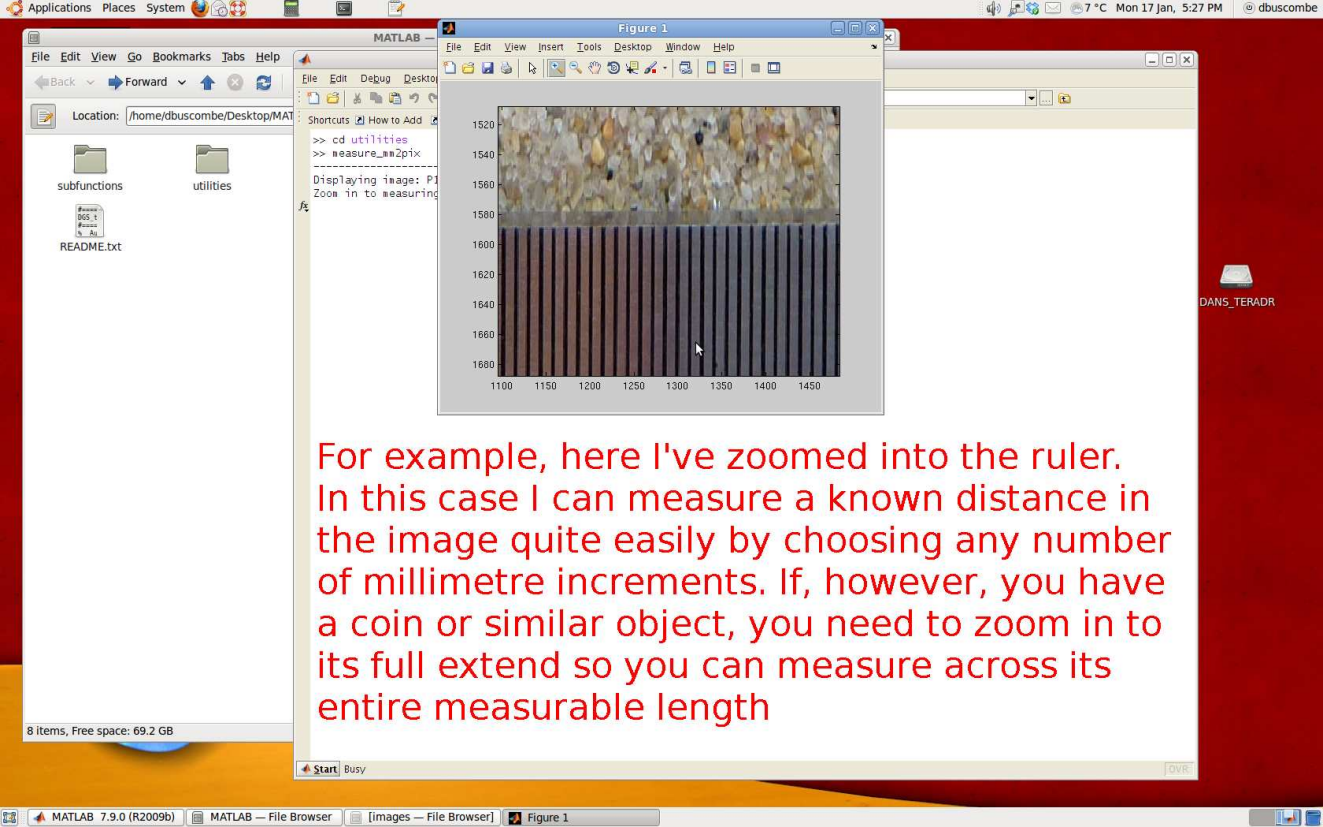

Applications Places System
7 °C Mon 17 Jan, 5:25 PM dbuscombe
MATLAB — File Browser
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
MATLAB 7.9.0 (R2009b)
File Edit Debug Desktop Window Help
Current Folder: /home/dbuscombe/Desktop/MATLAB/utilities
Shortcuts How to Add What's New
>> cd utilities
>> measure_mm2pix
Then type 'measure_mm2pix' (without quote marks) in the command window to start the program running
Start
DANS_TERADR
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]

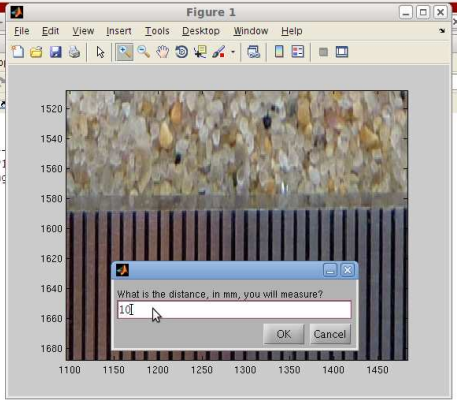

Applications Places System
7 °C Mon 17 Jan, 5:25 PM dbuscombe
MATLAB — File Browser
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
MATLAB 7.9.0 (R2009b)
File Edit Debug Desktop Window Help
Current Folder: /home/dbuscombe/Desktop/MATLAB/utilities
Shortcuts How to Add What's New
>> cd utilities
>> measure_mm2pix
The program will prompt you to select the folder on your computer which contains the 'scale image' - the image which contains something of
Select Directory to Open
Look In: utilities
File Name: /home/dbuscombe/Desktop/MATLAB/utilities
Files of Type: All Files
OK
Cancel
known length (such as a ruler or coin or pen) which you can use to work out the length of 1 pixel represented in the image
Start Busy
DANS_TERADR
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]


Applications Places System
7 °C Mon 17 Jan, 5:26 PM
dbuscombe
MATLAB — File Browser
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
MATLAB 7.9.0 (R2009b)
File Edit Debug Desktop Window Help
Current Folder: /home/dbuscombe/Desktop/MATLAB/utilities
Shortcuts How to Add What's New
>> cd utilities
>> measure_mm2pix
Just fo as far as the folder which contains the image(s), and not the image(s) themselves
Select Directory to Open
Look In: rufino
images
File Name: /home/dbuscombe/Dropbox/DGS/data/rufino/images
Files of Type: All Files
OK
Cancel
Start Busy
DANS_TERADR
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]

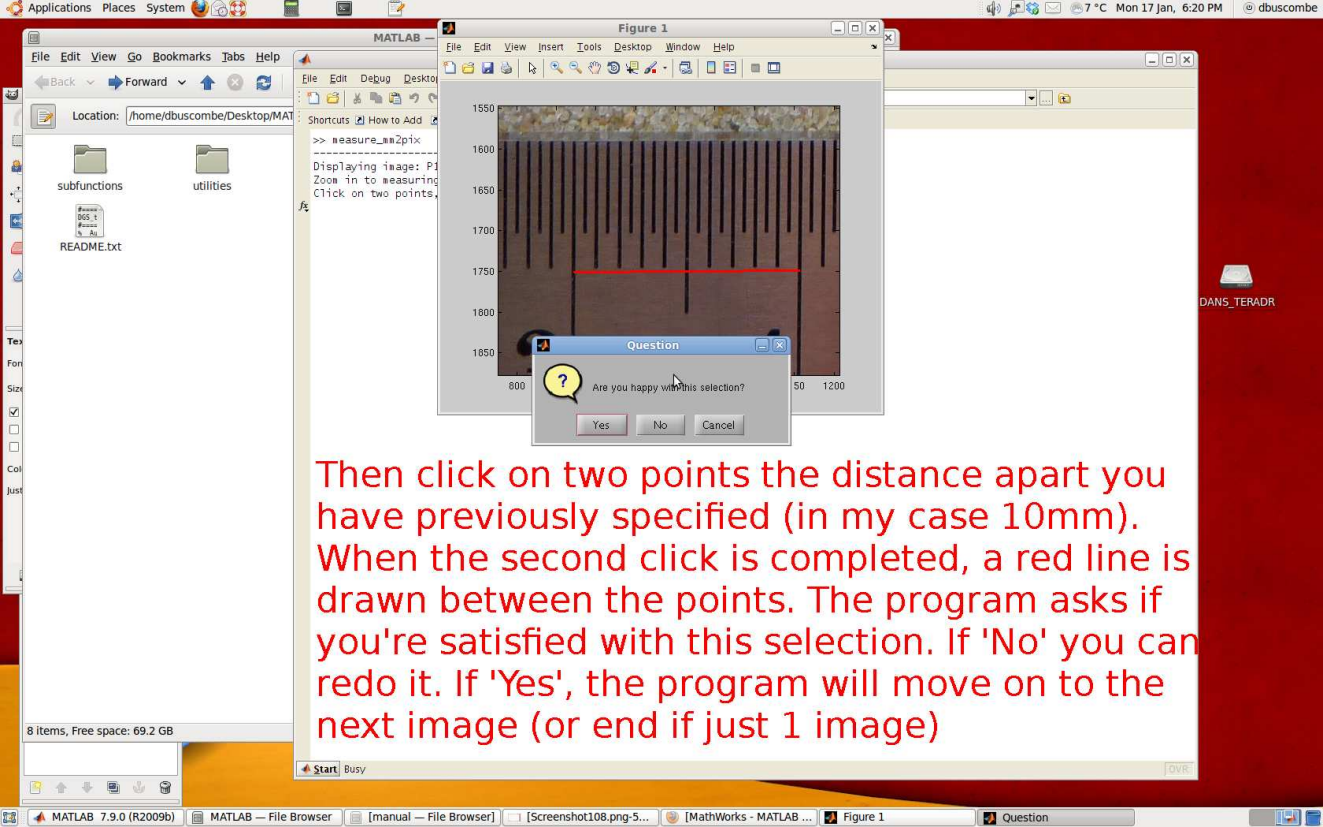

Applications Places System
7 °C Mon 17 Jan, 5:26 PM dbuscombe
MATLAB — File Browser
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
MATLAB 7.9.0 (R2009b)
File Edit Debug Desktop Window Help
Current Folder: /home/dbuscombe/Desktop/MATLAB/utilities
Shortcuts How to Add What's New
>> cd utilities
>> measure_mm2pix
Save mm_pix.txt
Save In: images
File Name: mm_pix.txt
Files of Type: text files
Save
Cancel
The program will then prompt you to give it a name of the file it will write to contain the result.
The program will automatically create this file
By default, it's called 'mm_pix.txt' which you could leave as it is, or modify if you wish
Start Busy
DANS_TERADR
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]

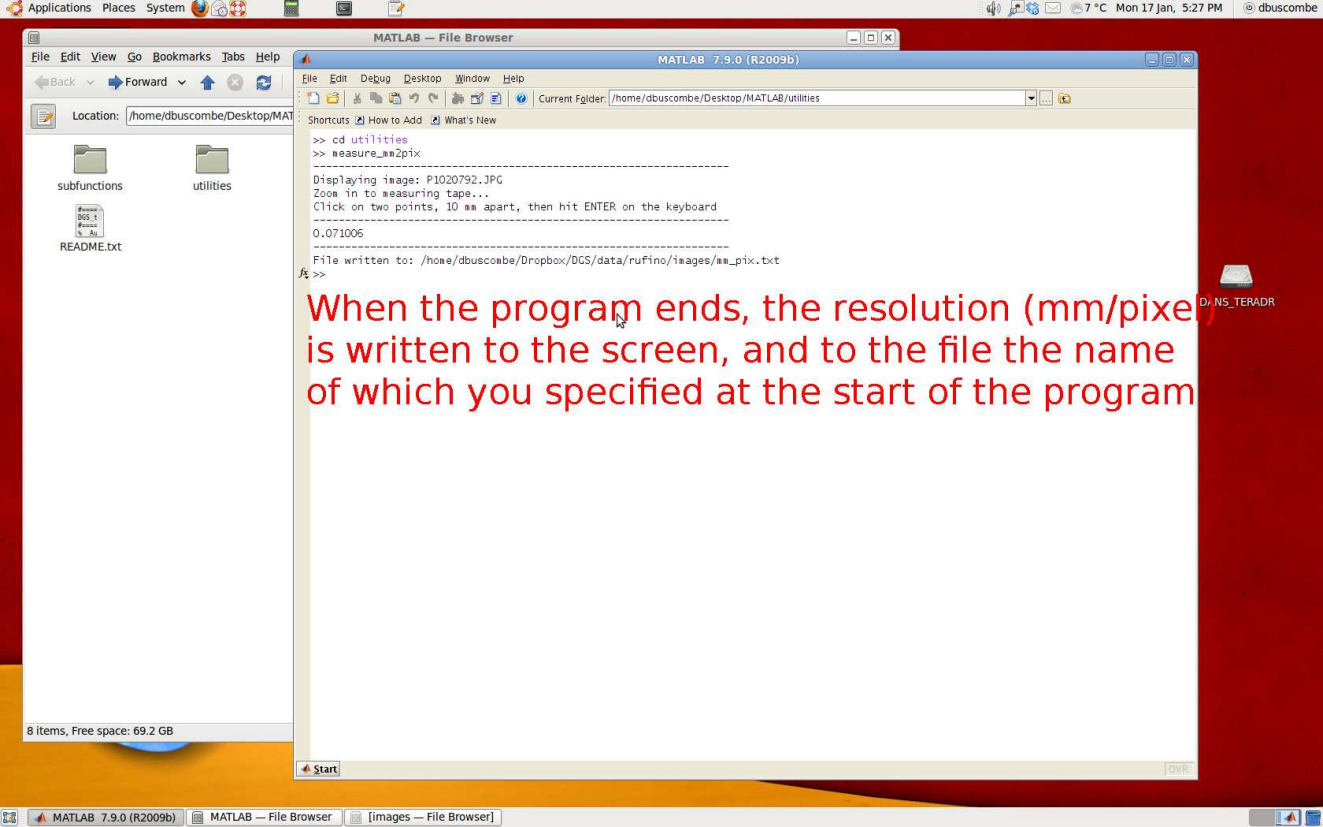

Applications Places System
7 °C Mon 17 Jan, 5:26 PM dbuscombe
MATLAB —
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
File Edit Debug Deskto
Shortcuts How to Add
>> cd utilities
>> measure_mm2pix
Displaying image: P1
Zoom in to measuring
Start Busy
Figure 1
File Edit View Insert Tools Desktop Window Help
200
400
600
800
1000
1200
1400
1600
1800
500
1000
1500
2000
2500
DANS_TERADR
Then the cursor will turn into a 'in zoom' cross-hairs when hovered over the image. The program expects you to zoom in to the part of the image which contains your object for scale. You can only do this once so you need to get it right first time
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]
Figure 1

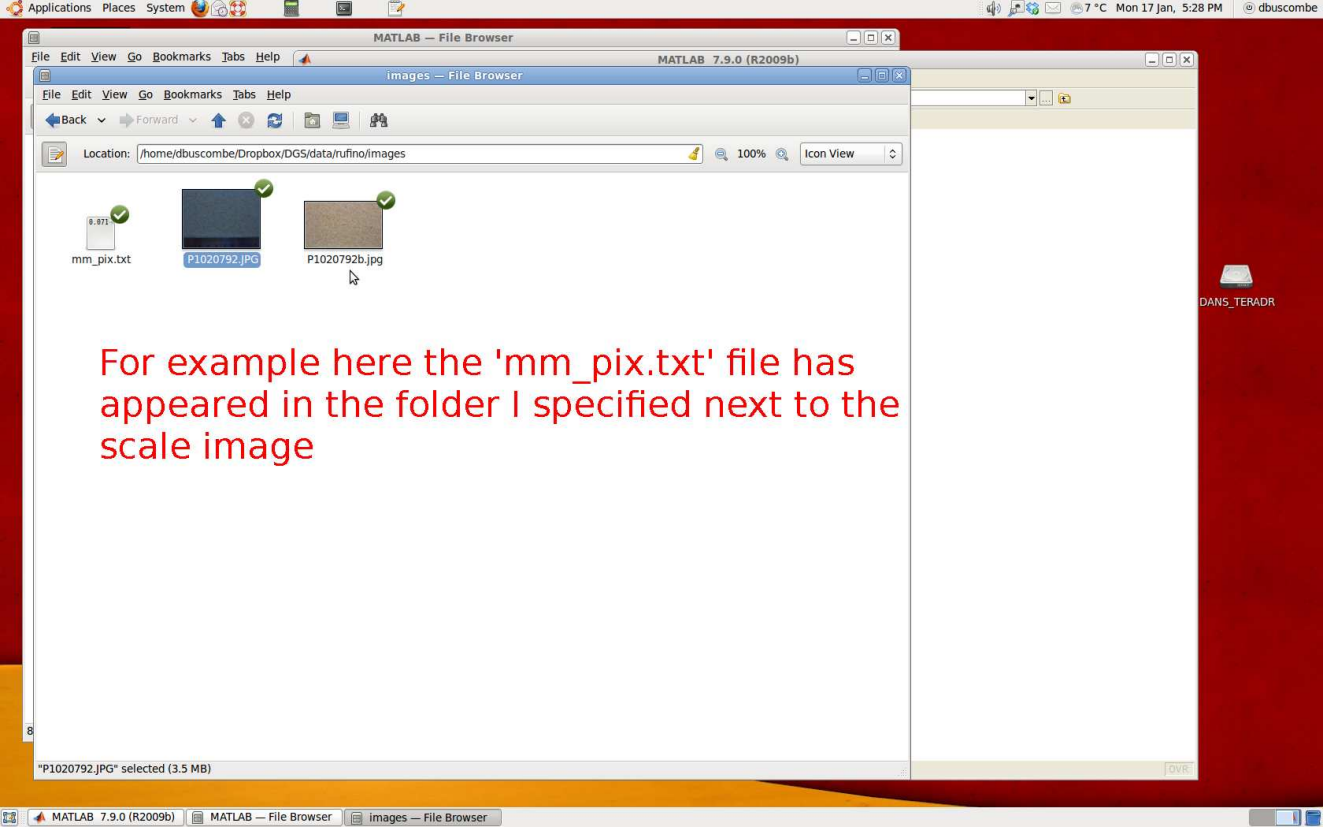

Applications Places System
7 °C Mon 17 Jan, 5:27 PM dbuscombe
MATLAB —
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
File Edit Debug Deskto
Shortcuts How to Add
>> cd utilities
>> measure_mm2pix
Displaying image: P1
Zoom in to measuring
Figure 1
File Edit View Insert Tools Desktop Window Help
1520
1540
1560
1580
1600
1620
1640
1660
1680
1100 1150 1200 1250 1300 1350 1400 1450
DANS_TERADR
For example, here I've zoomed into the ruler.
In this case I can measure a known distance in
the image quite easily by choosing any number
of millimetre increments. If, however, you have
a coin or similar object, you need to zoom in to
its full extend so you can measure across its
entire measurable length
Start Busy
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]
Figure 1

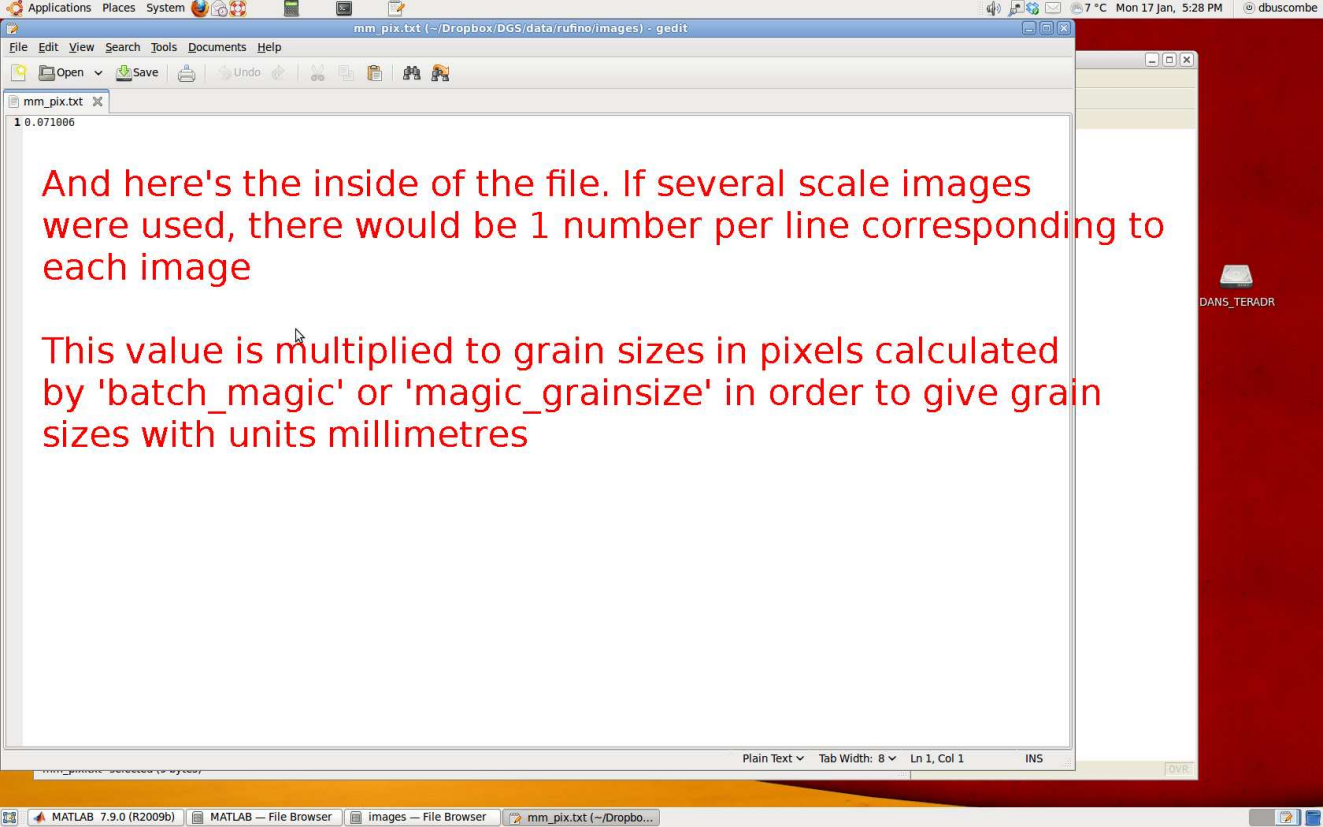


A dialogue box will ask you to input the distance in millimetres, that you will measure. This is your known length of object. Here, for example, I input 10 (mm) and so I must then measure exactly 10 increments of the ruler


Applications Places System
7 °C Mon 17 Jan, 6:20 PM dbuscombe
MATLAB —
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
File Edit Debug Deskto
Shortcuts How to Add
>> measure_mm2pix
Displaying image: P1
Zoom in to measuring
Click on two points,
Figure 1
File Edit View Insert Tools Desktop Window Help
1550
1600
1650
1700
1750
1800
1850
800
50
1200
Question
Are you happy with this selection?
Yes
No
Cancel
DANS_TERADR
Then click on two points the distance apart you have previously specified (in my case 10mm). When the second click is completed, a red line is drawn between the points. The program asks if you're satisfied with this selection. If 'No' you can redo it. If 'Yes', the program will move on to the next image (or end if just 1 image)
Start Busy
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[manual — File Browser]
[Screenshot108.png-5...
[MathWorks - MATLAB ...
Figure 1
Question


Applications Places System
7 °C Mon 17 Jan, 5:27 PM dbuscombe
MATLAB — File Browser
File Edit View Go Bookmarks Tabs Help
Back Forward
Location: /home/dbuscombe/Desktop/MAT
subfunctions
utilities
README.txt
8 items, Free space: 69.2 GB
MATLAB 7.9.0 (R2009b)
File Edit Debug Desktop Window Help
Current Folder: /home/dbuscombe/Desktop/MATLAB/utilities
Shortcuts How to Add What's New
>> cd utilities
>> measure_mm2pix
Displaying image: P1020792.JPG
Zoom in to measuring tape...
Click on two points, 10 mm apart, then hit ENTER on the keyboard
0.071006
File written to: /home/dbuscombe/Dropbox/DGS/data/rufino/images/mm_pix.txt
>>
When the program ends, the resolution (mm/pixel)
is written to the screen, and to the file the name
of which you specified at the start of the program
Start
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
[images — File Browser]


Applications Places System
7 °C Mon 17 Jan, 5:28 PM
dbuscombe
MATLAB — File Browser
File Edit View Go Bookmarks Tabs Help
MATLAB 7.9.0 (R2009b)
images — File Browser
File Edit View Go Bookmarks Tabs Help
Back
Forward
Location: /home/dbuscombe/Dropbox/DGS/data/rufino/images
100%
Icon View
mm_pix.txt
P1020792.JPG
P1020792b.jpg
DANS_TERADR
For example here the 'mm_pix.txt' file has appeared in the folder I specified next to the scale image
"P1020792.JPG" selected (3.5 MB)
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
images — File Browser


Applications Places System
7 °C Mon 17 Jan, 5:28 PM dbuscombe
mm_pix.txt (~/Dropbox/DGS/data/rufino/images) - gedit
File Edit View Search Tools Documents Help
Open Save Undo
mm_pix.txt
1 0.071006
And here's the inside of the file. If several scale images were used, there would be 1 number per line corresponding to each image
This value is multiplied to grain sizes in pixels calculated by 'batch_magic' or 'magic_grainsize' in order to give grain sizes with units millimetres
Plain Text Tab Width: 8 Ln 1, Col 1 INS
DANS_TERADR
MATLAB 7.9.0 (R2009b)
MATLAB — File Browser
images — File Browser
mm_pix.txt (~/Dropbo...

Feedback, Questions and Comments? Email Dan Buscombe:

daniel.buscombe@plymouth.ac.uk