FFT Library

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Table 1: **Revision History**

Date	**Version**	**Notes**
Date 1	1.0	Notes
Date 2	1.1	Notes

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1 Functional Requirements Evaluation

Please reference TestPlan System Test Description Section https://github.com/741ProjectFFT/FFT/tree/master/Doc/TestPlan.

Test Guide for all system tests below:

Name	Date modified	Type	Size
Debug	12/20/2017 2:20 A...	File folder	
testcase	12/20/2017 2:03 A...	File folder	
AllTests.c	12/20/2017 2:18 A...	C Source	2 KB
ConsoleApplication1.vcxproj	12/20/2017 2:20 A...	VC++ Project	8 KB
ConsoleApplication1.vcxproj.filters	12/20/2017 2:20 A...	VC++ Project Filte...	2 KB
ConsoleApplication1.vcxproj.user	12/19/2017 11:00 ...	Per-User Project O...	1 KB
CuTest.c	12/19/2017 12:15 ...	C Source	8 KB
CuTest.h	7/22/2010 11:11 A...	C/C++ Header	5 KB
CuTestTest.c	7/22/2010 11:11 A...	C Source	18 KB
main.c	12/20/2017 2:06 A...	C Source	4 KB
myLab.c	12/20/2017 2:15 A...	C Source	37 KB
myLab.h	12/20/2017 12:05 ...	C/C++ Header	4 KB
stdafx.cpp	12/18/2017 8:33 A...	C++ Source	1 KB
stdafx.h	12/18/2017 8:33 A...	C/C++ Header	1 KB
StrUtil.c	12/19/2017 12:30 ...	C Source	1 KB
SystemTest.c	12/20/2017 2:20 A...	C Source	1 KB
targetver.h	12/18/2017 8:33 A...	C/C++ Header	1 KB

Figure 1: program files directory layout

Step1: Be aware that when we want to do system test we should add all .h files and .c files into the project.
Step2: Remove the SystemTest.c and ALLTEST.c from the project not deleting them.
Step3: Run each block once a time. Step4: Then remove the main.c from the project and add SystemTest.c into this project.
Step5: Open SystemTest.c file and change the file name every time when we

want to test each test cases' results.
Because we already run the main function for each block so that we got all output files with a corresponding name.
Files with name called "test*_out.txt" is the output for "test*.txt" from matlab. And "test*_real.txt" is the output file from this FFT library. Thus, the file name should be changed every time with a pair "test*_out.txt" and "test*_real.txt" and * should be the same number.
Step6: Run SystemTest.c, the window will show the MSE value.

1.1 T-1 Radix-2 Complex Number FFT Calculation Function (T 1)

Test input numbers in "test1.txt". The result is shown below:

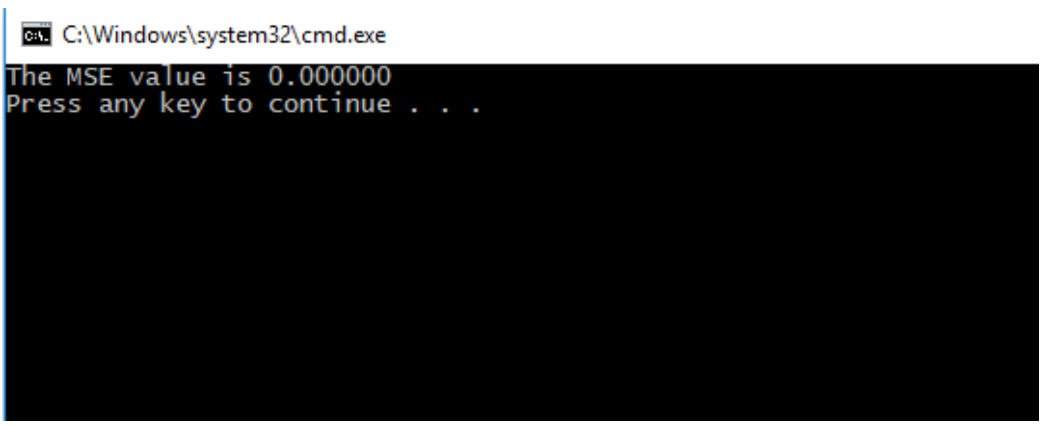

Figure 2: result from T-1

MSE = 0.000000 means that the results from Matlab and this FFT library are nearly the same and the system test passed.

1.2 T-2 Radix-2 Real Number Calculation Function (T 2)

Test input numbers in "test2.txt". The result is shown below:

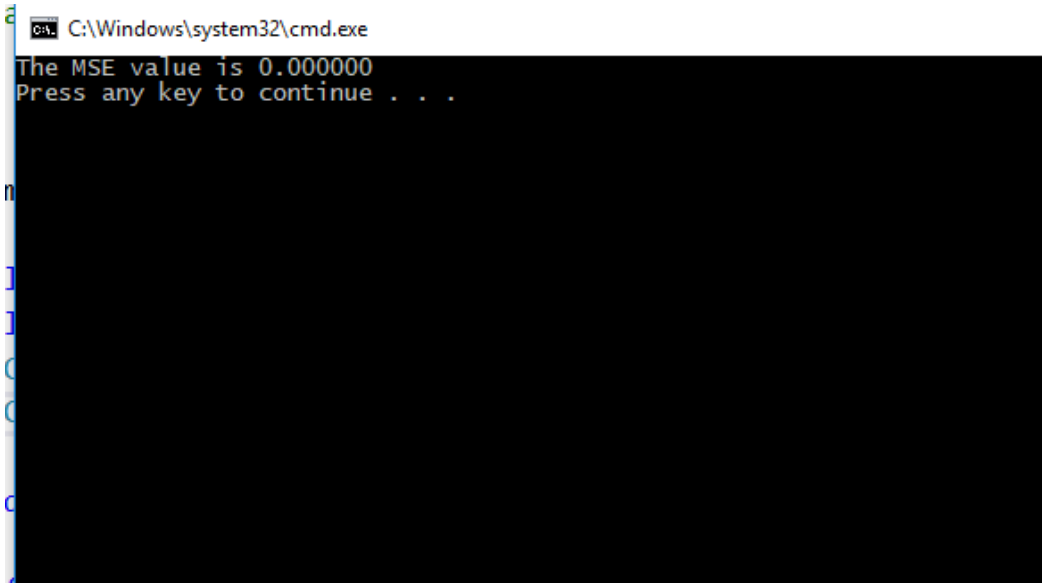

Figure 3: result from T-2

MSE = 0.000000 means that the results from Matlab and this FFT library are nearly the same and the system test passed.

1.3 T-3 Radix-2 Complex Number IFFT Calculation Function (T 3)

Test input numbers in "test1.txt". The result is shown below:

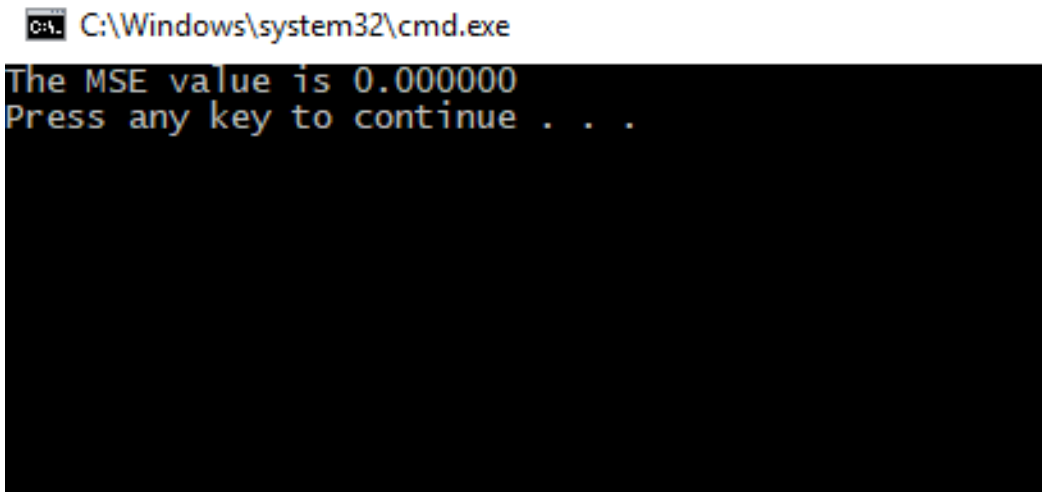

Figure 4: result from T-3

MSE = 0.000000 means that the results from Matlab and this FFT library are nearly the same and the system test passed.

1.4 T-4 Radix-2 Real Number IFFT Calculation Function (T 4)

Test input numbers in "test4.txt". The result is shown below:

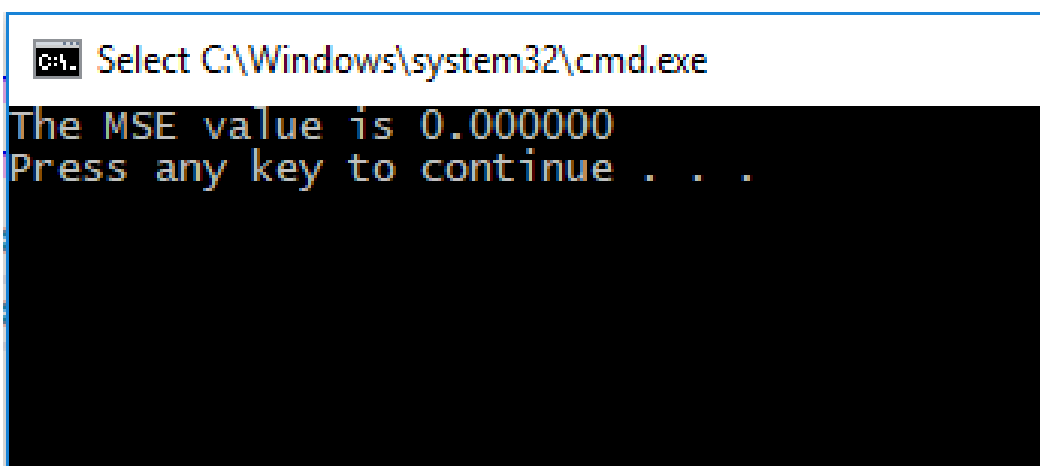

Figure 5: result from T-4

MSE = 0.000000 means that the results from Matlab and this FFT library are nearly the same and the system test passed.

1.5 T-5 Radix-3 Complex Number FFT Calculation Function (T 5)

Test input numbers in "test5.txt".
Not implemented successfully.

1.6 T-3 Radix-2 Complex Number IFFT Calculation Function (T 6)

Test input numbers in "test6.txt".
Not implemented successfully.

1.7 T-3 Radix-2 Complex Number IFFT Calculation Function (T 7)

Test input numbers in "test7.txt".
Not implemented successfully.

1.8 T-3 Radix-2 Complex Number IFFT Calculation Function (T 8)

Test input numbers in "test8.txt".
Not implemented successfully.

2 Nonfunctional Requirements Evaluation

2.1 Usability

2.2 Performance

2.3 etc.

3 Comparison to Existing Implementation

Compare with FFT Library in Matlab(T 9)

test1_out.txt - Notepad

File Edit Format View Help

```
5861828.72000000 & 5750417.21000000
896371.348755124 & 507434.736013154
21609.0449156676 & 144493.289820883
156166.043924289 & -501861.568909108
-185732.590000000 & 422424.120000000
478500.691522897 & 838804.772557229
540974.912617504 & -1839502.43030433
-144987.839886619 & 550852.014520090
449628.820000000 & -258542.230000000
252865.924965056 & 888894.729969686
1108915.47508433 & 1466453.19017912
423410.587155827 & 656557.657491859
-205081.030000000 & 732896.220000000
-121868.205243077 & 567744.281459931
-1305885.99261750 & 106106.870304331
210127.288806502 & 70308.4168971586
```

Figure 6: result from test1_out.text

test1_real.txt - Notepad

File Edit Format View Help

```
5861828.720000 & 5750417.21000000
896371.348755 & 507434.736013
21609.044916 & 144493.289821
156166.043924 & -501861.568909
-185732.590000 & 422424.120000
478500.691523 & 838804.772557
540974.912618 & -1839502.430304
-144987.839887 & 550852.014520
449628.820000 & -258542.230000
252865.924965 & 888894.729970
1108915.475084 & 1466453.190179
423410.587156 & 656557.657491859
-205081.030000 & 732896.220000
-121868.205243 & 567744.281460
-1305885.992618 & 106106.870304
210127.288807 & 70308.416897
```

Figure 7: result from test1_real.text

As the output values from Matlab and this FFT library, the precision of the numbers are different. So this library can be further improved to achieve

better precision.

4 Unit Testing

Test guide:
Remove main.c and SystemTest.c from project and add ALLTEST.c to project and run it, the result will be shown below:

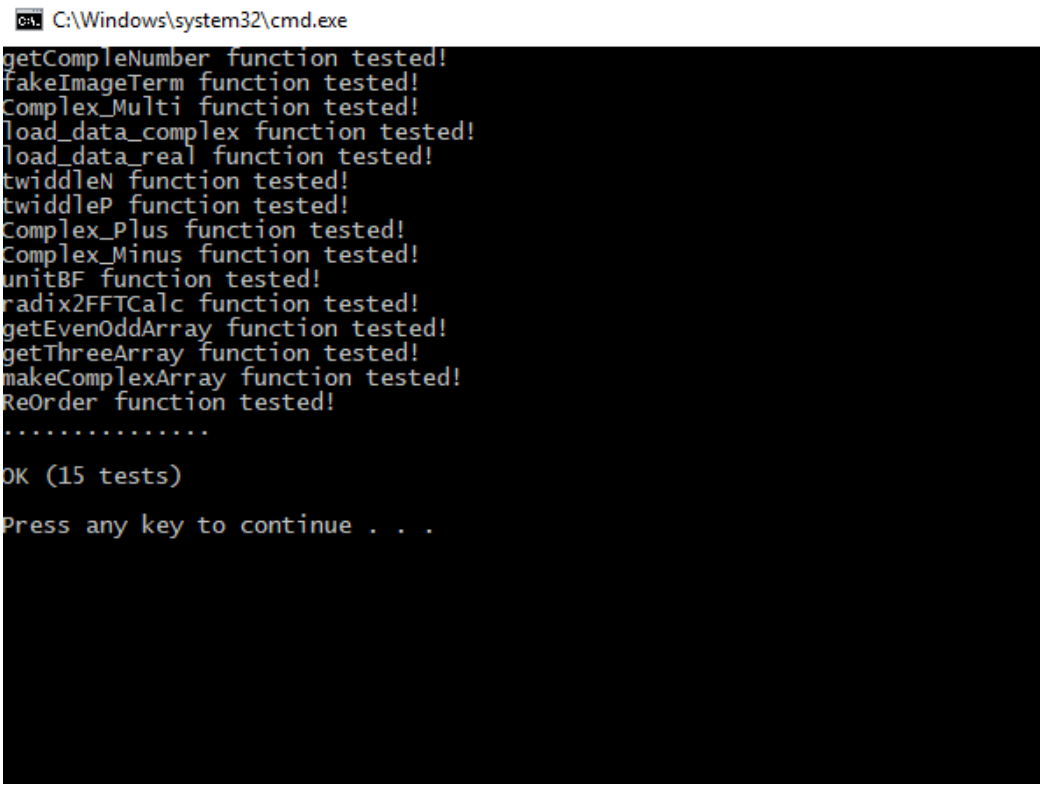

Figure 8: result from Test

Detailed unit test case including inputs and outputs information was described in TestPlan unit test section. Reference https://github.com/741ProjectFFT/FFT/tree/master/Doc/TestPlan

5 Changes Due to Testing

- Because of adding system test and unit test, the whole project will have totally three main functions. And they can not be run even can not exits in the project at the same time.
- myLab.c file was added more functions used to do unit test.
- CuTest.h and CuTest.h files should be included in th project.

6 Automated Testing

If consider the system test and unit test as independent test behaviors, unit test is fully automated. For system test, it was done by manually and automated half to half since we have to manually add files and remove files from our project. Also the test file name have to be modified manually.

7 Trace to Requirements

Table 2: Requirements Traceability Matrix

Test Number	**CA Instance Model**
T1	IM1
T2	IM1
T3	IM1
T4	IM1
T5	IM2
T6	IM2
T7	IM2
T8	IM2
T9	IM1, IM2
T10	IM1, IM2

Due to differences between CA and SRS template. There is no specific requirement stated in CA. So here only map test number to CA Instance models.

8 Trace to Modules

Table 3: Model Traceability Matrix

Test Number	CA Instance Model
T1	M1, M2, M3
T2	M1, M2, M3
T3	M1, M2, M3
T4	M1, M2, M3
T5	M1, M2, M3
T6	M1, M2, M3
T7	M1, M2, M3
T8	M1, M2, M3
T9	M1, M2, M3
T10	M1, M2, M3

M1 reference Input Module;
M2 reference FFT Calculation Module;
M1 reference Output Module;

9 Code Coverage Metrics

N/A