**********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

pi@raspberrypi3:~/jpeg-2000-test/bare-metal/LibC $ tftp 192.168.1.185
tftp> binary
tftp> put red-out.32t
Sent 1048576 bytes in 5.3 seconds
tftp>

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
```

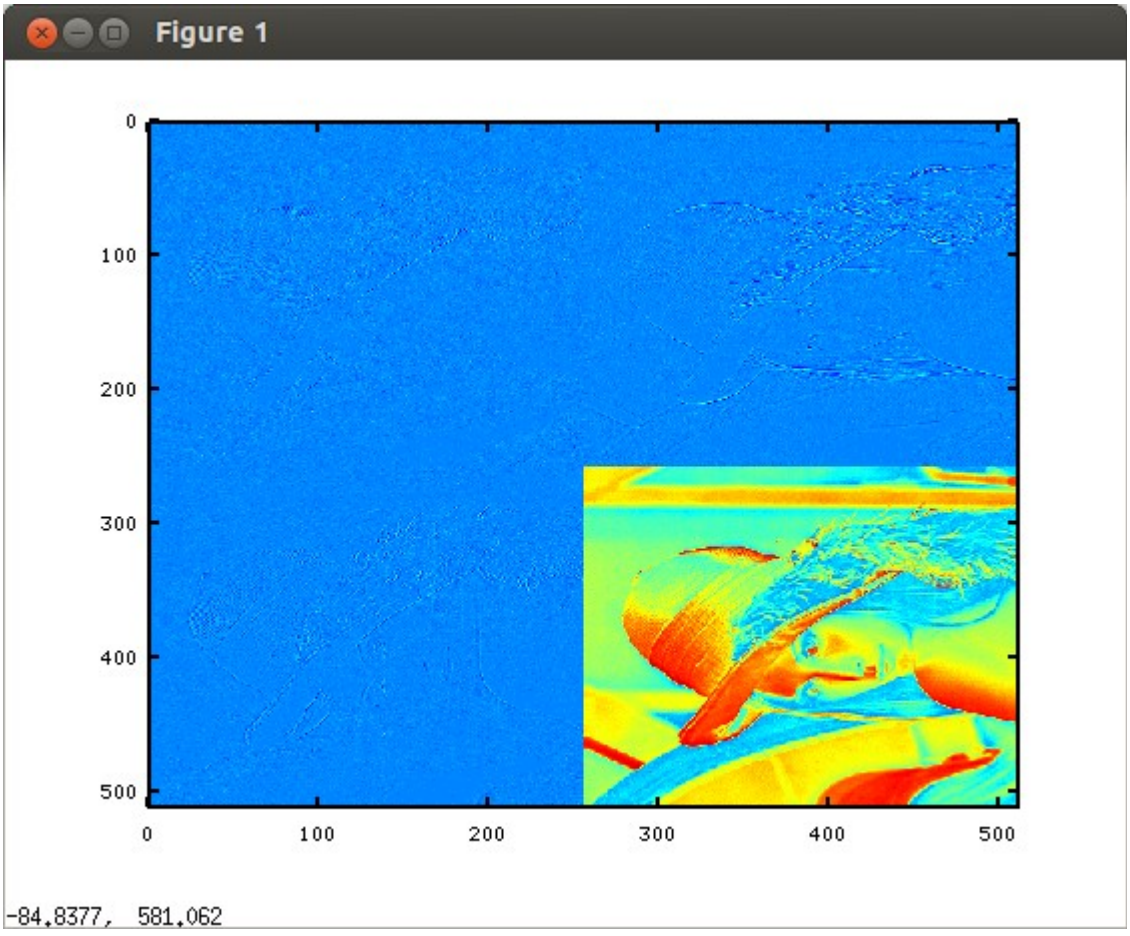
./build_liftmain.sh compiles lifting.c & liftmain.c --> liftmain

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

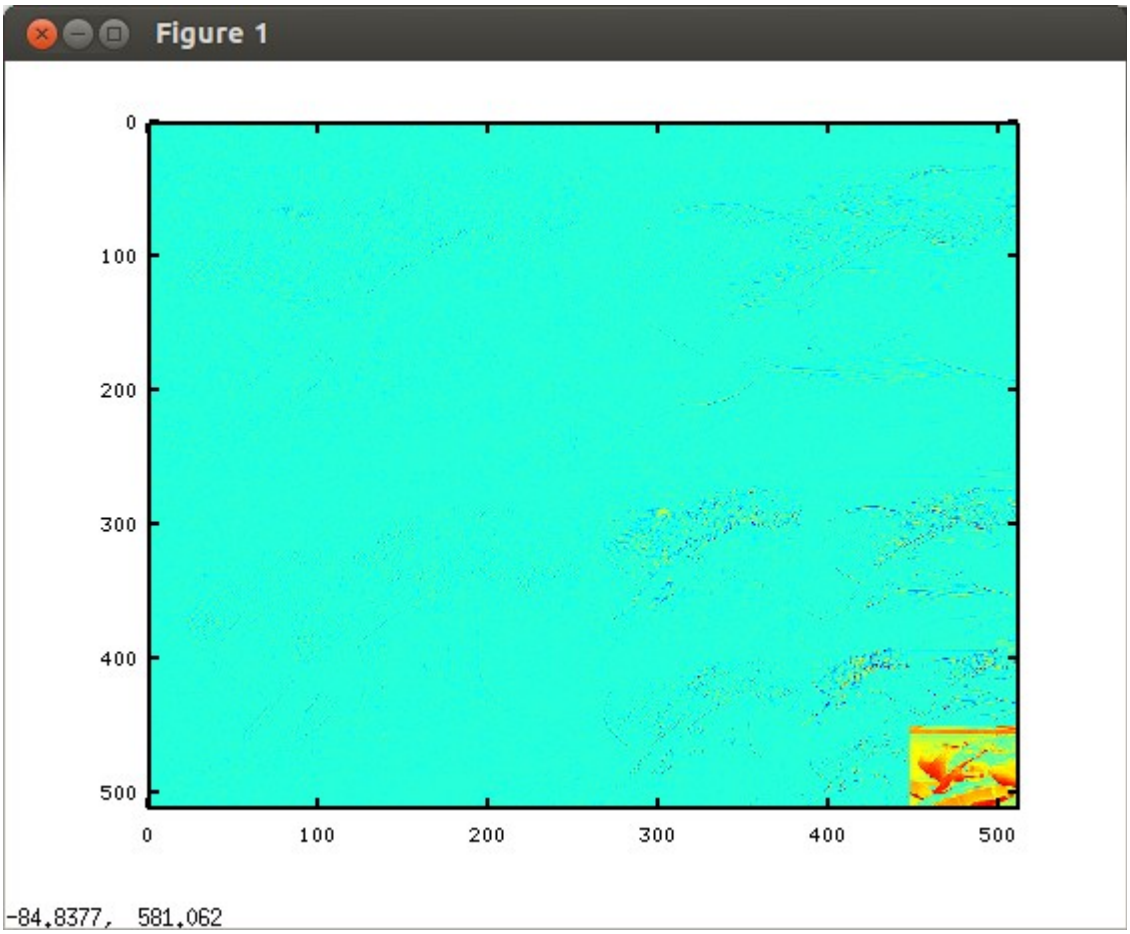
line 101 lifting.c const int LVLS = 1; performs 1 level forward DWT

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

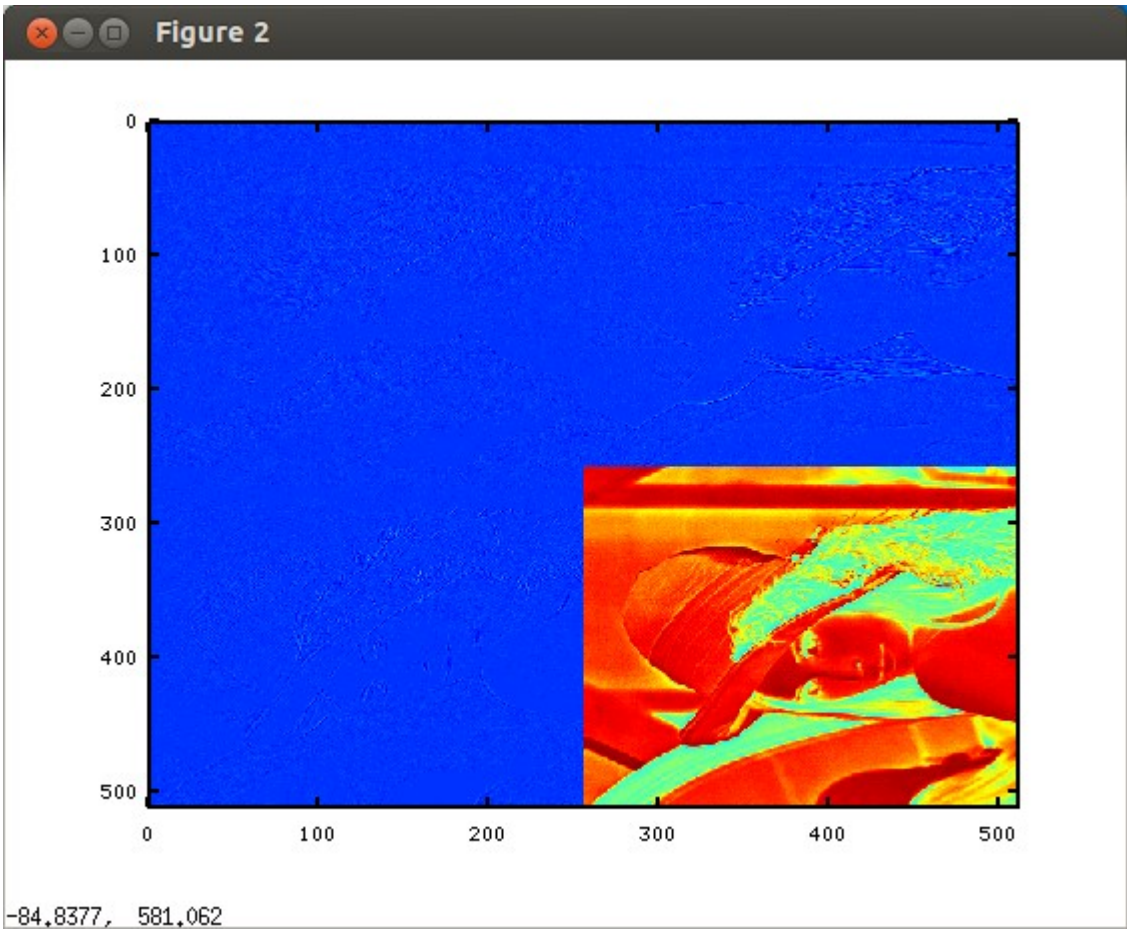
```
/*
        for(lvl=(LVLS-1); lvl>=0; lvl--) {
                int     offset;

                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);
        }
        */
```



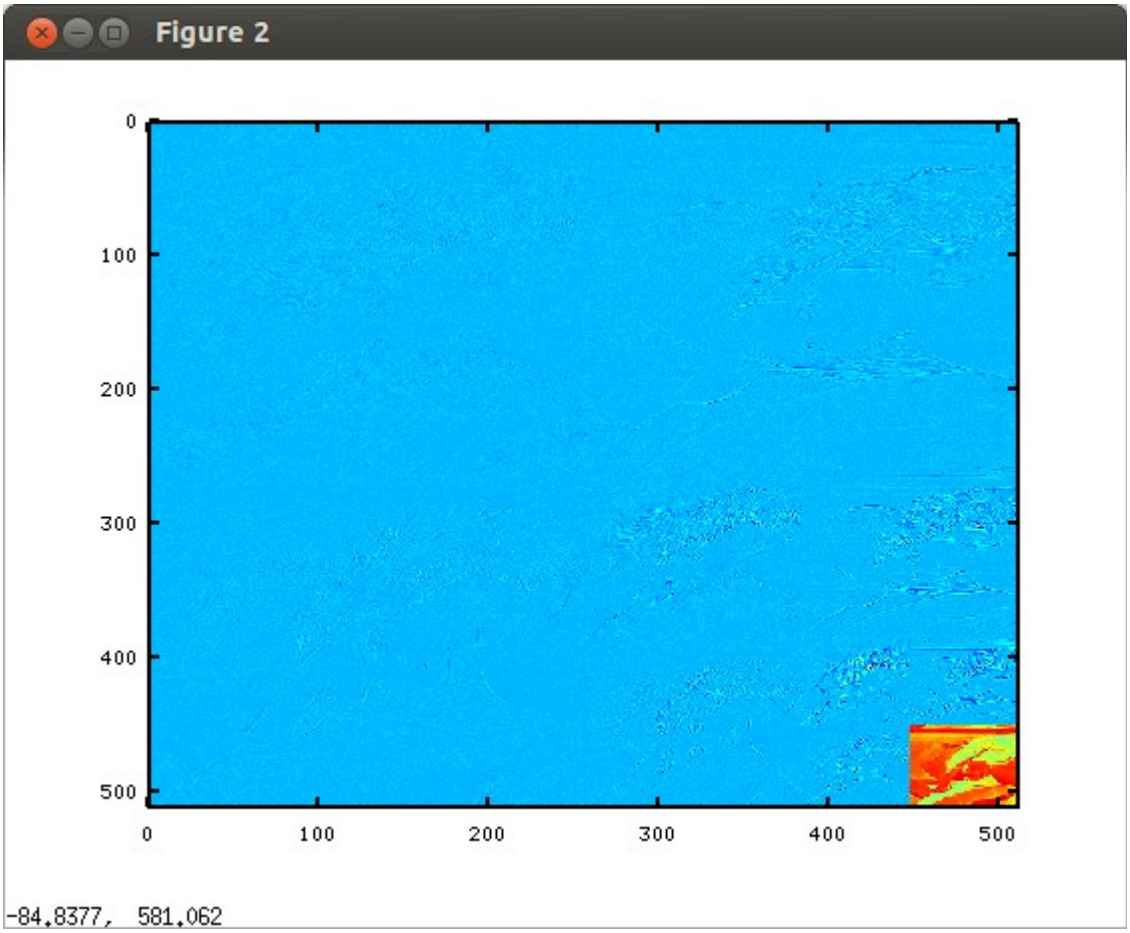
The image above is 1 level forward DWT red subband
The file red-out.32t



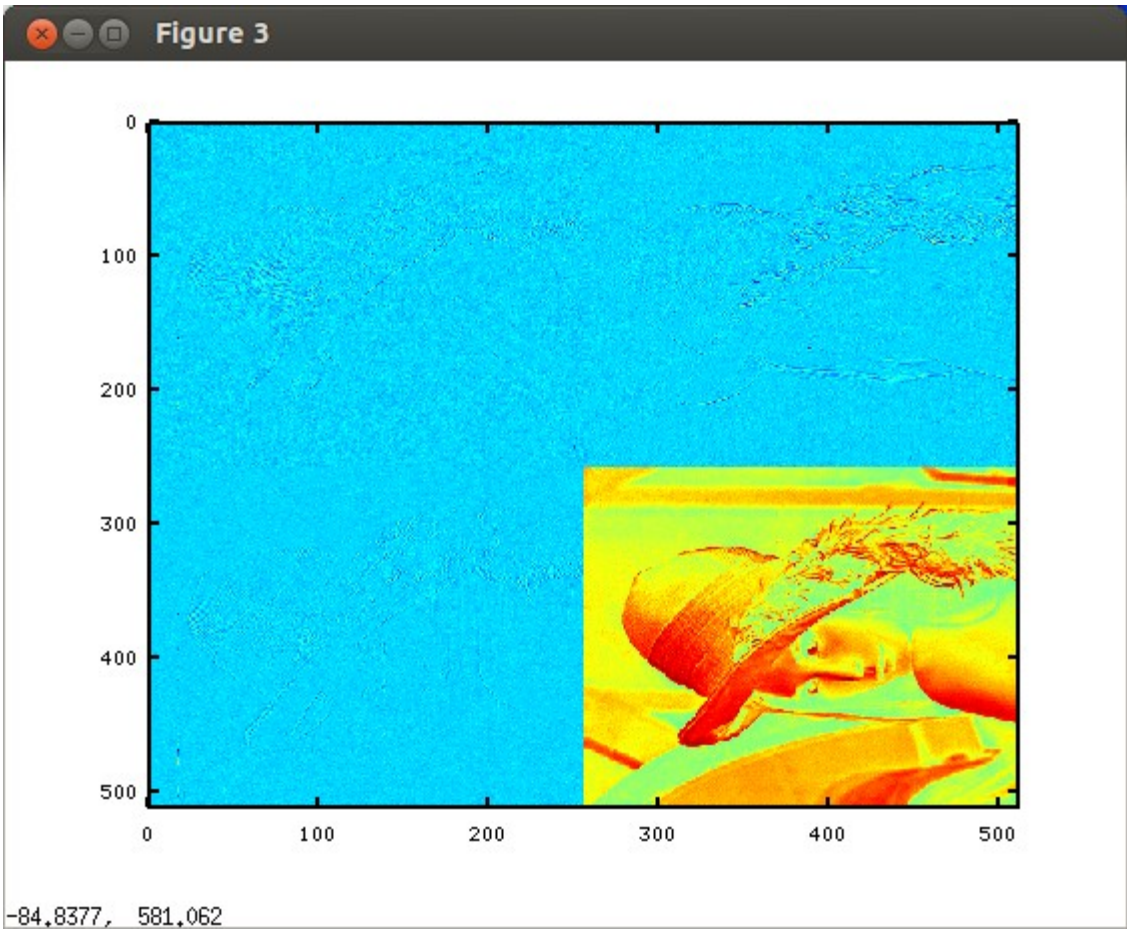

The image above is 3 levels forward DWT red subband
The file red-out.32t



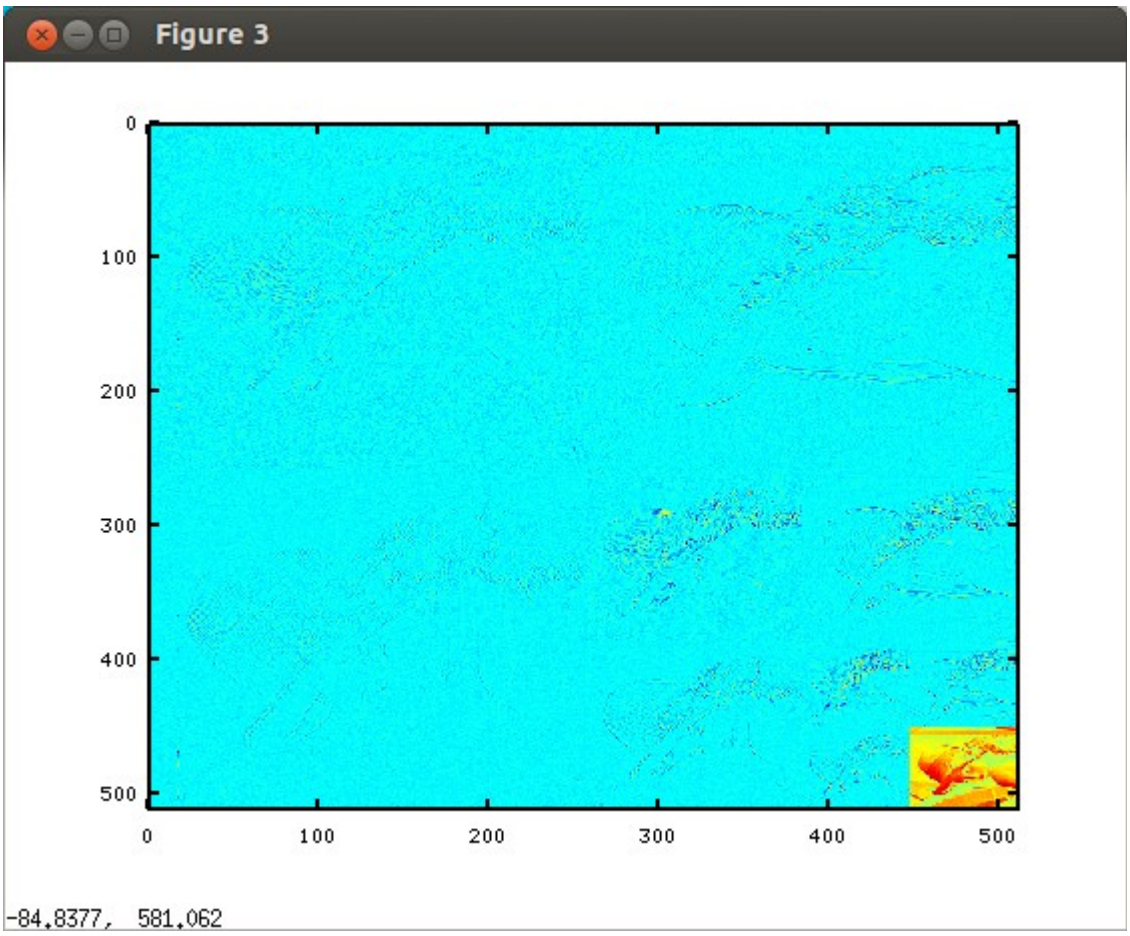

The image above is 1 level forward DWT grn subband
The file grn-out.32t



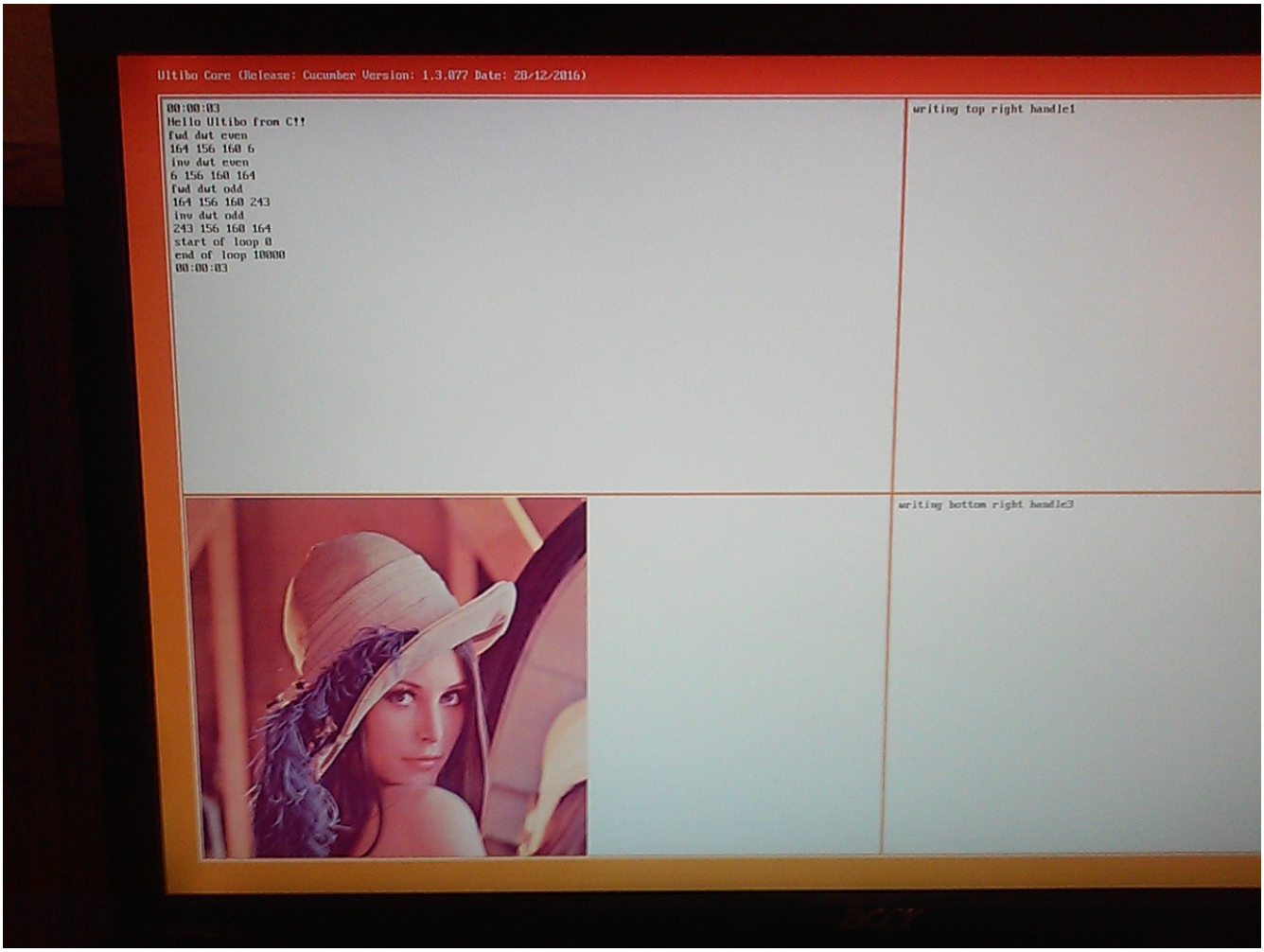

The image above is 3 levels forward DWT grn subband
The file grn-out.32t



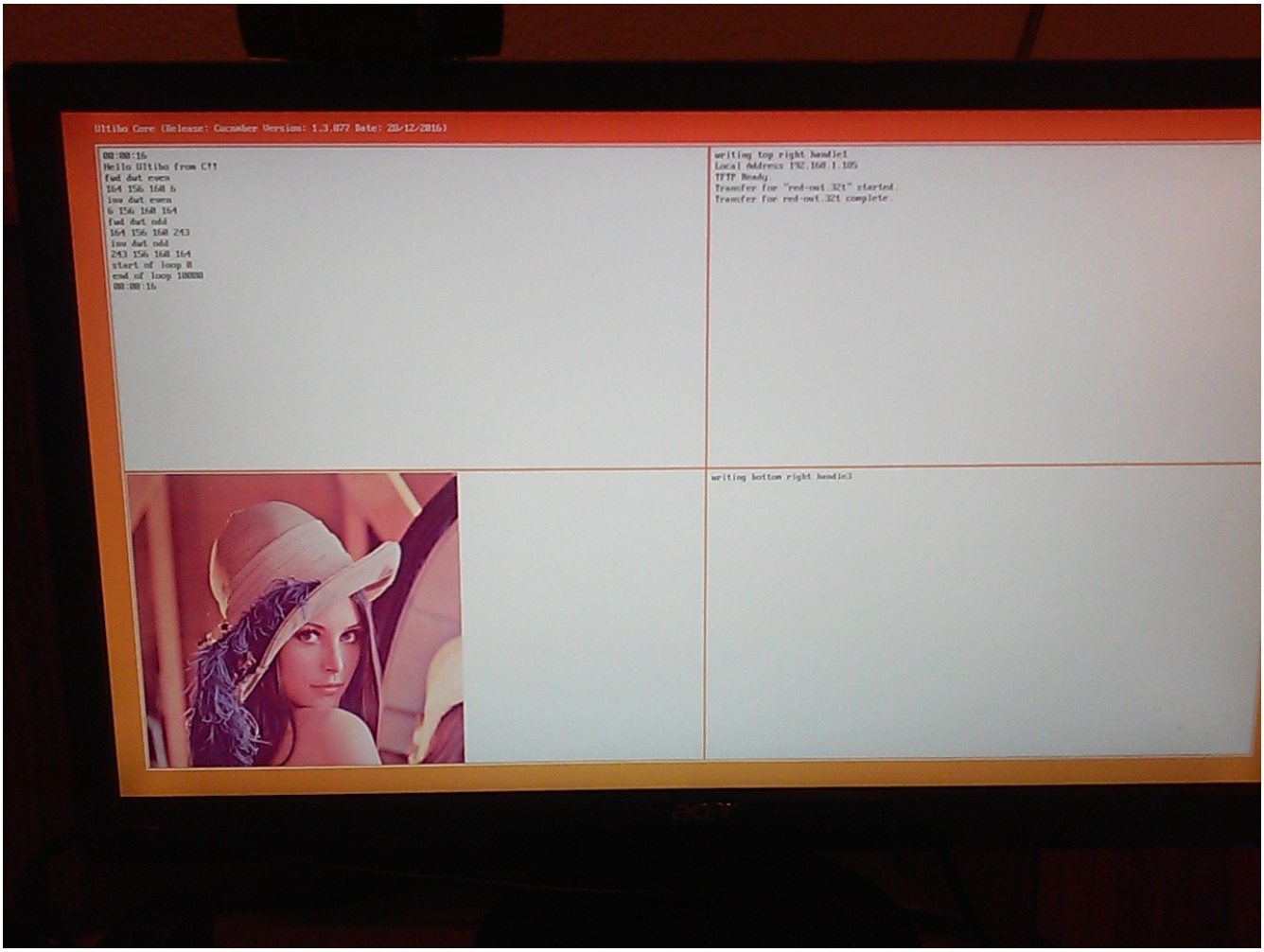

The image above is 1 level forward DWT blu subband
The file blu-out.32t




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




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


Ultiho Core (Release: Cucumber Version: 1.3.077 Date: 28/12/2016)
00:00:16
Hello Ultiho from C!!
fwd dut even
164 156 168 6
inv dut even
6 156 168 164
fwd dut odd
164 156 168 243
inv dut odd
243 156 168 164
start of loop 0
end of loop 10000
00:00:16
writing top right handle1
Local Address 192.168.1.105
TFTP Ready
Transfer for "red-out.32t" started.
Transfer for red-out.32t complete.
writing bottom right handle3