**********DRAFT**********

Testing C code with Ultibo Bare Metal, Ultibo TFTP and Ultibo Bitmaps
01/24/17

Goal: This is hopes of improving the speed of computing the JPEG2000. The RPi2B or RPi3B will run Ultibo Bare Metal.

To transfer images over an Ethernet connecttion to a RPi2B or RPi3B.

Perform the JPEG 2000 lifting step which is the firts step in the JPEG2000.

Status: Topleft is where the C routine is being called. Bottomleft is a 512 x 512 bitmap
In the file test.c the contents of lifing.c
In the topright is the tftp process.
# ultibo-tftp

A reasonably quick method of transferring files in an Ultibo project.
It uses Trival FTP based on RFC 1350
Approx upload times around 16 secs for kernel7.img of approx 2.2 MB

```
tftp 192.168.1.185
tftp> binary
tftp> put grn-out.32t
Sent 1048576 bytes in 4.0 seconds
tftp> get grn-out.32t xx
Received 1048580 bytes in 4.0 seconds
tftp> quit
```

https://github.com/pjde/ultibo-tftp.git

```
extern  void    singlelift(int rb, int w, int * const ibuf, int * const obuf);
extern  void    ilift(int rb, int w, int * const ibuf, int * const obuf);
extern  void    lifting(int w, int *ibuf, int *tmpbuf);
```

This is needed to add the fpc compiler to the PATH.

```
export PATH=/home/pi/ultibo/core/fpc/bin:$PATH
echo $PATH
/home/pi/ultibo/core/fpc/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/local/games:/usr/games
```

```
arm-none-eabi-gcc -O2 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c test.c
```

```
arm-none-eabi-ar rcs libtest.a test.o
```

```
fpc -vi -B -Tultibo -Parm -CpARMV7A -WpRPI2B @/home/pi/ultibo/core/fpc/bin/rpi2.cfg -O2 LibCTestRPi2.lpr
```

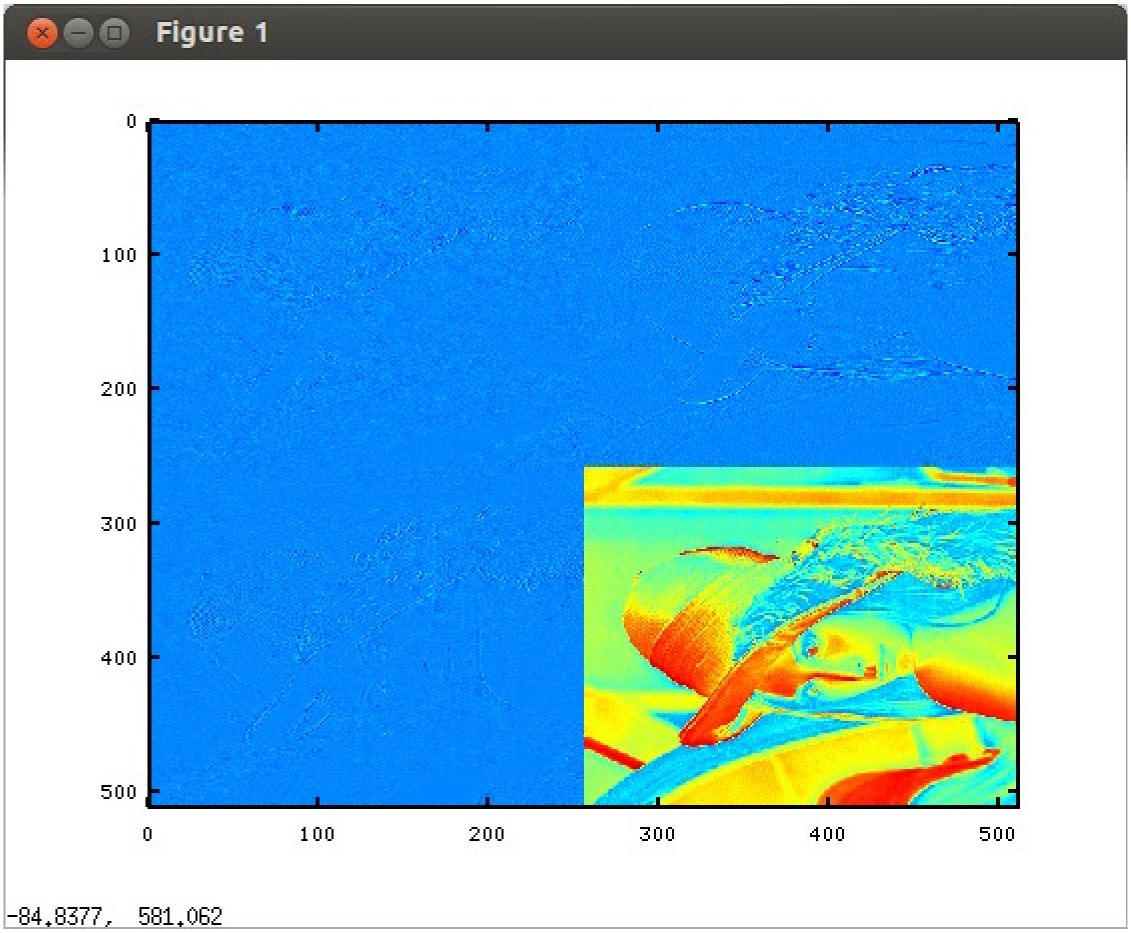
./build_liftmain.sh compiles lifting.c & liftmain.c --> liftmain

```
./liftmain lena_rgb_512.png
        red-out.32t
```

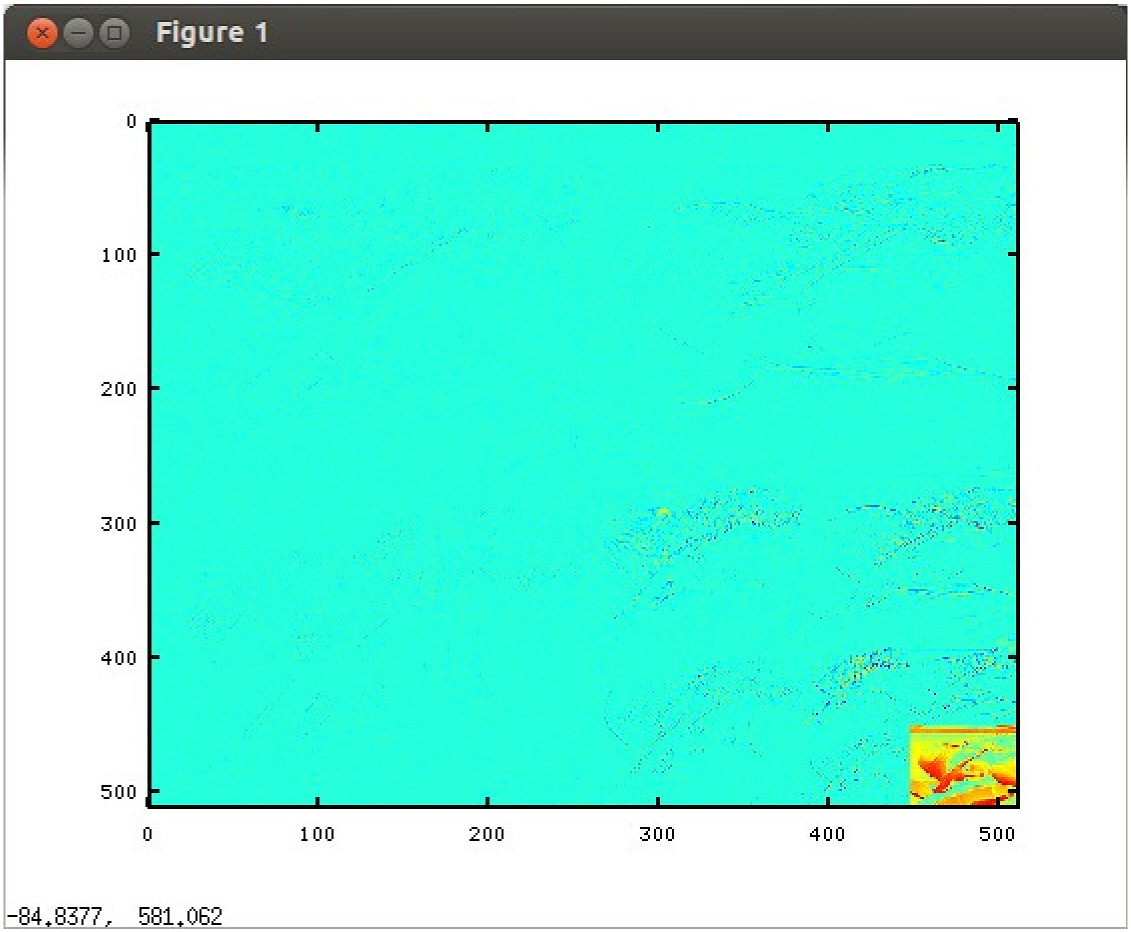
line 101 lifting.c   const int   LVLS = 1; performs 1 level forward DWT

lines 230-246 in lifting.c when commented does not perform the inverse DWT.

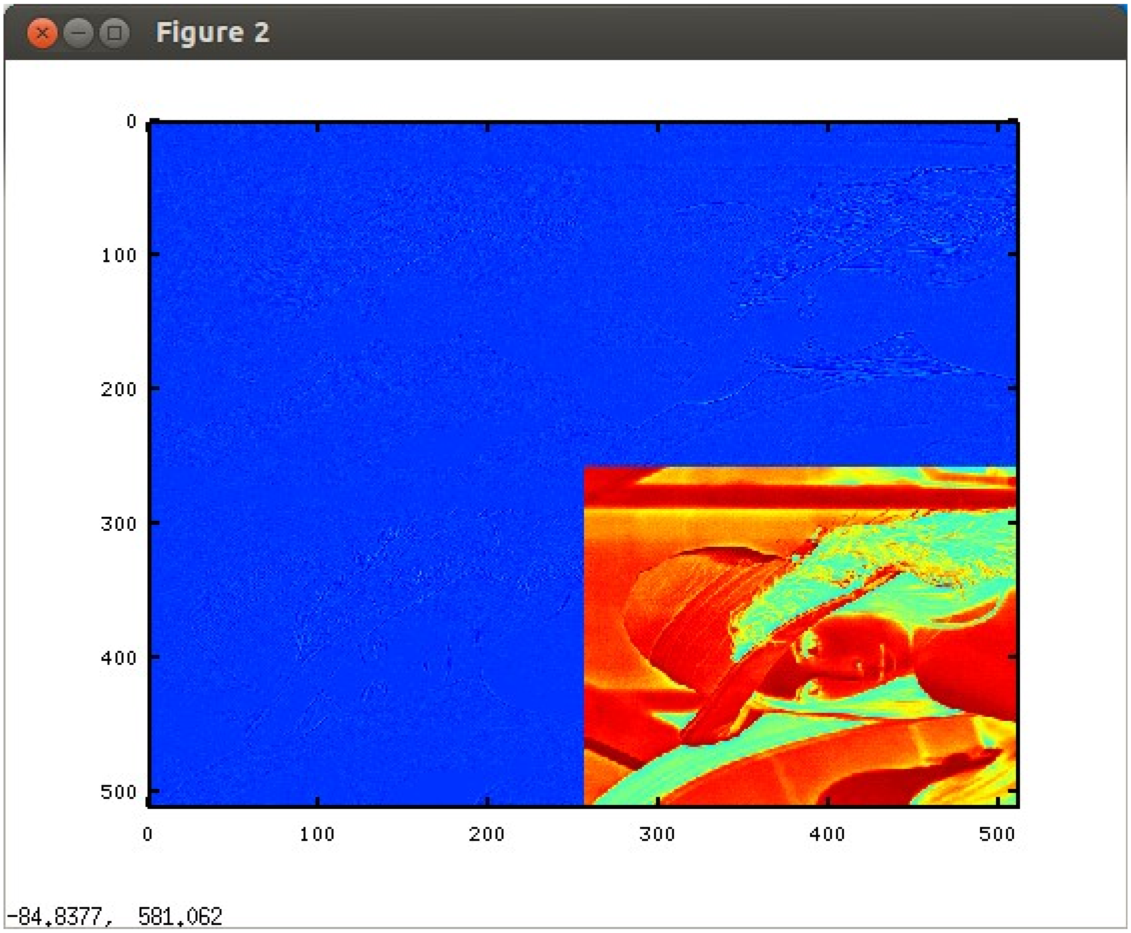
```
/*
        for(lvl=(LVLS-1); lvl>=0; lvl--) {
                int     offset;

                w <<= 1;

                if (lvl)
                        offset = ov[lvl-1];
                else
                        offset = 0;
                ip = &ibuf[offset];
                tp = &tmpbuf[offset];

                ilift(rb, w, ip, tp);
                ilift(rb, w, tp, ip);
        }
        */
```



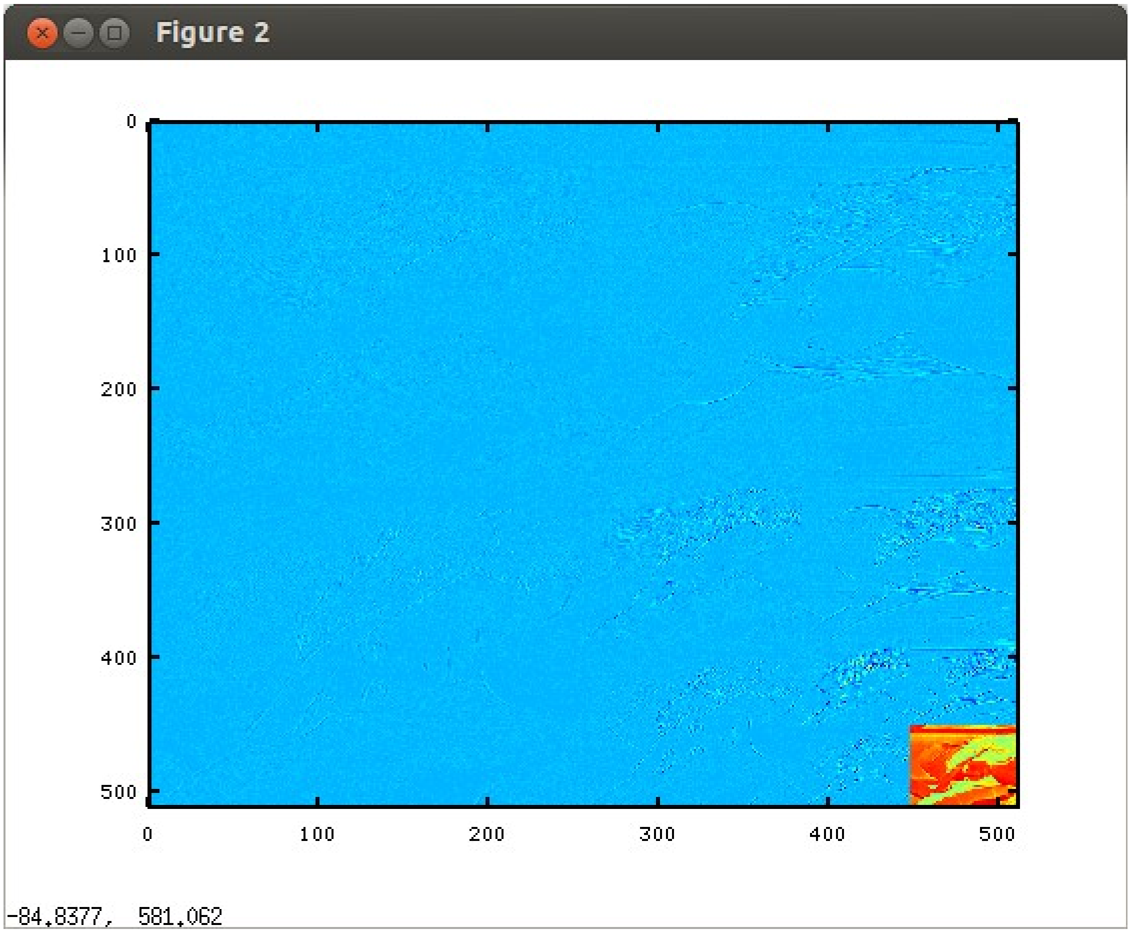
The image above is 1 level forward DWT red subband
The file red-out.32t



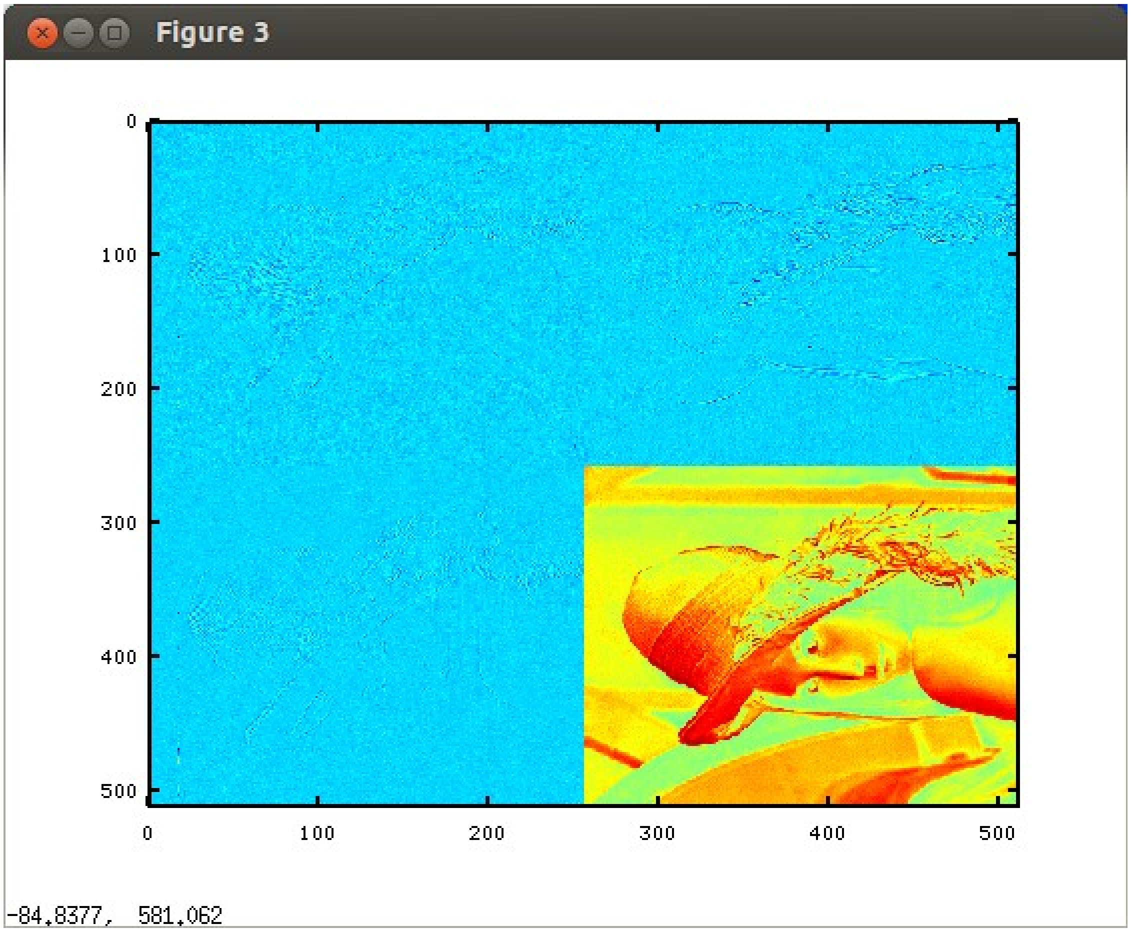
The image above is 3 levels forward DWT red subband
The file red-out.32t



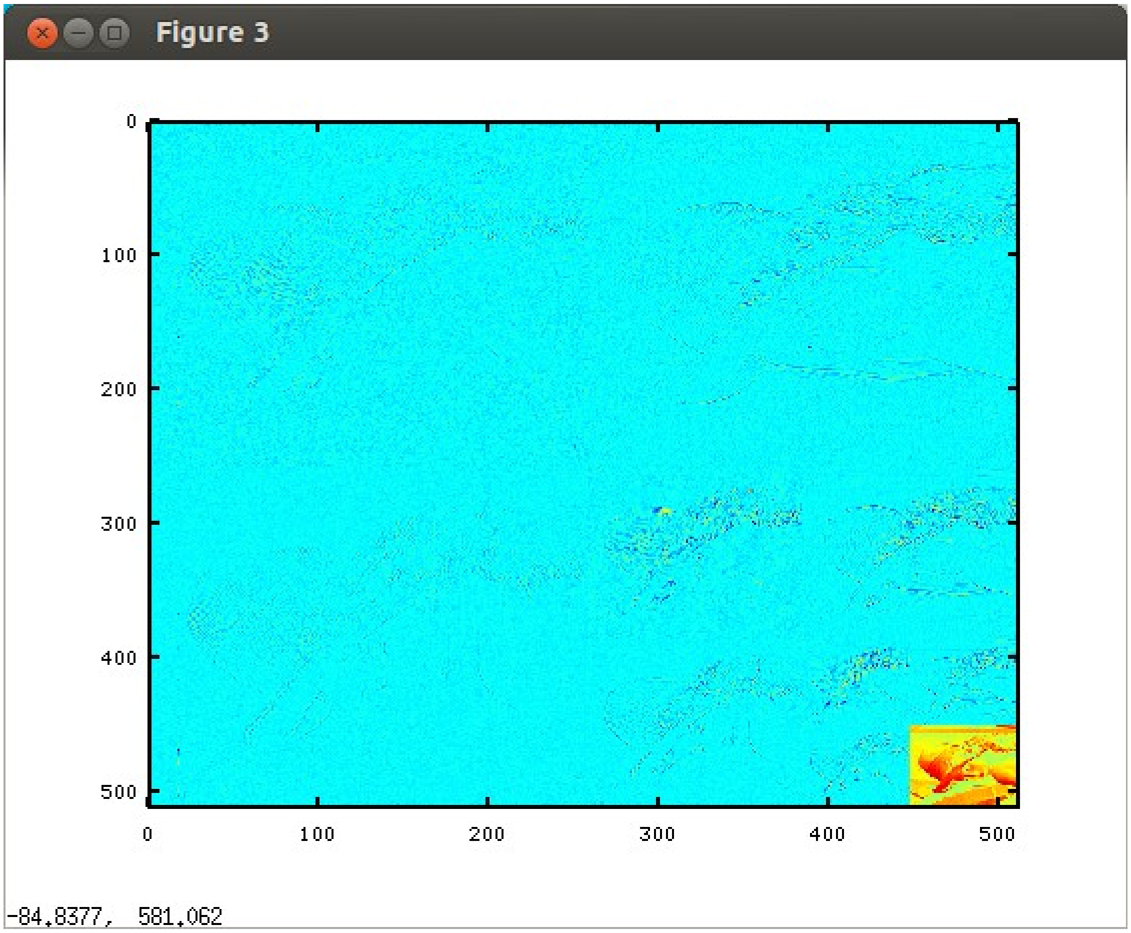
The image above is 1 level forward DWT grn subband
The file grn-out.32t



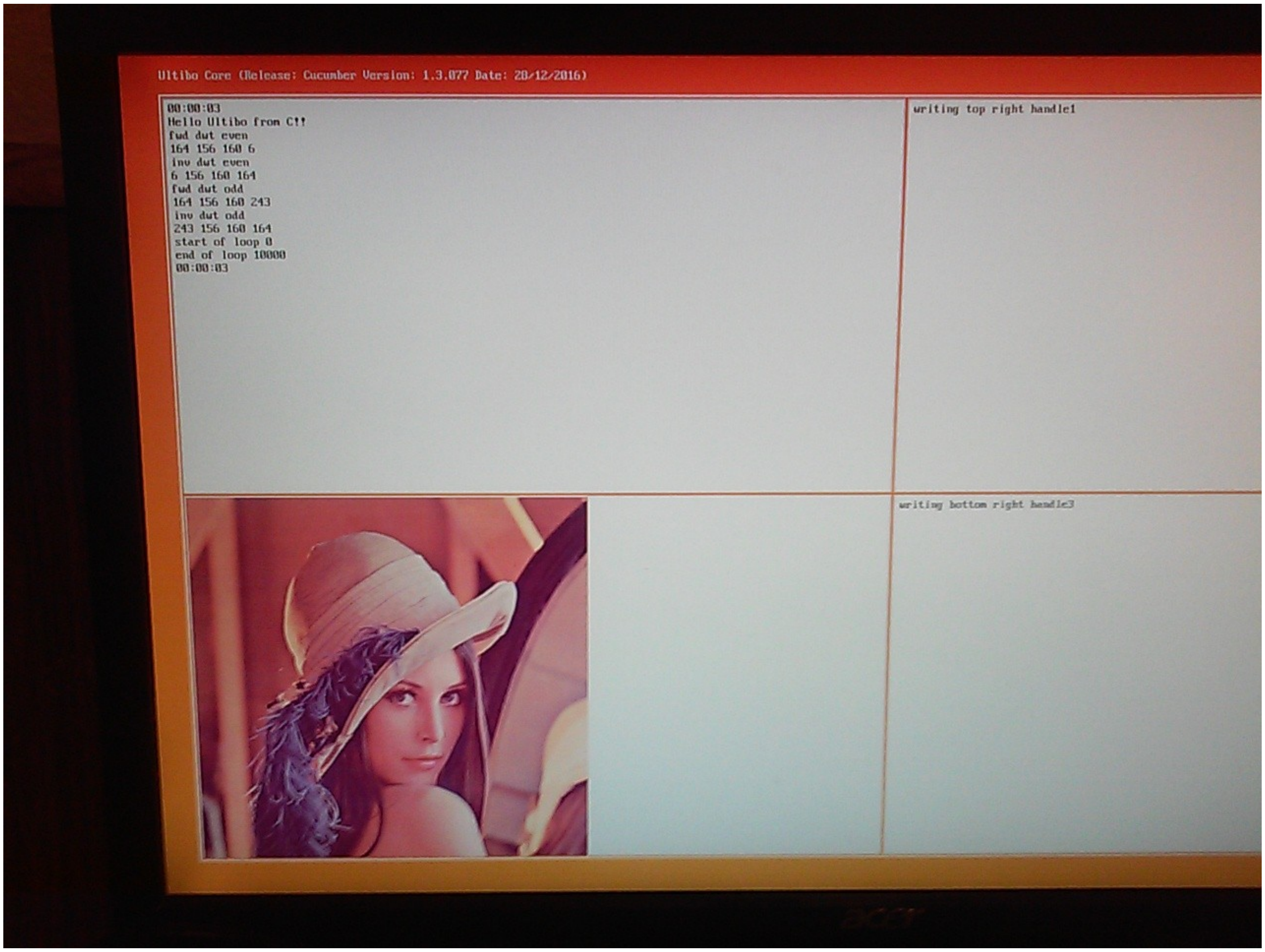
The image above is 3 levels forward DWT grn subband
The file grn-out.32t



The image above is 1 level forward DWT blu subband
The file blu-out.32t



The image above is 3 levels forward DWT blu subband
The file blu-out.32t



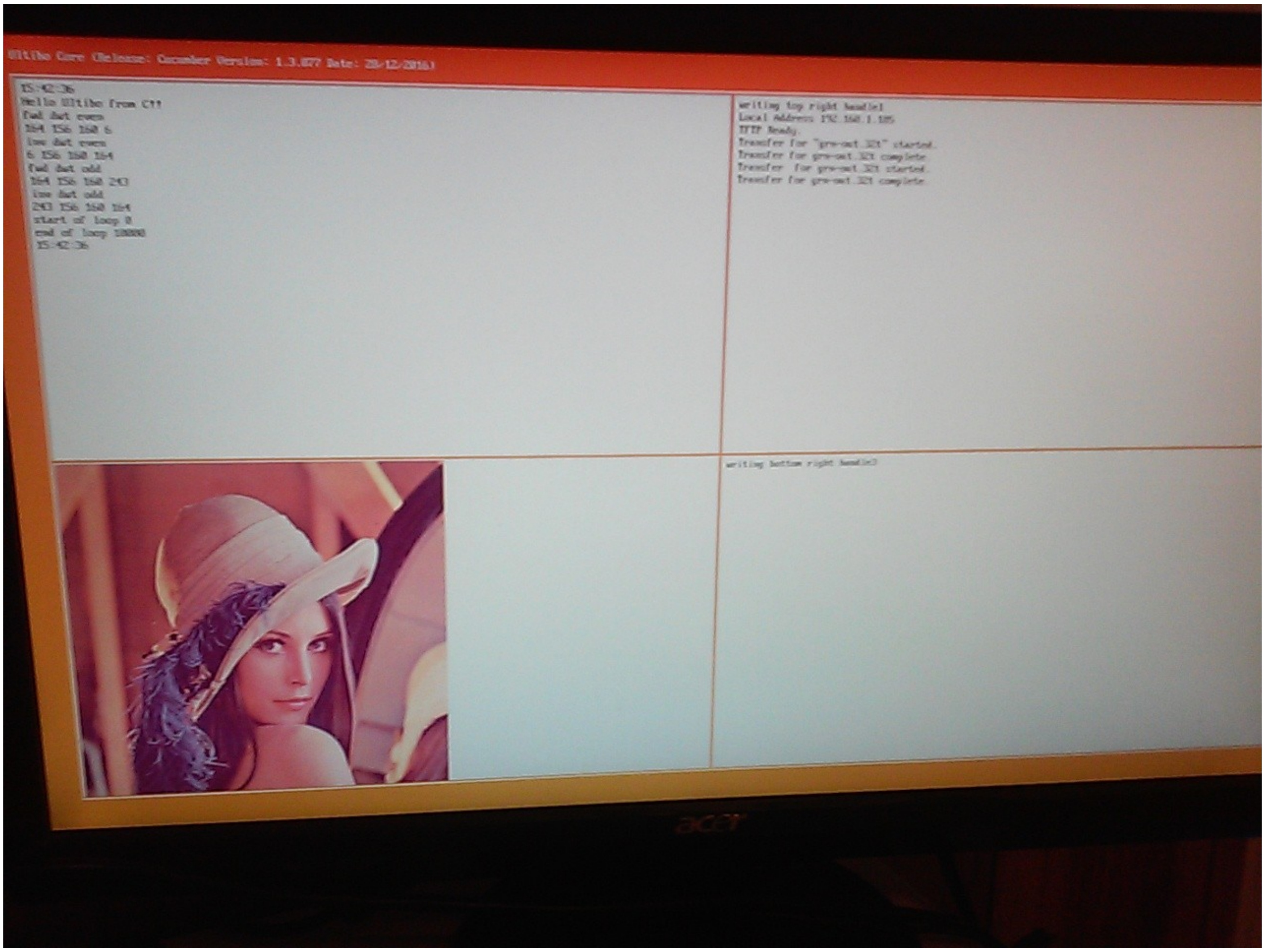
Ultibo Core (Release: Cucumber Version: 1.3.077 Date: 28/12/2016)

```
00:00:03
Hello Ultibo from C!!
fwd dwt even
164 156 160 6
inv dwt even
6 156 160 164
fwd dwt odd
164 156 160 243
inv dwt odd
243 156 160 164
start of loop 0
end of loop 10000
00:00:03
```

```
writing top right handle1
```

```
writing bottom right handle3
```

The above image is the running on RPi3B as compiled for RPi2B on 01/23/17.



```
Ultibo Core (Release: Cucumber Version: 1.3.077 Date: 28/12/2016)
```

```
15:42:36
Hello Ultibo from C!!
fwd dwt even
164 156 160 6
inv dwt even
6 156 160 164
fwd dwt odd
164 156 160 243
inv dwt odd
243 156 160 164
start of loop 0
end of loop 10000
15:42:36
```

```
writing top right handle1
Local Address 192.168.1.105
TFTP Ready.
Transfer for "grw-out.32t" started.
Transfer for grw-out.32t complete.
Transfer  for grw-out.32t started.
Transfer for grw-out.32t complete.
```

```
writing bottom right handle3
```