PBS/ PBS Pro and Matlab Examples

1. Simple example to approximate a sawtooth

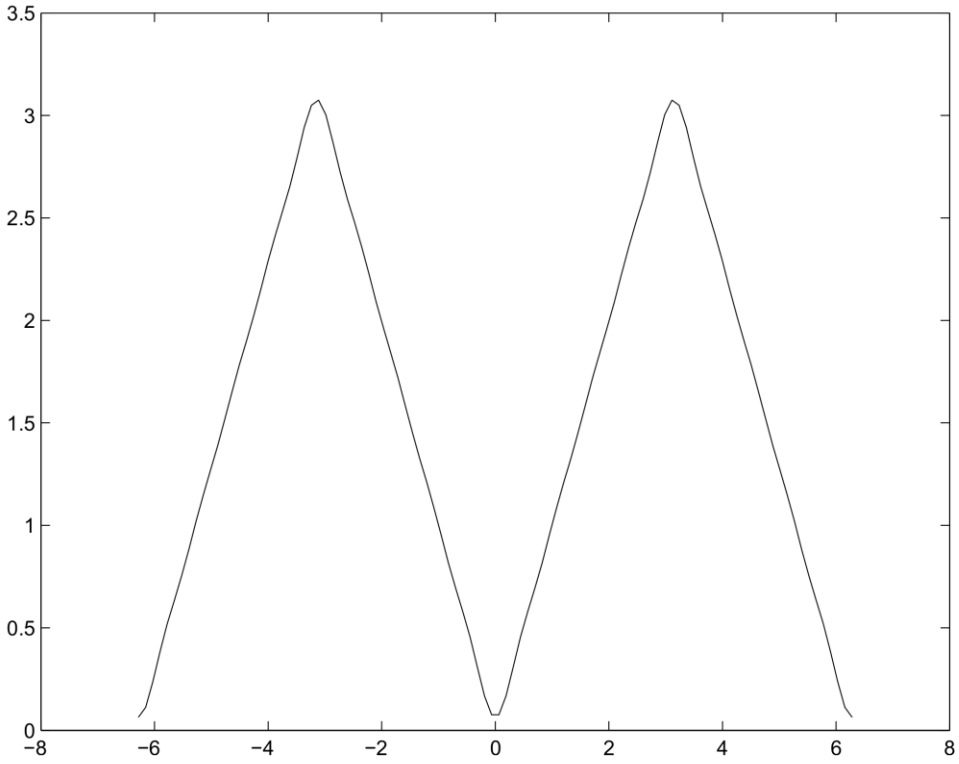
matlab_test.pbs

```
#!/bin/bash -l
#
#### job name
#PBS -N matlab_test
#
#### select resources
#PBS -l walltime=10:00:00
#PBS -l nodes=1:ppn=1
#
#### mail Options
#PBS -m abe
#PBS -M ruser@usq.edu.au
#
#### set journal options
#PBS -j oe
#
#### select queue
#PBS -q default
#

#### load matlab module
module load matlab

#### cd to the directory where the job was submitted
cd $PBS_O_WORKDIR

# Run MATLAB
matlab -nodisplay -nodesktop -nosplash -r matlab_test
```

matlab_test.m

```
% MATLAB M-file example to approximate a sawtooth
% with a truncated Fourier expansion.
%
nterms=5;
fourbypi=4.0/pi;
np=100;
y(1:np)=pi/2.0;
x(1:np)=linspace(-2.0*pi,2*pi,np);
for k=1:nterms
   twokm=2*k-1;
   y=y-fourbypi*cos(twokm*x)/twokm^2;
end;
plot(x,y);
print -deps matlab_test_plot.ps;

quit;
```

mattlab_test_plot.pdf (output)


3.5
3
2.5
2
1.5
1
0.5
0
−8
−6
−4
−2
0
2
4
6
8

2. Simple example to parallel matlab

central_theorem.pbs

```
#!/bin/bash -l
#
#### job name
#PBS -N central_theorem
#
#### select resources
#PBS -l nodes=1:ppn=8
#PBS -l walltime=02:00:00
#PBS -l mem=4g
#
#### mail options
#PBS -m abe
#PBS -M ruser@usq.edu.au
#
#### set journal options
#PBS -j oe
#
#### select queue
#PBS -q default
#

#### load matlab module
module load matlab

#### writes current log file information
echo Master process running on `hostname`
echo Directory is `pwd`
echo PBS has allocated the following nodes:
echo `cat $PBS_NODEFILE`
NPROCS=`wc -l < $PBS_NODEFILE`
echo This job has allocated $NPROCS nodes
echo `date`
echo ------------------------------------------------------------------------
---------

#### cd to working directory
cd $PBS_O_WORKDIR

#### run MATLAB
matlab -nodisplay -nodesktop -nosplash -r central_theorem
```

central_theorem.log (Output)

```
Master process running on usqhpc01
Directory is /home/eng/ruser
PBS has allocated the following nodes:
usqhpc01 usqhpc01 usqhpc01 usqhpc01
This job has allocated 4 nodes
Wed Apr 4 15:22:40 EST 2012
------------------------------------------------------------------------
----

                            < M A T L A B (R) >
                  Copyright 1984-2011 The MathWorks, Inc.
                    R2011b (7.13.0.564) 64-bit (glnxa64)
                              August 13, 2011


To get started, type one of these: helpwin, helpdesk, or demo.
For product information, visit www.mathworks.com.

     1

     2

     3

     4

     5

     6

     7

     8

     9

Elapsed time is 147.834154 seconds.
>>
```

3. A simple example to parallel Matlab

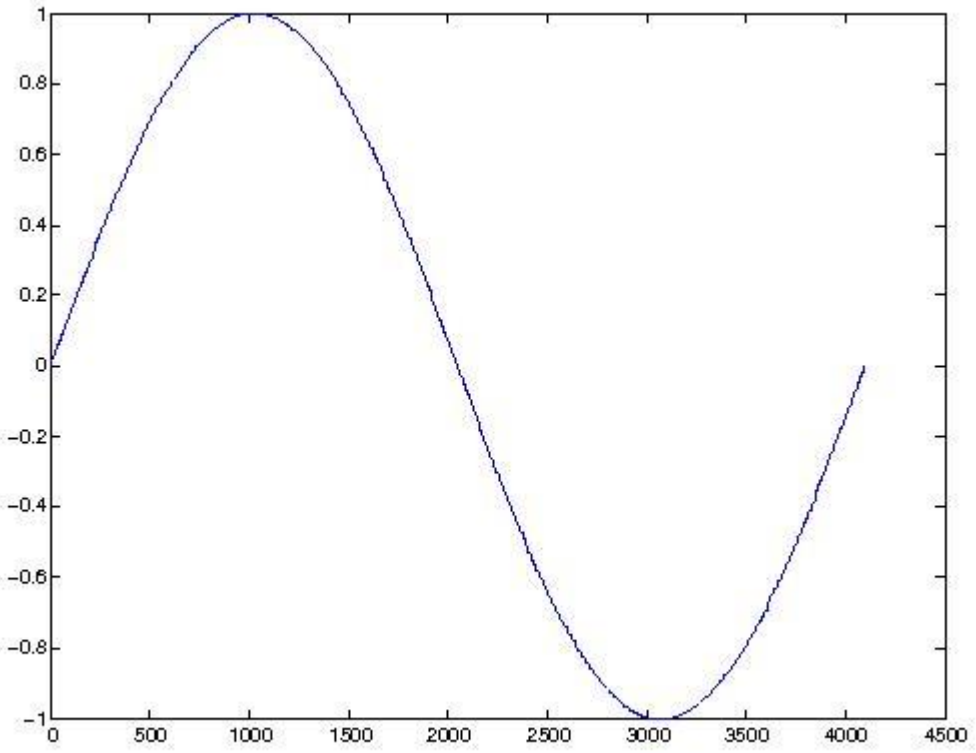
wave.pbs

```
#!/bin/bash -l
#
#### set shell
#PBS -S /bin/bash
#
#### job name
#PBS -N wave
#
#### select resources
#PBS -l nodes=2:ppn=4
#PBS -l walltime=02:00:00
#PBS -l mem=2g
#
####
#PBS -m abe
#PBS -M r.user@usq.edu.au
#
#### select queue
#PBS -q default

#### load matlab module
module load matlab

#### cd to working directory
cd $PBS_O_WORKDIR

unset DISPLAY

#### run MATLAB

matlab -nodisplay -nodesktop -nosplash -r wave
```

wave.m

```
number_of_sims=10^6;
batches=4;
sample_sizes=[5 10 15 20 30 50 75 100 500];
bins=4:.2:7;
tic
count_by_bin=zeros(length(sample_sizes),length(bins));
for i=1:length(sample_sizes)
  disp(i)
  sample_size=sample_sizes(i);
  count_by_bin_i=count_by_bin(i,:);
  parfor j=1:batches
      Y=random('t',3,sample_size,number_of_sims/batches);
      Z=sqrt(sample_size) * mean(Y)./sqrt(var(Y)); %should be approximatel
normal
      count_by_bin_i=count_by_bin_i+histc(Z,bins);
end
  count_by_bin(i,:)=count_by_bin_i;
end
toc
%plot results
for i=1:length(sample_sizes)
  subplot(3,3,i)
  bin_midpoints=(bins(1:(length(bins)-1))+bins(2:length(bins)))/2;
  normal_prob=cdf('norm',bins(2:length(bins)),0,1)-
cdf('norm',bins(1:(length(bins)-1)),0,1);
  hold on
  title(strcat('Sample Size = ',num2str(sample_sizes(i))))
  bar(bins,count_by_bin(i,:)/number_of_sims,'histc')
  p=plot(bin_midpoints,normal_prob);
  set(p,'Color','red','LineWidth',2)
  hold off
end

%make sure this line is run
```

wave_plot.jpg (output)



4. Parallel/Distributed Computing Toolbox example

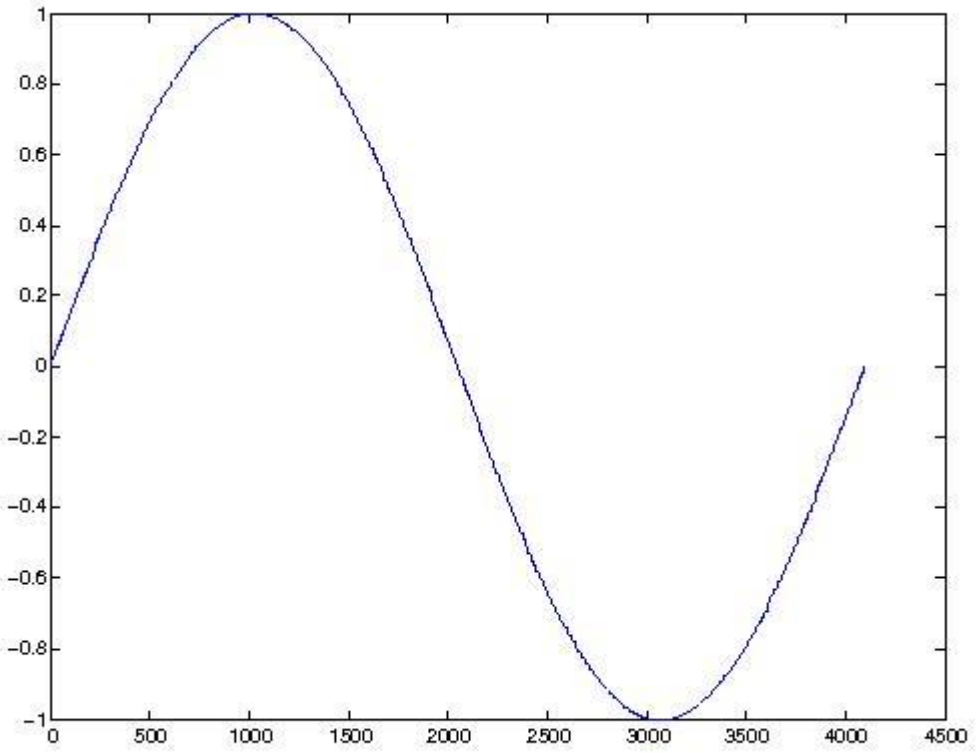
wave.pbs

```
#!/bin/bash -l
#
#### set shell
#PBS -S /bin/bash
#
#### job name
#PBS -N wave
#
#### select resources
#PBS -l nodes=2:ppn=4
#PBS -l walltime=02:00:00
#PBS -l mem=2g
#
####
#PBS -m abe
#PBS -M r.user@usq.edu.au
#
#### select queue
#PBS -q default

#### load matlab module
module load matlab

#### cd to working directory
cd $PBS_O_WORKDIR

unset DISPLAY

#### run MATLAB

matlab -nodisplay -nodesktop -nosplash -r wave
```

wave.m

```
matlabpool open 3
parfor i=1:4096
A(i) = sin(i*2*pi/4096);
end
matlabpool close
plot(A)
print ('-r75','-djpeg','plot.jpg')

quit
```

wave_plot.jpg (output)



References

1. Matlab Parallel Computing Toolbox
2. Matlab Distributed Toolbox and Torque Scheduler
3. Matlab Distributed Toolbox and Generic Scheduler