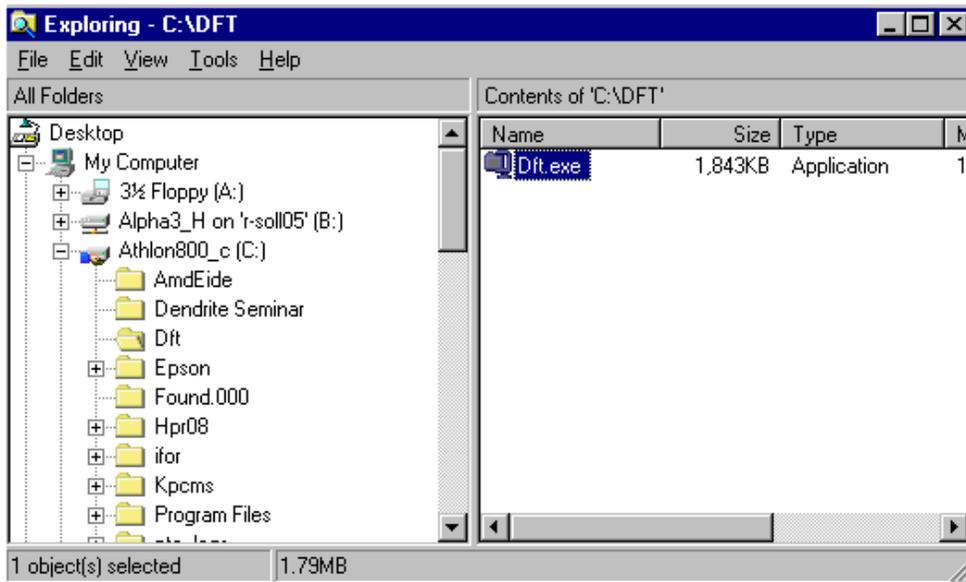
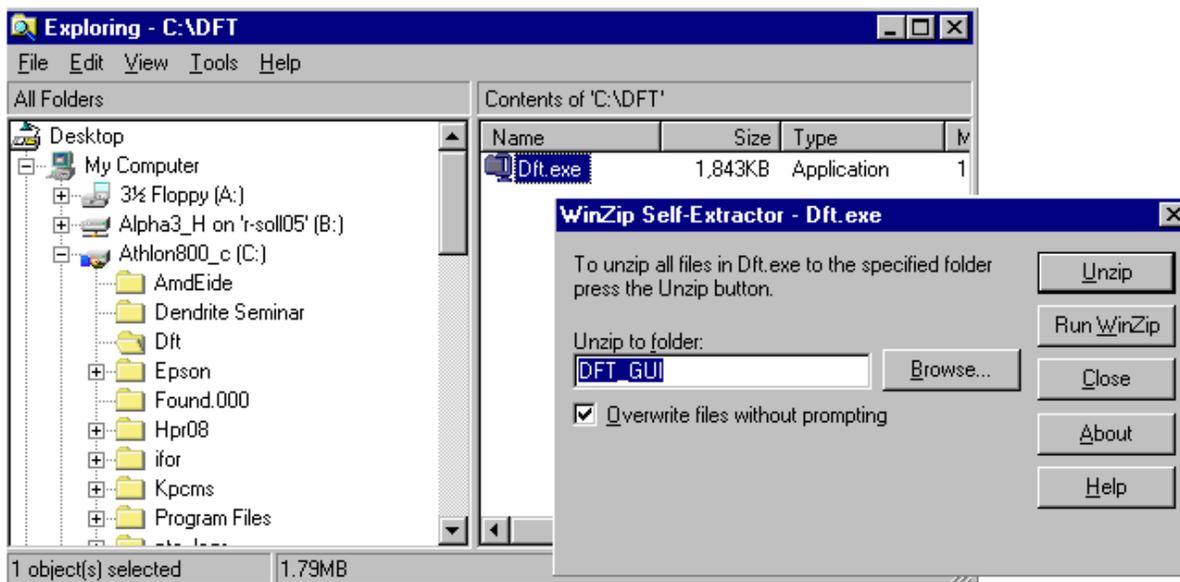


1.0 Installing the Software

The software comes in a self extracting zip file called “dft.exe”. Executing the file, you will be prompted that the directory DFT_GUI will be created, and the contents of the archive will be placed in that directory. For example,



Step 1. Execute the install program



Step 2. Prompt for location ... use the default

The directory DFT_GUI will be created, 26 files should be unzipped, and the directory should contain the files shown below:

Contents of 'C:\DFT\DFT_GUI'			
Name	Size	Type	Modified
DFT_GUI.exe	293KB	Application	11/28/00 5:10 PM
ggraflib.dll	397KB	Application Ex...	6/16/99 8:06 PM
Ginlibdg.dll	1,164KB	Application Ex...	6/16/99 8:06 PM
gmenudll.dll	1,438KB	Application Ex...	6/16/99 9:26 AM
gsurplib.dll	615KB	Application Ex...	6/16/99 8:08 PM
Jpeg.dll	130KB	Application Ex...	6/16/99 8:34 PM
Mwin.dll	114KB	Application Ex...	6/16/99 8:06 PM
Mwinerr.dll	45KB	Application Ex...	6/16/99 8:34 PM
WINGUI.dll	54KB	Application Ex...	6/16/99 7:58 PM
Gino.con	1KB	CON File	2/13/98 1:23 AM
Gino.fon	672KB	Font file	1/30/98 2:21 PM
dft_input.in	7KB	IN File	11/27/00 3:35 PM
dft_input_test_1.in	2KB	IN File	11/27/00 3:42 PM
dft_input_test_2.in	2KB	IN File	11/27/00 4:09 PM
dft_input_test_3.in	19KB	IN File	11/28/00 5:14 PM
dft_input_test_4.in	20KB	IN File	11/28/00 5:17 PM
dft_input_test_5.in	20KB	IN File	11/28/00 5:19 PM
dft_input_test_6.in	20KB	IN File	11/28/00 5:29 PM
dft_input_test_7.in	20KB	IN File	11/28/00 5:31 PM
Gino.mes	20KB	MES File	4/9/98 10:45 AM
Saw Tooth Wave Test da...	104KB	Microsoft Exc...	11/28/00 5:36 PM
Sine Test data.xls	24KB	Microsoft Exc...	11/27/00 6:09 PM
dft_output.out	40KB	OUT File	11/29/00 9:19 AM
dft_output_test.out	14KB	OUT File	11/28/00 5:04 PM
raw.out	4KB	OUT File	11/27/00 3:58 PM
test.out	4KB	OUT File	11/20/00 5:24 PM

“DFT_GUI.exe” is the executable program you will run to perform the discrete Fourier transform analysis. There are also two *.xls, Excel spreadsheet files, I left in the archive to serve as example for generating input files to DFT_GUI (“Saw Tooth Wave Test data.xls” and “Sine Test data.xls”). The program is configured to recognize *.in files as input, and *.out files as output.

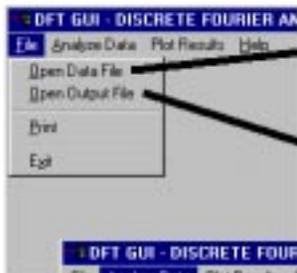
2.0 Running DFT_GUI

Double clicking on “DFT_GUI.exe” using the Windows “Explorer” program, the program should appear as shown below:



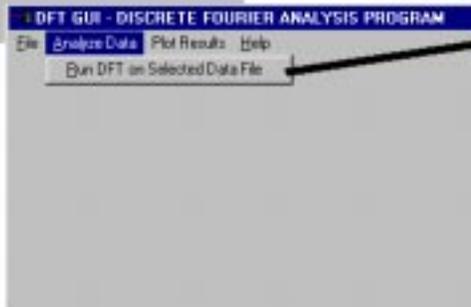
The steps used in running a DFT analysis on a given input data file are shown below:

Running DFT_GUI



Step 1. From File menu, open (select) the data file you want to analyze. "dft_input.in" is the default file.

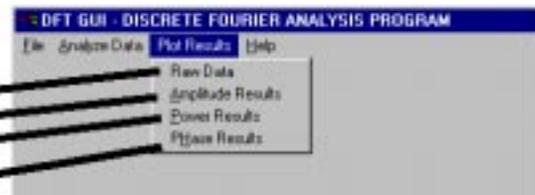
Step 2. From File menu, open (select) the output file where you want results stored, "dft_output.out" is the default output file name.



Step 3. Under the "Analyze Data" menu, select the "Run DFT on Selected Data File" using the mouse. The DOS window echos (displays) the results that are being stored to the currently selected output file. Output files are overwritten on each run of the program.

Step 4. From the "Plot Results" menu the results of the DTF analysis can be displayed:

- The raw data from the input file
- The amplitude spectrum
- The power spectrum
- The phase shift spectrum



The currently displayed plot can be printed using the File -> Print selection from the program menus. Note that you must run the DFT analysis even to display the raw data from the “Plot Results” menu.

3.0 Input and Output Files

Input files used in DFT_GUI are ascii text files (i.e. generate by saving as tab delimited using the Excel spreadsheet program) having two columns of data (i.e. a file with two number on each line of the file). Up to 5000 lines of data maybe analyzed with this version of the software (actually this has not been tested yet, but it should work). The first number on each line is the time in seconds, and the second value is the corresponding data value of the signal. For example the first few lines of the default input file “dft_input.in” are

```
0      10
0.1    10.3139526
0.2    10.62666617
0.3    10.93690657
0.4    11.24344944
0.5    11.54508497
0.6    11.84062276
0.7    12.12889646
0.8    12.40876837
0.9    12.67913397
1      12.93892626
1.1    13.18711995
1.2    13.42273553
1.3    13.64484314
1.4    13.85256621
...
```

The user can create input files using a spreadsheet, and should use their judgement and experience in determining the sampling rate. In most cases, the rule of thumb is “the higher the sampling frequency, the better the results”, but there are usually practical limitations to consider. It is sometimes recommended that the sampling rate should be 5 to 10 time higher than the highest frequency one hopes to analyze.

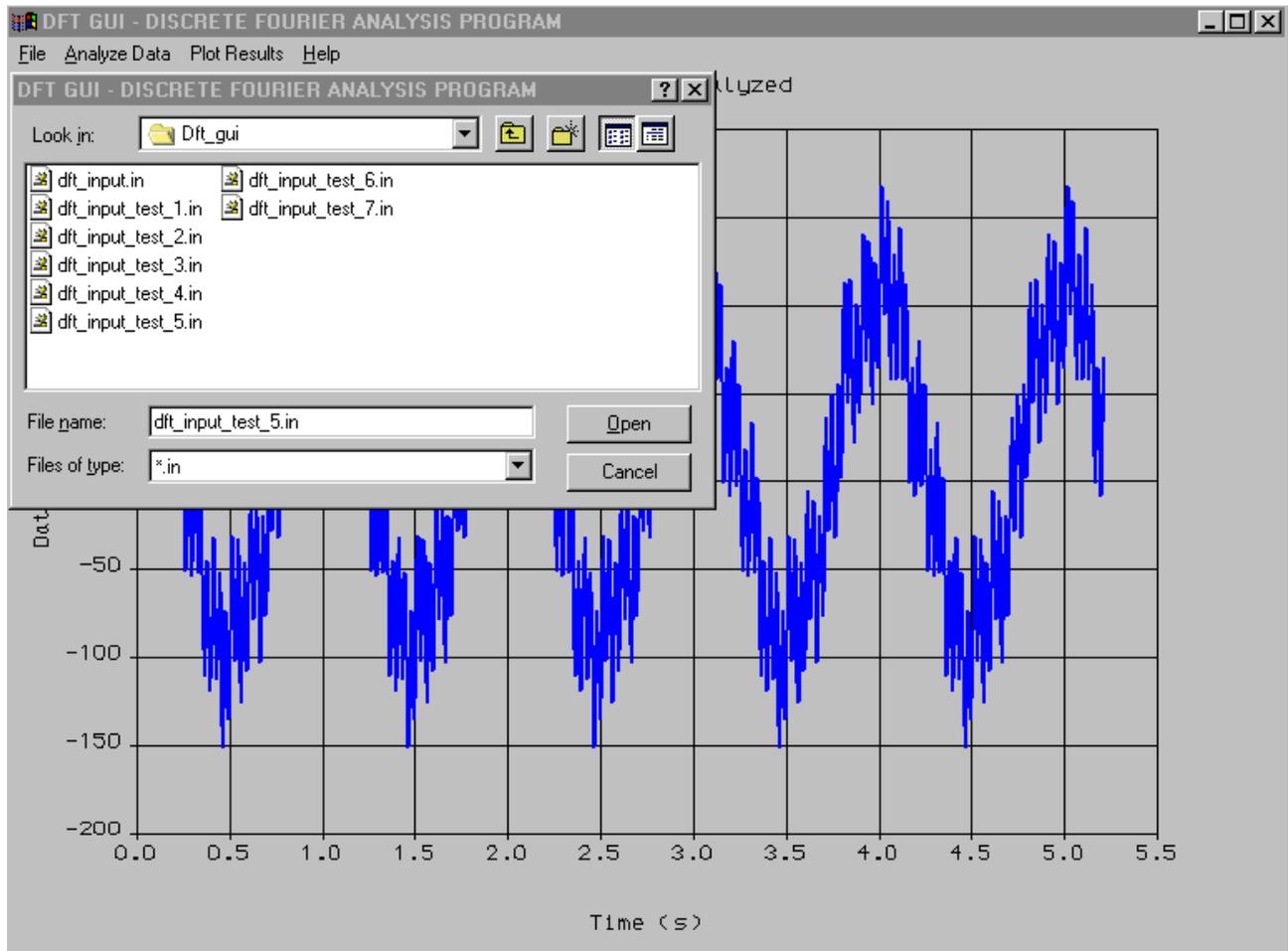
Output files contain the numerical values of the DFT analysis in ascii text format and can be examined using any text editor (i.e. Notepad in Windows). The contents of the output file generated from analyzing the “dft_input.in” file is, for example:

FREQUENCY (HZ), AMPLITUDE, POWER, AND PHASE DATA FROM DFT ANALYSIS					
K-TH	FREQUENCY	FREQ(K)	AMPLITUDE(K)	POWER(K)	PHASE(K)
1		0.024	0.09	0.004	0.706
2		0.049	0.17	0.015	1.049
3		0.073	0.39	0.076	1.216
4		0.098	4.87	11.844	1.312
5		0.122	0.59	0.176	1.375
6		0.146	0.30	0.045	1.421
7		0.171	0.21	0.022	1.456 ...

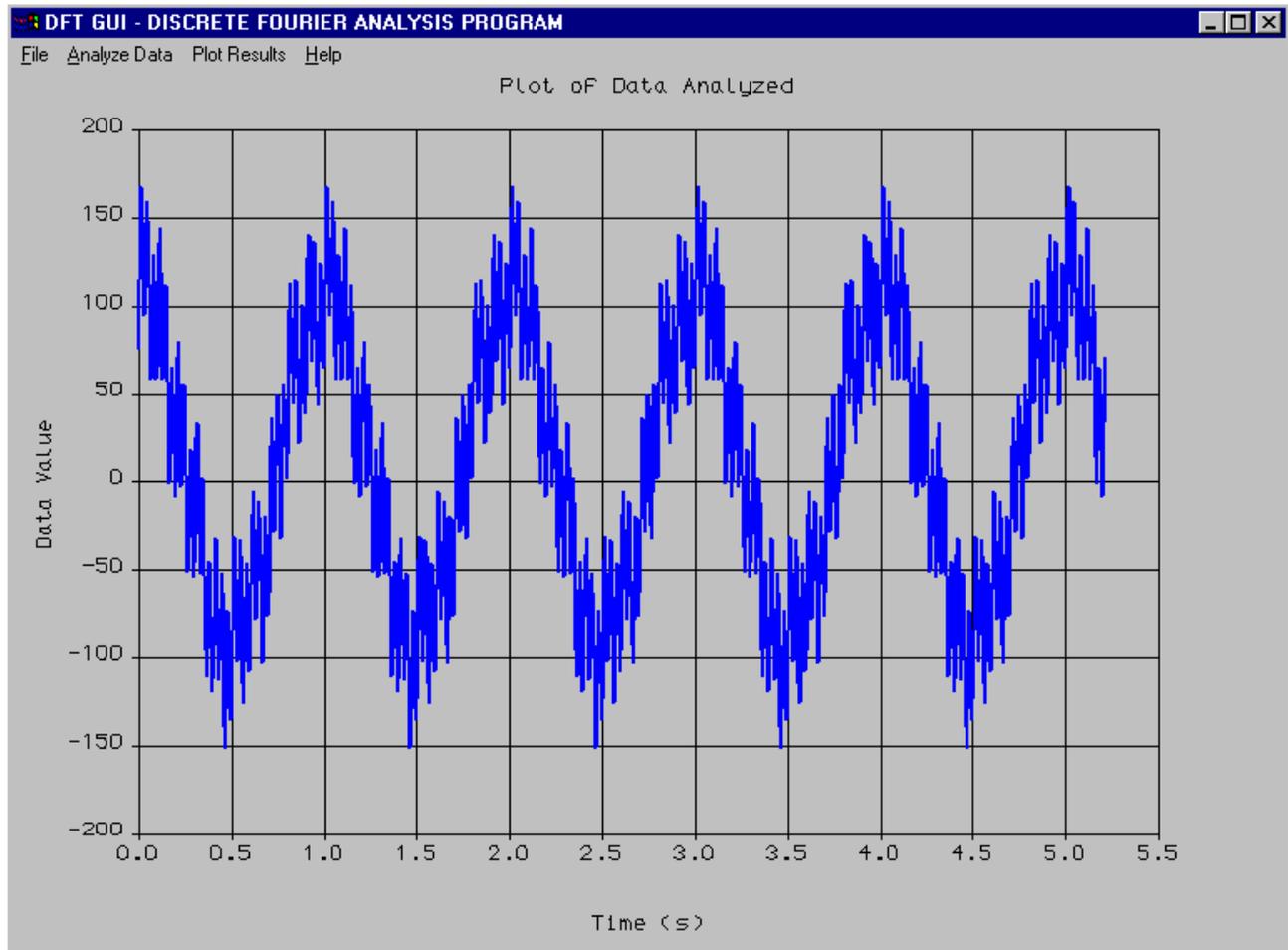
Note that it contains the index K of the frequency analyzed, the value of the K-th frequency analyzed, the amplitude of the K-th frequency, the power content of the K-th frequency, and the phase shift of the K-th frequency analyzed. **When using the software, the results contained in the output file should be reported since they are more accurate than estimating the values from the plots.**

4.0 Example: Running the Software and Reporting Results

Select the data input file “dft_input_test_5.in” using the File->Open Data File menu option as shown below:

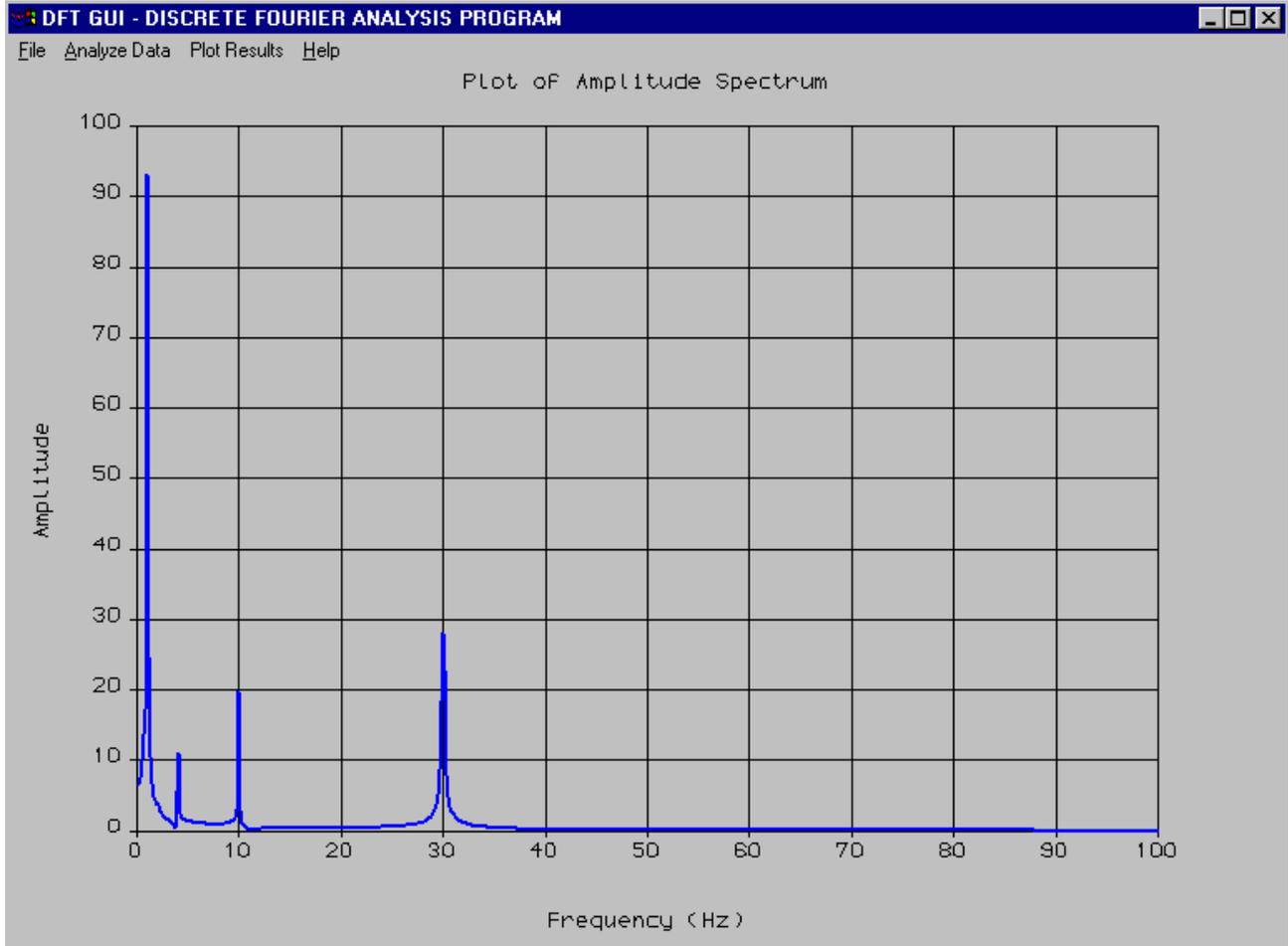


Run the DFT analysis on this data by selecting “Analyze Data->Run DFT on Selected Data File” from the program menus. Then select “Plot Results->Raw Data” from the program menus and the program output should appear as shown below:



This data file was generated using Excel, and was created from a Fourier series composed of four terms: a large amplitude, low frequency term (having a 1 Hz cycle frequency), and three higher frequency terms of much lower amplitudes. Note that in the input file "dft_input_test_5.in" the data is sampled every 0.005 s (200 Hz sampling rate).

The amplitude spectrum is plotted in DFT_GUI by selecting the “Plot Results->Amplitude Results” from program menus. For this example it appears as shown below:



For this case the actual amplitude of the lowest frequency term was 100, and from the plot shown above the peak amplitude from the analysis is about 93. As you can see with each of the four peaks, the amplitude information is spread out (or diffused) about the actual frequency in the Fourier series. Experiment with the sampling rate, and check out how the analysis is sensitive to it.

A final note: When reporting results using DFT_GUI, use the results in the output file for reporting frequency and amplitude information. It is generally not good practice to report information estimated from plots.