**********Draft**********

QEMU Ultibo Bare Metal
SVD
with
Remote Shell and Web Status
07/27/21

**********Draft**********

Note:
https://ultibo.org/forum/viewtopic.php?f=13&t=1303&p=11632#p11632

By Ultibo Wed Jul 21, 2021 9:01 pm

I suspect the version of QEMU that you have on the RPI3B+ is later than the one on the RPi4, try doing qemu-system-arm -version on each one.

We recently discovered that the Ultibo SD card driver was not compatible with the latest versions of QEMU, a fix for this is included in the release from today (Ultibo core 2.1.079) so if you update your RTL to the latest either using the RTL Builder or by rerunning the ultiboinstaller script then it should work now.
https://en.m.wikipedia.org/wiki/QEMU. On the pi400-1 I ran ./ultiboinstaller.sh on pi400-1.

QEMU is a hosted virtual machine monitor: it emulates the machine's processor through dynamic binary translation and provides a set of different hardware and device models for the machine, enabling it to run a variety of guest operating systems. It also can be used with Kernel-based Virtual Machine (KVM) to run virtual machines at near-native speed (by taking advantage of hardware extensions such as Intel VT-x). QEMU can also do emulation for user-level processes, allowing applications compiled for one architecture to run on another.[3]

Note : Additional software is needed to run QEMU "sudo apt-get install qemu-system-arm". The following programs are added.

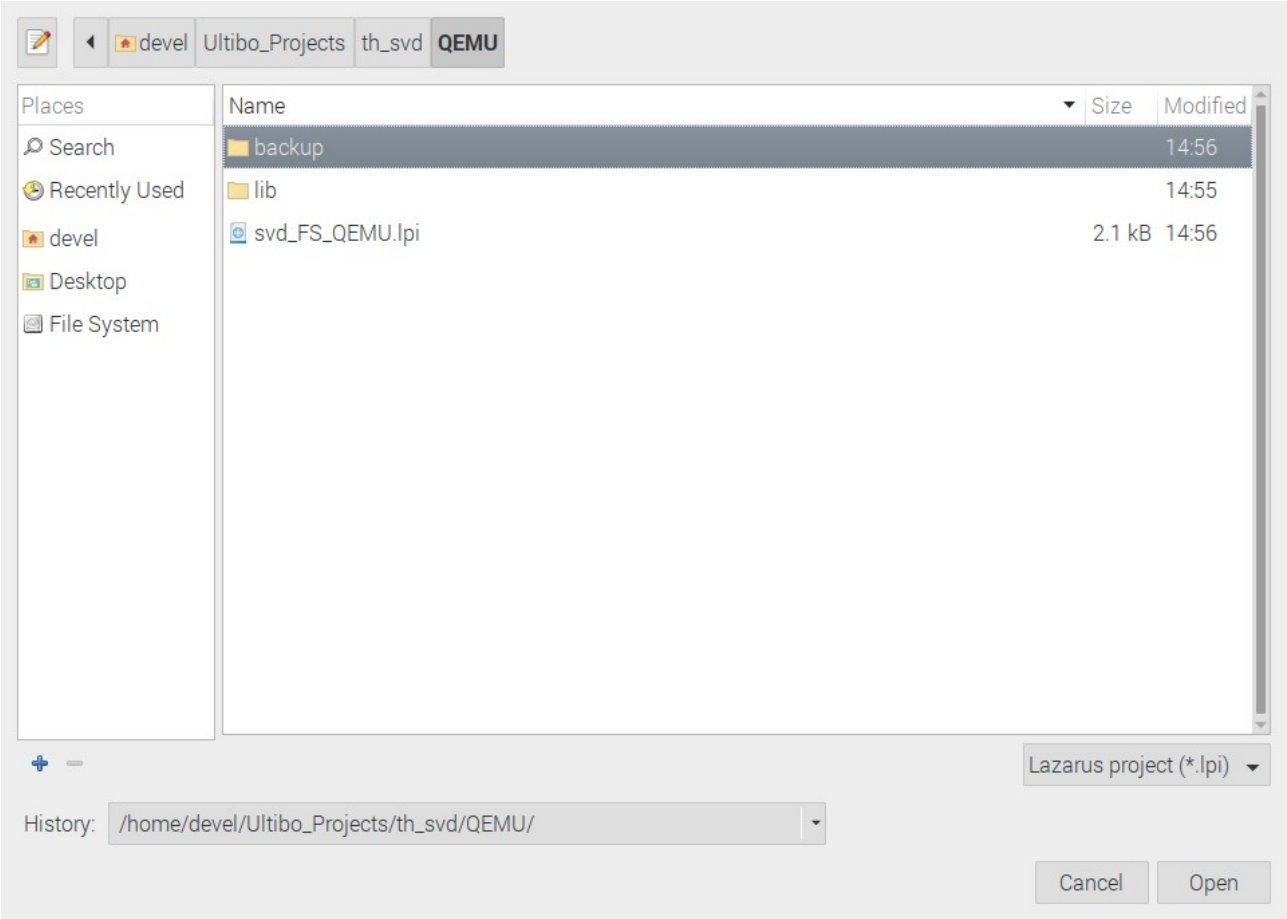
/usr/bin/qemu-img /usr/bin/qemu-nbd /usr/bin/qemu-system-aarch64
/usr/bin/qemu-io /usr/bin/qemu-pr-helper /usr/bin/qemu-system-arm

The command line for starting **Lazarus IDE (Ultibo Edition) "~/ultibo/core/lazarus.sh"**

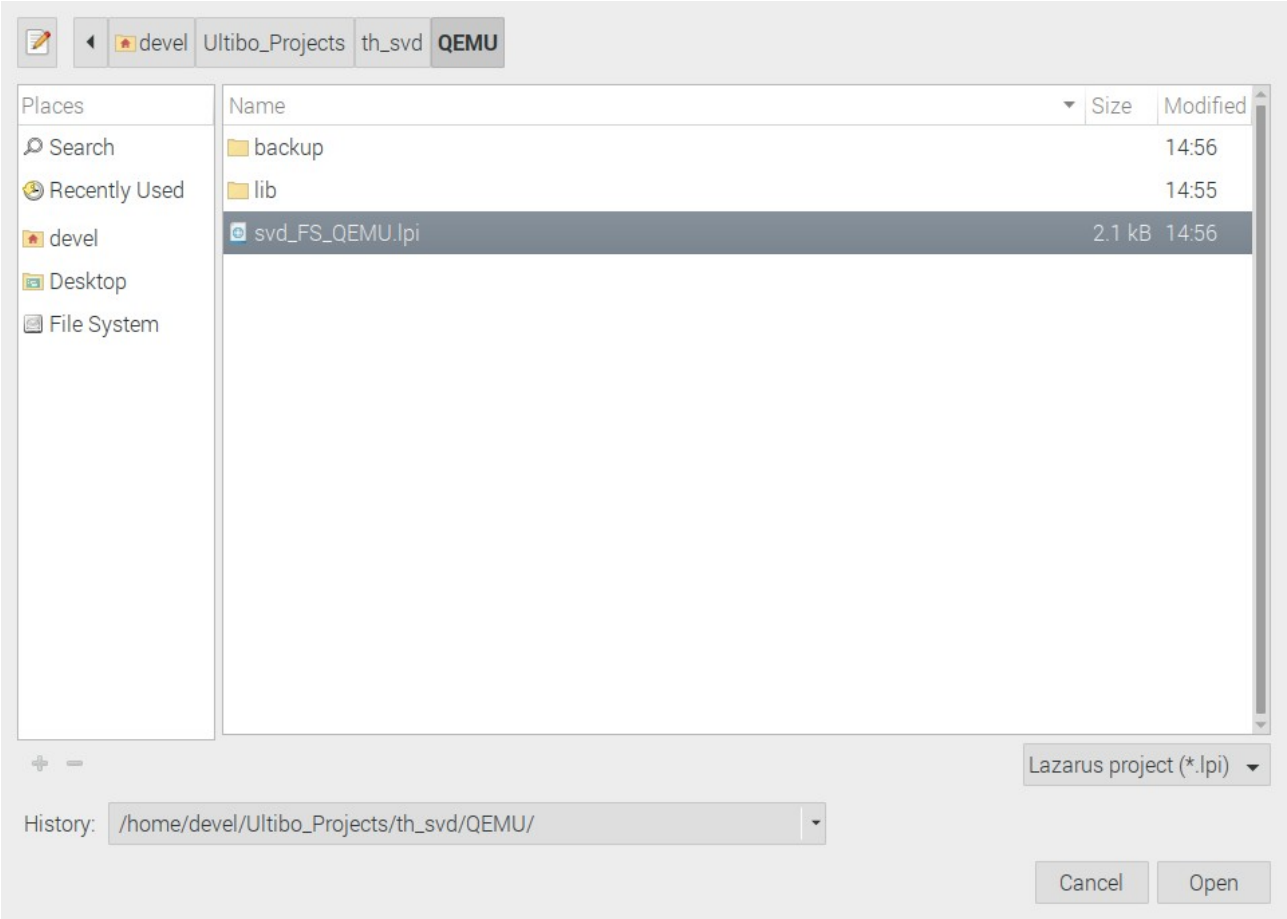
buildlib.sh

```
 #!/bin/bash
#export PATH=/home/devel/ultibo/core/fpc/bin:$PATH
rm -f *.o
rm -f libsvd.a
```

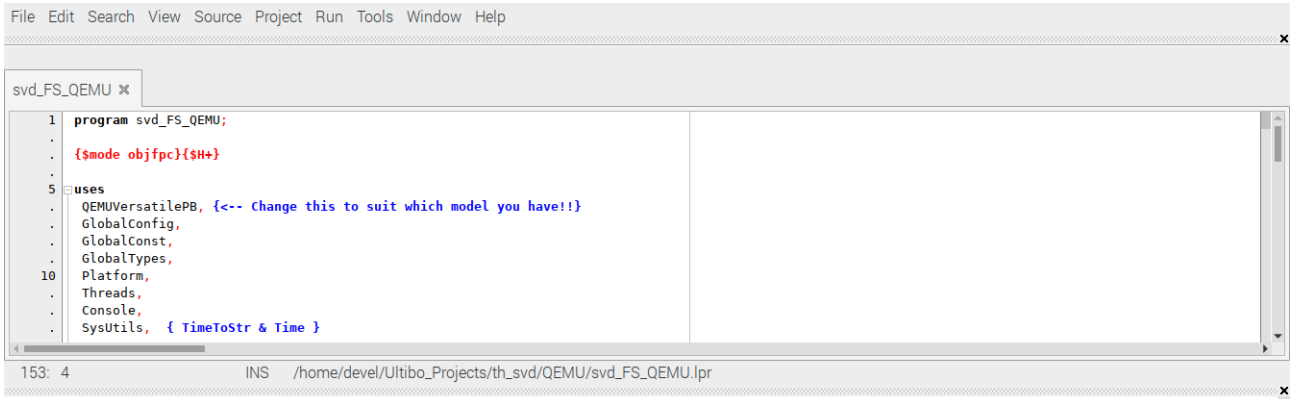
```
arm-none-eabi-gcc -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c svd.c -o svd.o
arm-none-eabi-gcc -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c disp_mat.c -o disp_mat.o
arm-none-eabi-gcc -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c trans_mat.c -o trans_mat.o
arm-none-eabi-gcc -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c mul_mat.c -o mul_mat.o
arm-none-eabi-gcc -D_POSIX_THREADS -lpthread -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c mythread.c -o mythread.o
arm-none-eabi-gcc -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c pnmio.c -o pnmio.o
arm-none-eabi-gcc -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c error.c -o error.o


echo "Compiling example ultibo_th_svd "
arm-none-eabi-gcc -DUltibo -D_POSIX_THREADS -lpthread -I../include -O3 -mabi=aapcs -marm -march=armv7-a -mfpu=vfpv3-d16 -mfloat-abi=hard -c master.c -o ultibo_th_svd.o


#gcc test_svd.c svd.o disp_mat.o -lm -o test_svd
arm-none-eabi-ar rcs libsvd.a *.o
arm-none-eabi-ar -t libsvd.a > libsvd_obj.txt
#fpc -vi -B -Tultibo -Parm -CpARMV7A -WpRPI3B @/home/devel/ultibo/core/fpc/bin/RPI3.CFG -O4 svd_FS_RPi3.lpr

./buildlib.sh
Compiling example ultibo_th_svd

less libsvd_obj.txt

disp_mat.o
error.o
mul_mat.o
mythread.o
pnmio.o
svd.o
trans_mat.o
ultibo_th_svd.o

ls -la libsvd.a
-rw-r--r-- 1 devel devel 33010 Jul 27 17:33 libsvd.a

Project/Open Project
```



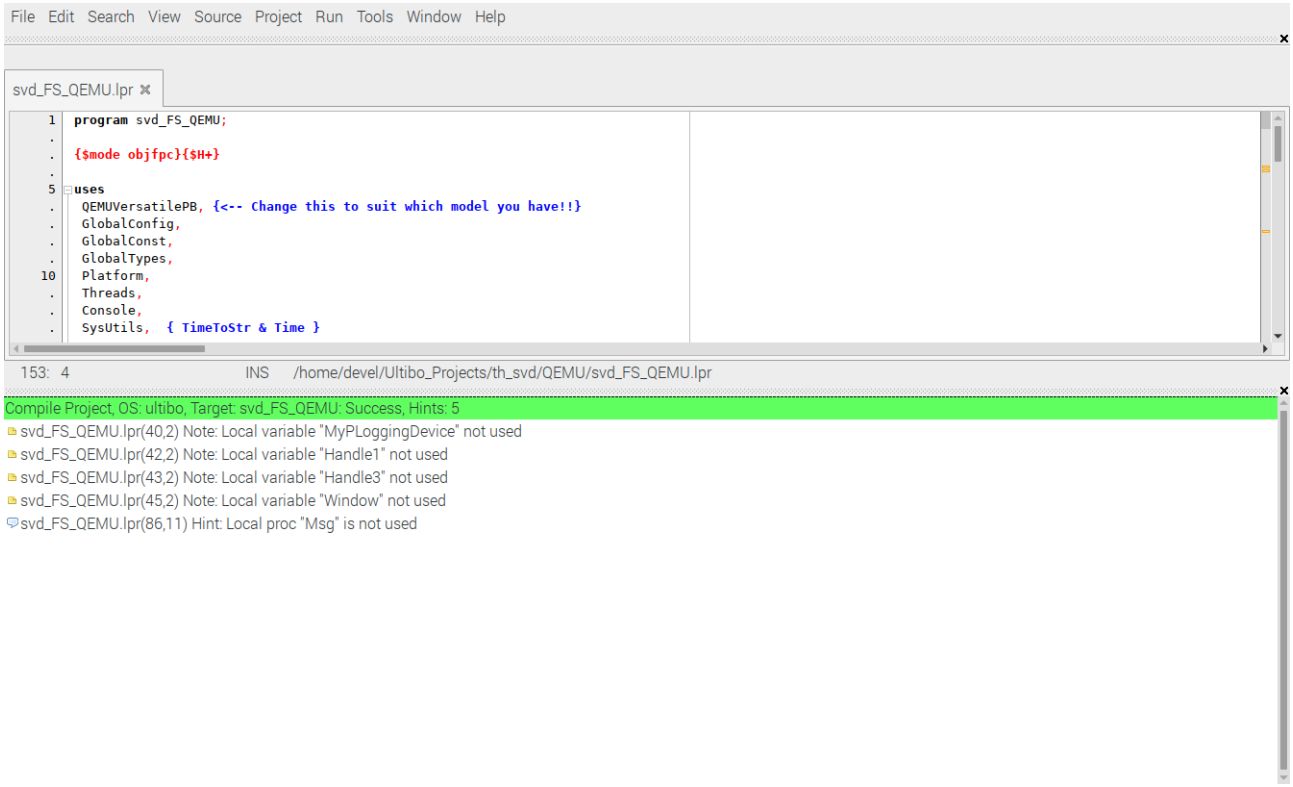
Select svd_FS_QEMU.lpi



Depress Open



Run/Compile The kernel.bin is created when the Grean bar appears.

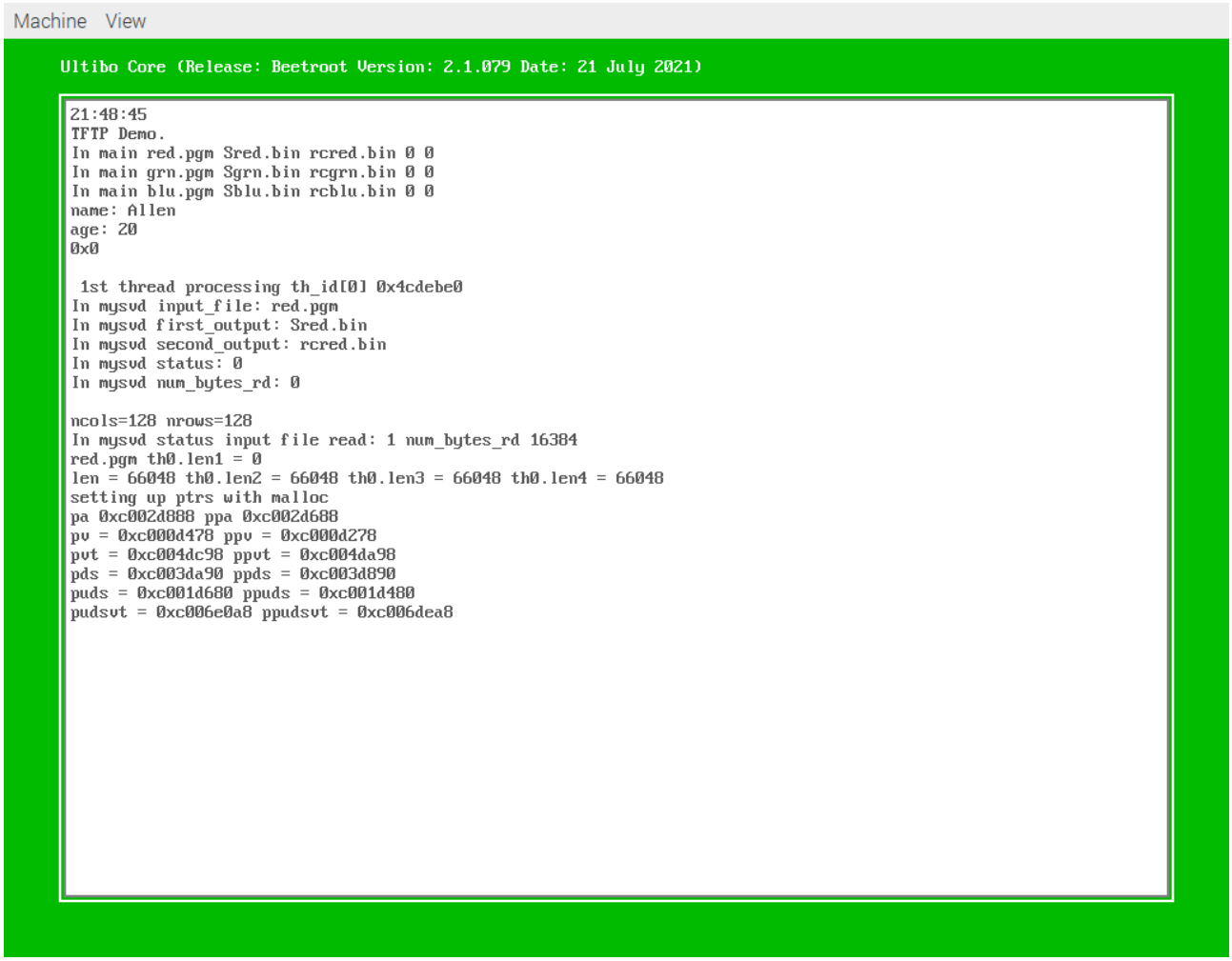


qemu-img create disk.img 25M

Formatting 'disk.img', fmt=raw size=26214400

```
sudo fdisk disk.img

Welcome to fdisk (util-linux 2.33.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.

Device does not contain a recognized partition table.
Created a new DOS disklabel with disk identifier 0x165f8cb7.

Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-51199, default 2048):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (2048-51199, default 51199):

Created a new partition 1 of type 'Linux' and of size 24 MiB.

Command (m for help): t
Selected partition 1
Hex code (type L to list all codes): L

 0  Empty           24  NEC DOS         81  Minix / old Lin bf  Solaris
 1  FAT12           27  Hidden NTFS Win 82  Linux swap / So c1  DRDOS/sec (FAT-
 2  XENIX root      39  Plan 9          83  Linux           c4  DRDOS/sec (FAT-
 3  XENIX usr       3c  PartitionMagic  84  OS/2 hidden or  c6  DRDOS/sec (FAT-
 4  FAT16 <32M      40  Venix 80286     85  Linux extended  c7  Syrinx
 5  Extended        41  PPC PReP Boot   86  NTFS volume set da  Non-FS data
 6  FAT16           42  SFS             87  NTFS volume set db  CP/M / CTOS / .
 7  HPFS/NTFS/exFAT 4d  QNX4.x          88  Linux plaintext de  Dell Utility
 8  AIX             4e  QNX4.x 2nd part 8e  Linux LVM       df  BootIt
 9  AIX bootable    4f  QNX4.x 3rd part 93  Amoeba          e1  DOS access
 a  OS/2 Boot Manag 50  OnTrack DM      94  Amoeba BBT      e3  DOS R/O
 b  W95 FAT32       51  OnTrack DM6 Aux 9f  BSD/OS          e4  SpeedStor
 c  W95 FAT32 (LBA) 52  CP/M            a0  IBM Thinkpad hi ea  Rufus alignment
 e  W95 FAT16 (LBA) 53  OnTrack DM6 Aux a5  FreeBSD         eb  BeOS fs
 f  W95 Ext'd (LBA) 54  OnTrackDM6      a6  OpenBSD         ee  GPT
10  OPUS            55  EZ-Drive        a7  NeXTSTEP        ef  EFI (FAT-12/16/
11  Hidden FAT12    56  Golden Bow      a8  Darwin UFS      f0  Linux/PA-RISC b
12  Compaq diagnost 5c  Priam Edisk     a9  NetBSD          f1  SpeedStor
14  Hidden FAT16 <3 61  SpeedStor       ab  Darwin boot     f4  SpeedStor
16  Hidden FAT16    63  GNU HURD or Sys af  HFS / HFS+      f2  DOS secondary
17  Hidden HPFS/NTF 64  Novell Netware  b7  BSDI fs         fb  VMware VMFS
18  AST SmartSleep  65  Novell Netware  b8  BSDI swap       fc  VMware VMKCORE
1b  Hidden W95 FAT3 70  DiskSecure Mult bb  Boot Wizard hid fd  Linux raid auto
1c  Hidden W95 FAT3 75  PC/IX           bc  Acronis FAT32 L fe  LANstep
1e  Hidden W95 FAT1 80  Old Minix       be  Solaris boot    ff  BBT
Hex code (type L to list all codes): 4
Changed type of partition 'Linux' to 'FAT16 <32M'.
```

```
Command (m for help): p
Disk disk.img: 25 MiB, 26214400 bytes, 51200 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: dos
Disk identifier: 0x165f8cb7

Device     Boot Start   End Sectors Size Id Type
disk.img1        2048 51199   49152  24M  4 FAT16 <32M

Command (m for help): w
The partition table has been altered.
Syncing disks.

mkdosfs disk.img

mkfs.fat 4.1 (2017-01-24)

sudo mount disk.img /mnt/img1

sudo cp -R ~/Ultibo_Projects/Little_Interpreted_Language/img-tests/disk/* /mnt/img1

sudo cp *.pgm /mnt/img1/

ls /mnt/img1
'Another File.txt'   blu.pgm   grn.pgm   red.pgm  'Test File.txt'   www

sudo umount /mnt/img1

./startqemu.sh

#!/bin/bash
qemu-system-arm -machine versatilepb -cpu cortex-a8 -kernel kernel.bin \
-net
user,hostfwd=tcp::5080-:80,hostfwd=tcp::5023-:23,hostfwd=udp::5069-:69,hostfwd=tcp::6050-:505
0 -net nic \
 -drive file=disk.img,if=sd,format=raw
```


Machine View
Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)
21:48:45
TFTP Demo.
In main red.pgm Sred.bin rcred.bin 0 0
In main grn.pgm Sgrn.bin rcgrn.bin 0 0
In main blu.pgm Sblu.bin rcblu.bin 0 0
name: Allen
age: 20
0x0
1st thread processing th_id[0] 0x4cdebe0
In mysvd input_file: red.pgm
In mysvd first_output: Sred.bin
In mysvd second_output: rcred.bin
In mysvd status: 0
In mysvd num_bytes_rd: 0
ncols=128 nrows=128
In mysvd status input file read: 1 num_bytes_rd 16384
red.pgm th0.len1 = 0
len = 66048 th0.len2 = 66048 th0.len3 = 66048 th0.len4 = 66048
setting up ptrs with malloc
pa 0xc002d888 ppa 0xc002d688
pv = 0xc000d478 ppv = 0xc000d278
pvt = 0xc004dc98 ppvt = 0xc004da98
pds = 0xc003da90 ppds = 0xc003d890
puds = 0xc001d680 ppuds = 0xc001d480
pudsvt = 0xc006e0a8 ppudsvt = 0xc006dea8

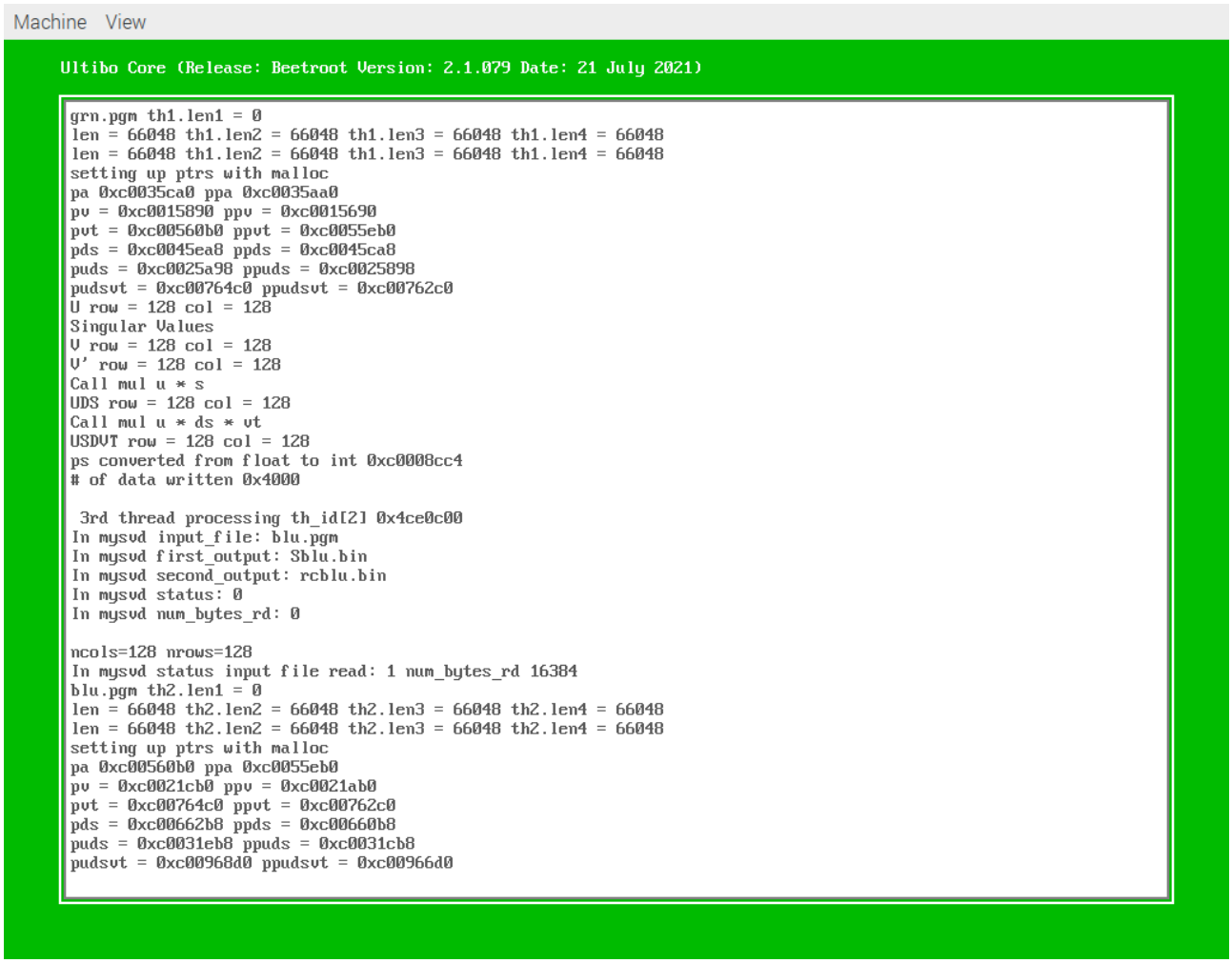
svd

Machine View

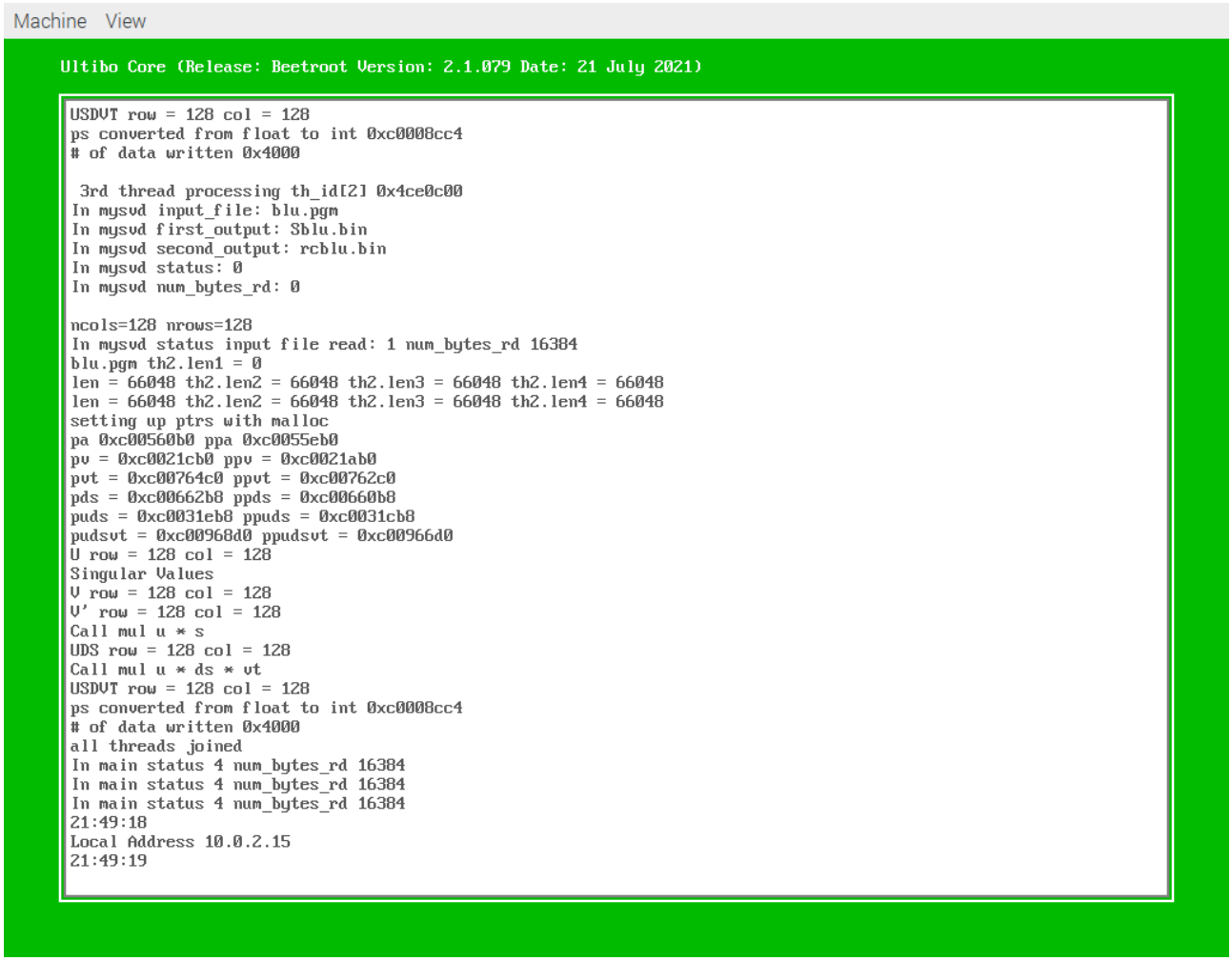
Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)

```
In mysvd status input file read: 1 num_bytes_rd 16384
red.pgm th0.len1 = 0
len = 66048 th0.len2 = 66048 th0.len3 = 66048 th0.len4 = 66048
setting up ptrs with malloc
pa 0xc002d888 ppa 0xc002d688
pv = 0xc000d478 ppv = 0xc000d278
pvt = 0xc004dc98 ppvt = 0xc004da98
pds = 0xc003da90 ppds = 0xc003d890
puds = 0xc001d680 ppuds = 0xc001d480
pudsvt = 0xc006e0a8 ppudsvt = 0xc006dea8
U row = 128 col = 128
Singular Values
V row = 128 col = 128
V' row = 128 col = 128
Call mul u * s
UDS row = 128 col = 128
Call mul u * ds * vt
USDVT row = 128 col = 128
ps converted from float to int 0xc0008cc4
# of data written 0x4000

 2nd thread processing th_id[1] 0x4cdfbf0
In mysvd input_file: grn.pgm
In mysvd first_output: Sgrn.bin
In mysvd second_output: rcgrn.bin
In mysvd status: 0
In mysvd num_bytes_rd: 0

ncols=128 nrows=128
In mysvd status input file read: 1 num_bytes_rd 16384
grn.pgm th1.len1 = 0
len = 66048 th1.len2 = 66048 th1.len3 = 66048 th1.len4 = 66048
len = 66048 th1.len2 = 66048 th1.len3 = 66048 th1.len4 = 66048
setting up ptrs with malloc
pa 0xc0035ca0 ppa 0xc0035aa0
pv = 0xc0015890 ppv = 0xc0015690
pvt = 0xc00560b0 ppvt = 0xc0055eb0
pds = 0xc0045ea8 ppds = 0xc0045ca8
puds = 0xc0025a98 ppuds = 0xc0025898
pudsvt = 0xc00764c0 ppudsvt = 0xc00762c0
```

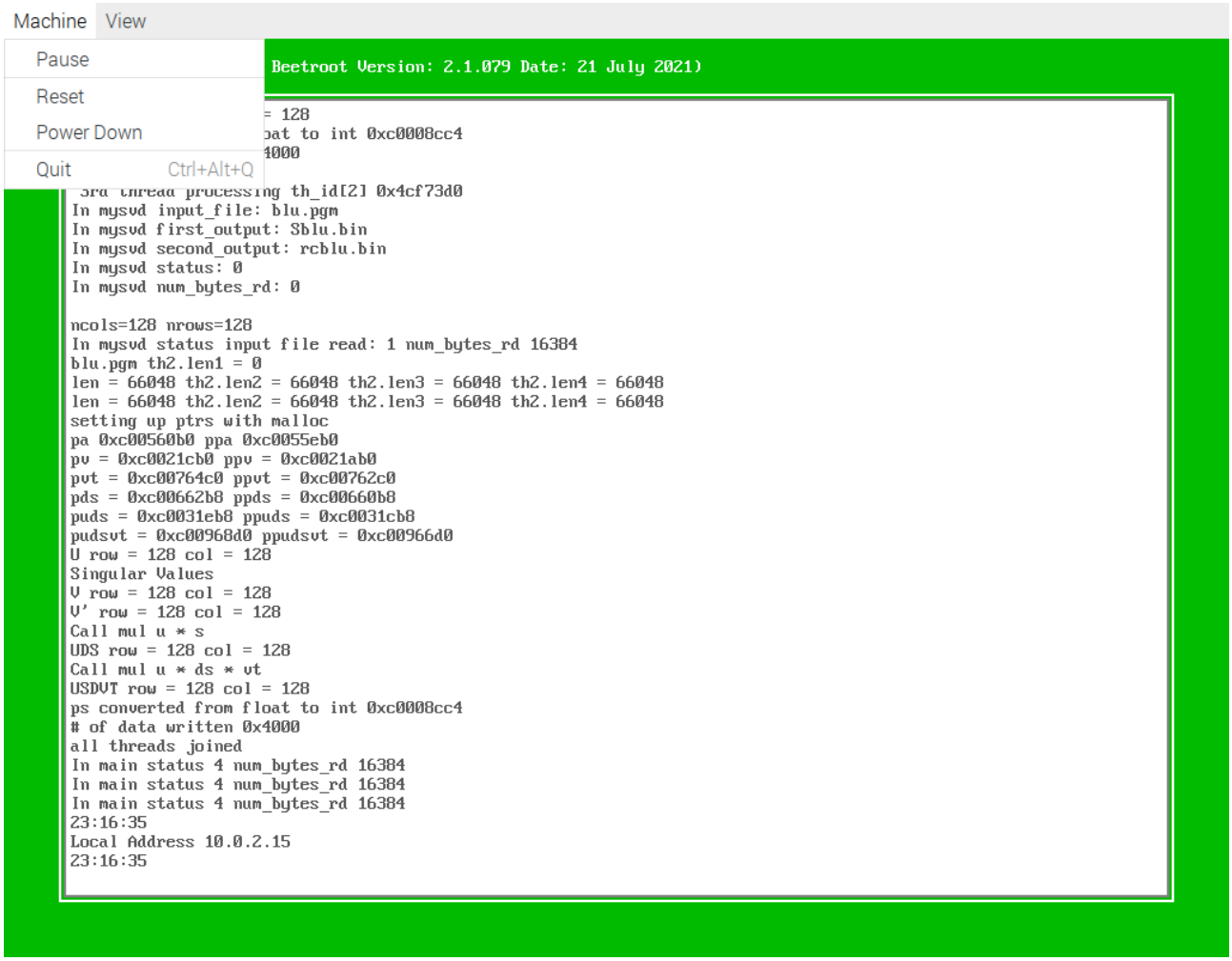
svd1


Machine View
Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)
grn.pgm th1.len1 = 0
len = 66048 th1.len2 = 66048 th1.len3 = 66048 th1.len4 = 66048
len = 66048 th1.len2 = 66048 th1.len3 = 66048 th1.len4 = 66048
setting up ptrs with malloc
pa 0xc0035ca0 ppa 0xc0035aa0
pv = 0xc0015890 ppv = 0xc0015690
pvt = 0xc00560b0 ppvt = 0xc0055eb0
pds = 0xc0045ea8 ppds = 0xc0045ca8
puds = 0xc0025a98 ppuds = 0xc0025898
pudsvt = 0xc00764c0 ppudsvt = 0xc00762c0
U row = 128 col = 128
Singular Values
V row = 128 col = 128
V' row = 128 col = 128
Call mul u * s
UDS row = 128 col = 128
Call mul u * ds * vt
USDVT row = 128 col = 128
ps converted from float to int 0xc0008cc4
# of data written 0x4000
3rd thread processing th_id[2] 0x4ce0c00
In mysvd input_file: blu.pgm
In mysvd first_output: Sblu.bin
In mysvd second_output: rcblu.bin
In mysvd status: 0
In mysvd num_bytes_rd: 0
ncols=128 nrows=128
In mysvd status input file read: 1 num_bytes_rd 16384
blu.pgm th2.len1 = 0
len = 66048 th2.len2 = 66048 th2.len3 = 66048 th2.len4 = 66048
len = 66048 th2.len2 = 66048 th2.len3 = 66048 th2.len4 = 66048
setting up ptrs with malloc
pa 0xc00560b0 ppa 0xc0055eb0
pv = 0xc0021cb0 ppv = 0xc0021ab0
pvt = 0xc00764c0 ppvt = 0xc00762c0
pds = 0xc00662b8 ppds = 0xc00660b8
puds = 0xc0031eb8 ppuds = 0xc0031cb8
pudsvt = 0xc00968d0 ppudsvt = 0xc00966d0

svd2


Machine View
Ultibo Core (Release: Beetroot Version: 2.1.079 Date: 21 July 2021)
USDVT row = 128 col = 128
ps converted from float to int 0xc0008cc4
# of data written 0x4000
3rd thread processing th_id[2] 0x4ce0c00
In mysvd input_file: blu.pgm
In mysvd first_output: Sblu.bin
In mysvd second_output: rcblu.bin
In mysvd status: 0
In mysvd num_bytes_rd: 0
ncols=128 nrows=128
In mysvd status input file read: 1 num_bytes_rd 16384
blu.pgm th2.len1 = 0
len = 66048 th2.len2 = 66048 th2.len3 = 66048 th2.len4 = 66048
len = 66048 th2.len2 = 66048 th2.len3 = 66048 th2.len4 = 66048
setting up ptrs with malloc
pa 0xc00560b0 ppa 0xc0055eb0
pv = 0xc0021cb0 ppv = 0xc0021ab0
pvt = 0xc00764c0 ppvt = 0xc00762c0
pds = 0xc00662b8 ppds = 0xc00660b8
puds = 0xc0031eb8 ppuds = 0xc0031cb8
pudsvt = 0xc00968d0 ppudsvt = 0xc00966d0
U row = 128 col = 128
Singular Values
V row = 128 col = 128
V' row = 128 col = 128
Call mul u * s
UDS row = 128 col = 128
Call mul u * ds * vt
USDVT row = 128 col = 128
ps converted from float to int 0xc0008cc4
# of data written 0x4000
all threads joined
In main status 4 num_bytes_rd 16384
In main status 4 num_bytes_rd 16384
In main status 4 num_bytes_rd 16384
21:49:18
Local Address 10.0.2.15
21:49:19

svd3



Depress Quit

sudo mount disk.img /mnt/img1

ls -la /mnt/img1
total 278
drwxr-xr-x 3 root root 16384 Dec 31 1969 .
drwxr-xr-x 5 root root 4096 Jul 18 10:10 ..
-rwxr-xr-x 1 root root   53 Jul 27 17:14 'Another File.txt'
-rwxr-xr-x 1 root root 16444 Jul 27 17:14 blu.pgm
-rwxr-xr-x 1 root root 16444 Jul 27 17:14 grn.pgm
-rwxr-xr-x 1 root root 65536 Jul 27 17:16 rcblu.bin
-rwxr-xr-x 1 root root 65536 Jul 27 17:16 rcgrn.bin
-rwxr-xr-x 1 root root 65536 Jul 27 17:16 rcred.bin
-rwxr-xr-x 1 root root 16444 Jul 27 17:14 red.pgm
-rwxr-xr-x 1 root root   512 Jul 27 17:16 Sblu.bin
-rwxr-xr-x 1 root root   512 Jul 27 17:16 Sgrn.bin
-rwxr-xr-x 1 root root   512 Jul 27 17:16 Sred.bin
-rwxr-xr-x 1 root root   31 Jul 27 17:14 'Test File.txt'
drwxr-xr-x 2 root root 2048 Jul 27 17:14 www

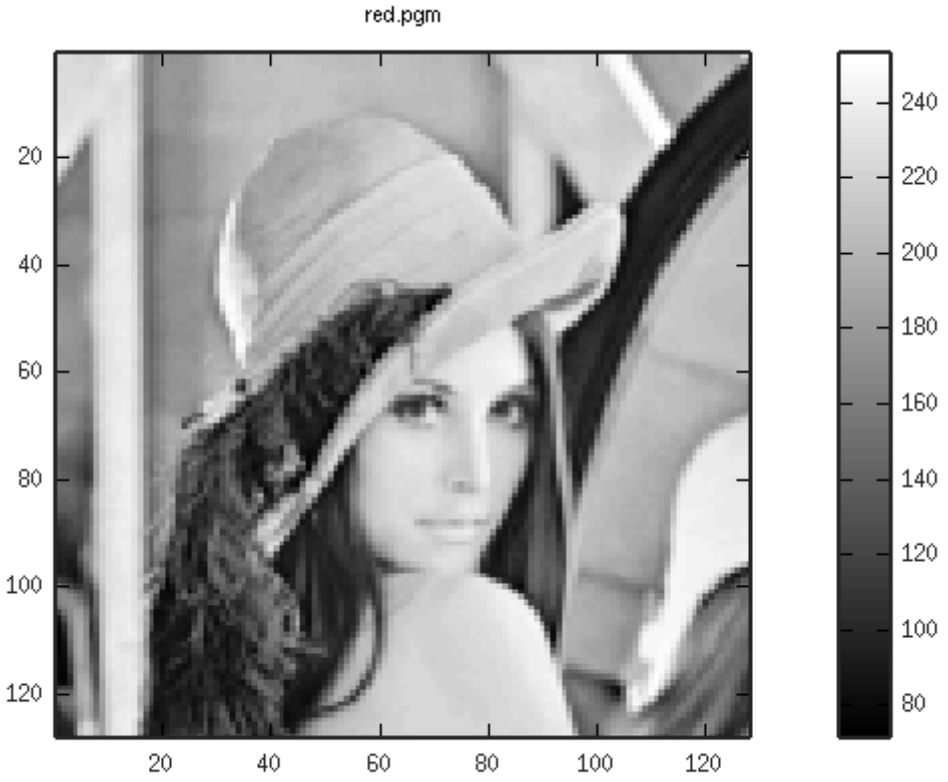
sudo cp /*mnt*/img1/*.bin .

ls -la *.bin

```
-rwxr-xr-x 1 devel devel 2921536 Jul 27 15:46 kernel.bin
-rwxr-xr-x 1 devel devel   65536 Jul 27 17:19 rcblu.bin
-rwxr-xr-x 1 devel devel   65536 Jul 27 17:19 rcgrn.bin
-rwxr-xr-x 1 devel devel   65536 Jul 27 17:19 rcred.bin
-rwxr-xr-x 1 devel devel     512 Jul 27 17:19 Sblu.bin
-rwxr-xr-x 1 devel devel     512 Jul 27 17:19 Sgrn.bin
-rwxr-xr-x 1 devel devel     512 Jul 27 17:19 Sred.bin
```

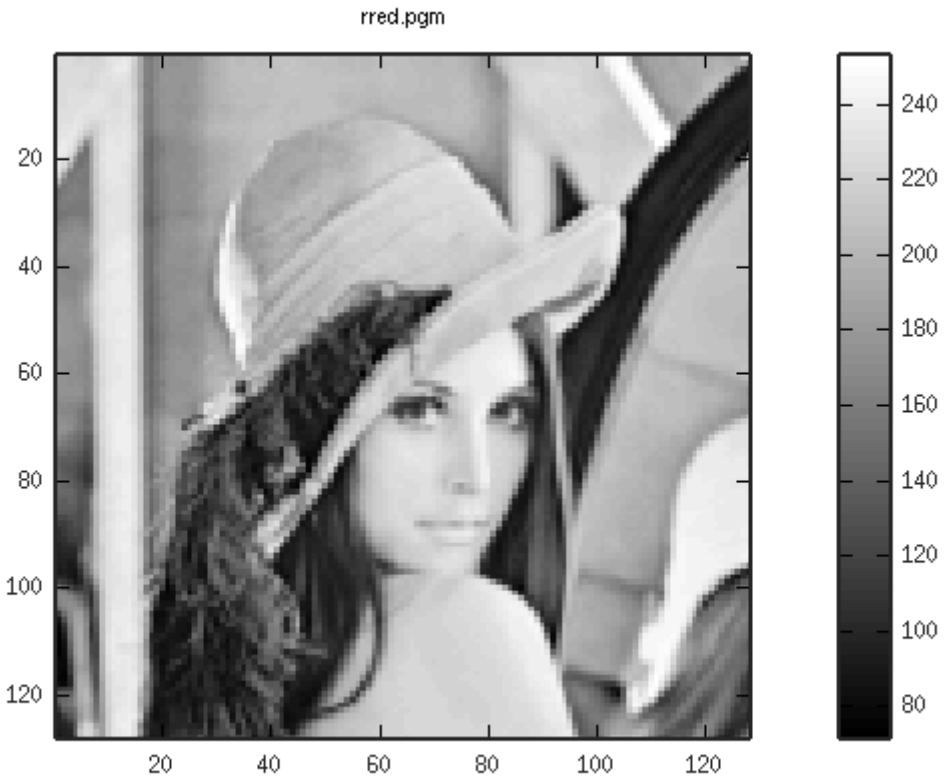
```
File  Edit  Tabs  Help
devel@mypi3-20:~/Ultibo_Projects/th_svd/QEMU $ octave
GNU Octave, version 4.4.1
Copyright (C) 2018 John W. Eaton and others.
This is free software; see the source code for copying conditions.
There is ABSOLUTELY NO WARRANTY; not even for MERCHANTABILITY or
FITNESS FOR A PARTICULAR PURPOSE.  For details, type 'warranty'.

Octave was configured for "arm-unknown-linux-gnueabihf".

Additional information about Octave is available at https://www.octave.org.

Please contribute if you find this software useful.
For more information, visit https://www.octave.org/get-involved.html

Read https://www.octave.org/bugs.html to learn how to submit bug reports.
For information about changes from previous versions, type 'news'.

octave:1> qemu
```

Start octave



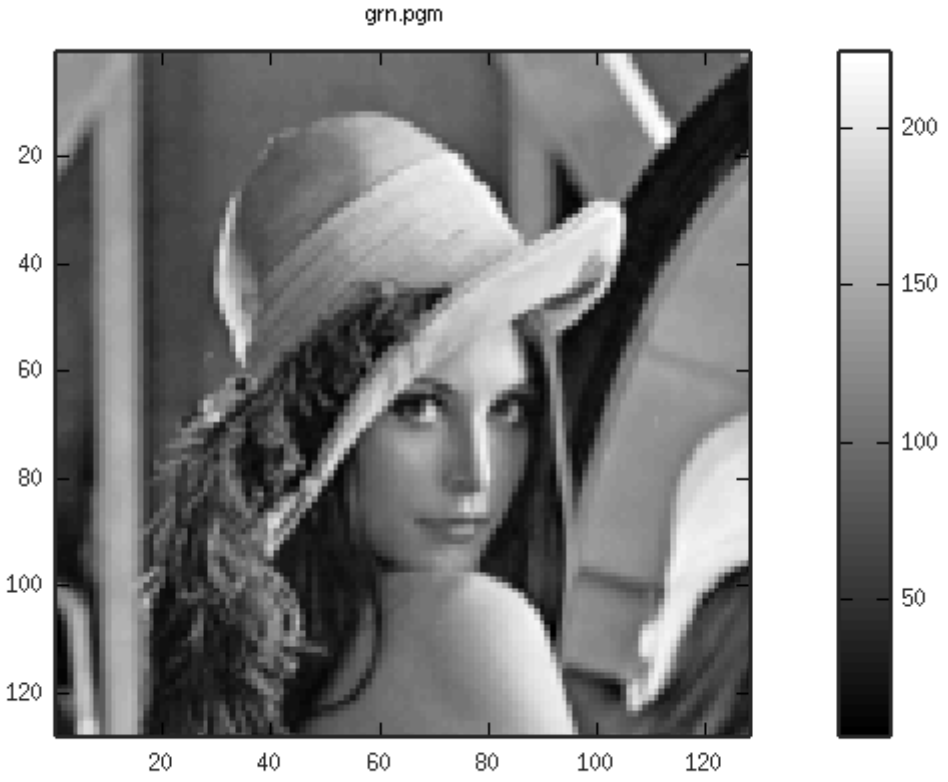

```
y2= 46.4231
```

oct1



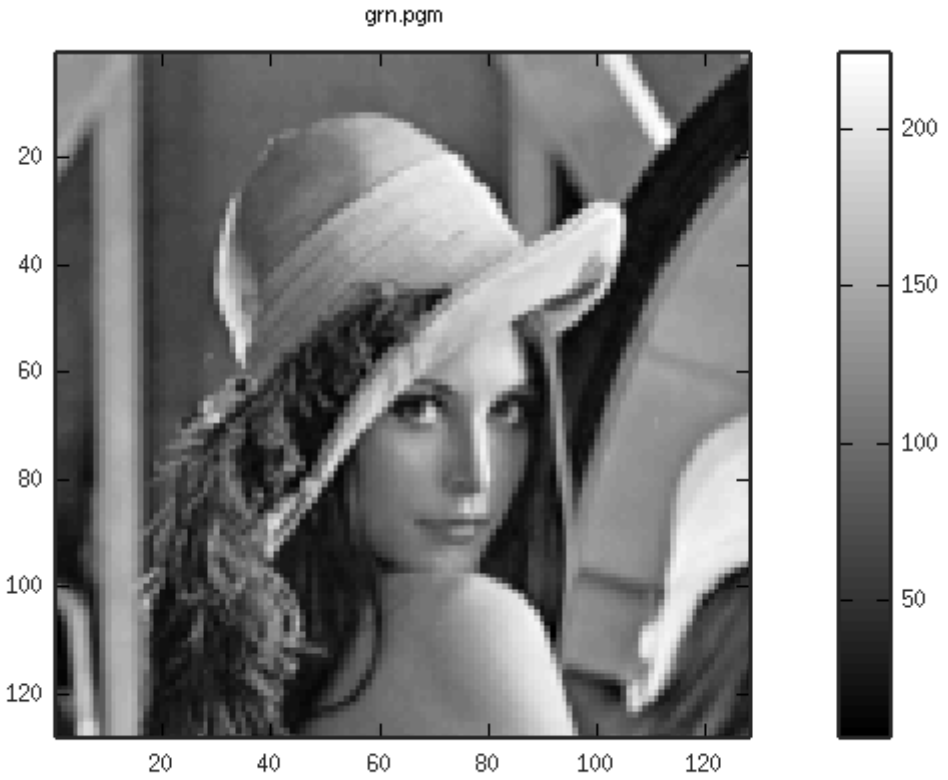
y2= 46.4231

oct2



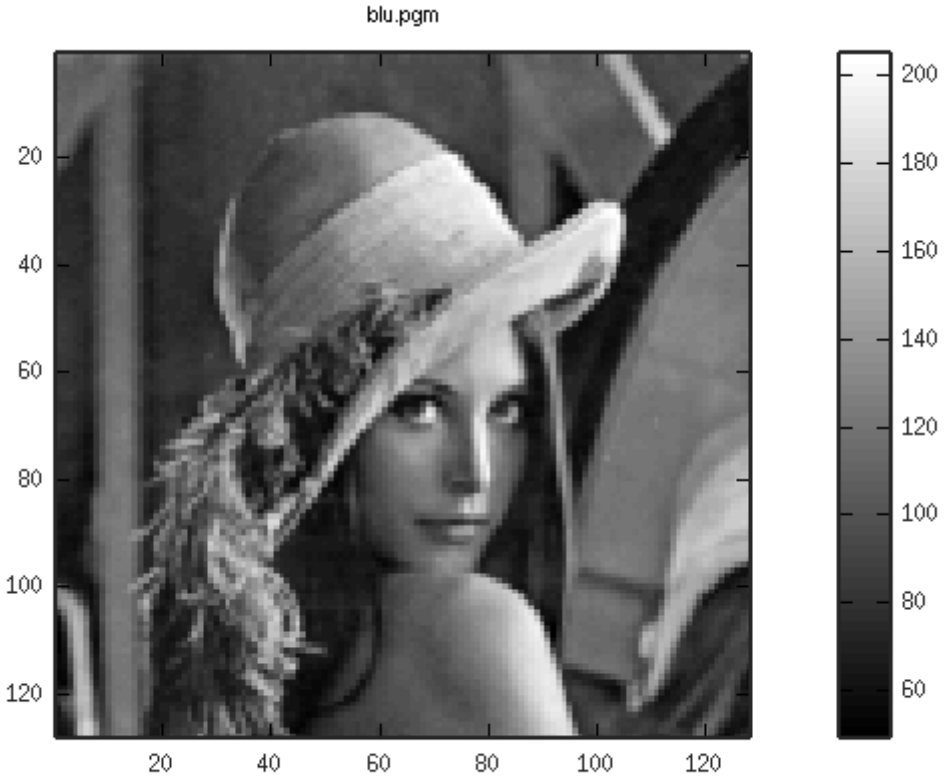
y2=-23.4383

oct3



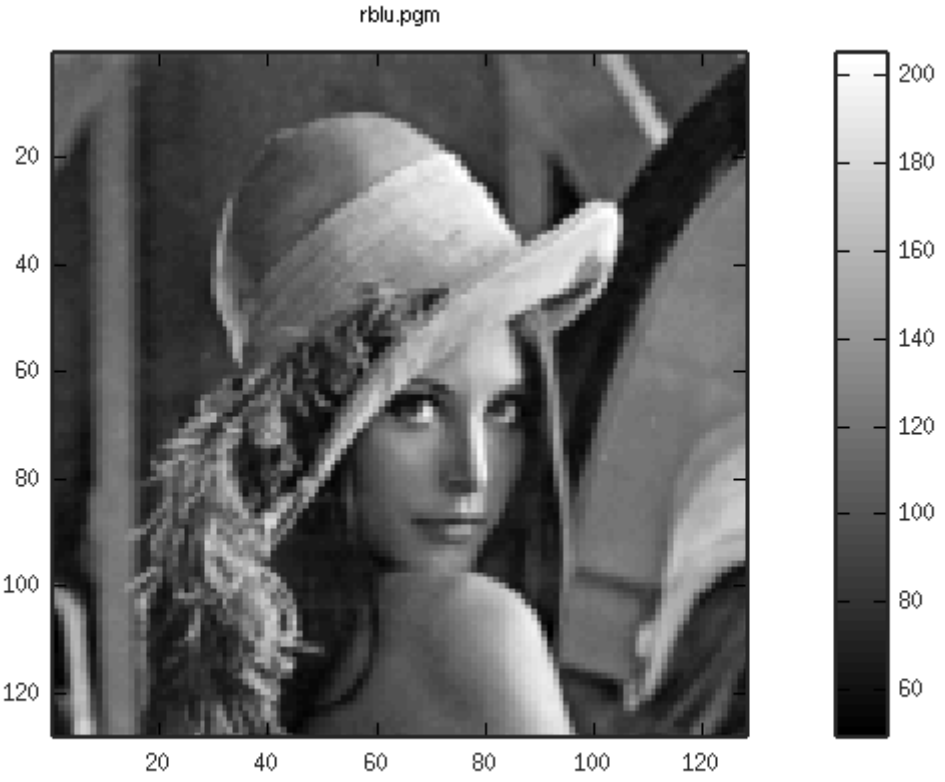
y2=-23.4383

oct4



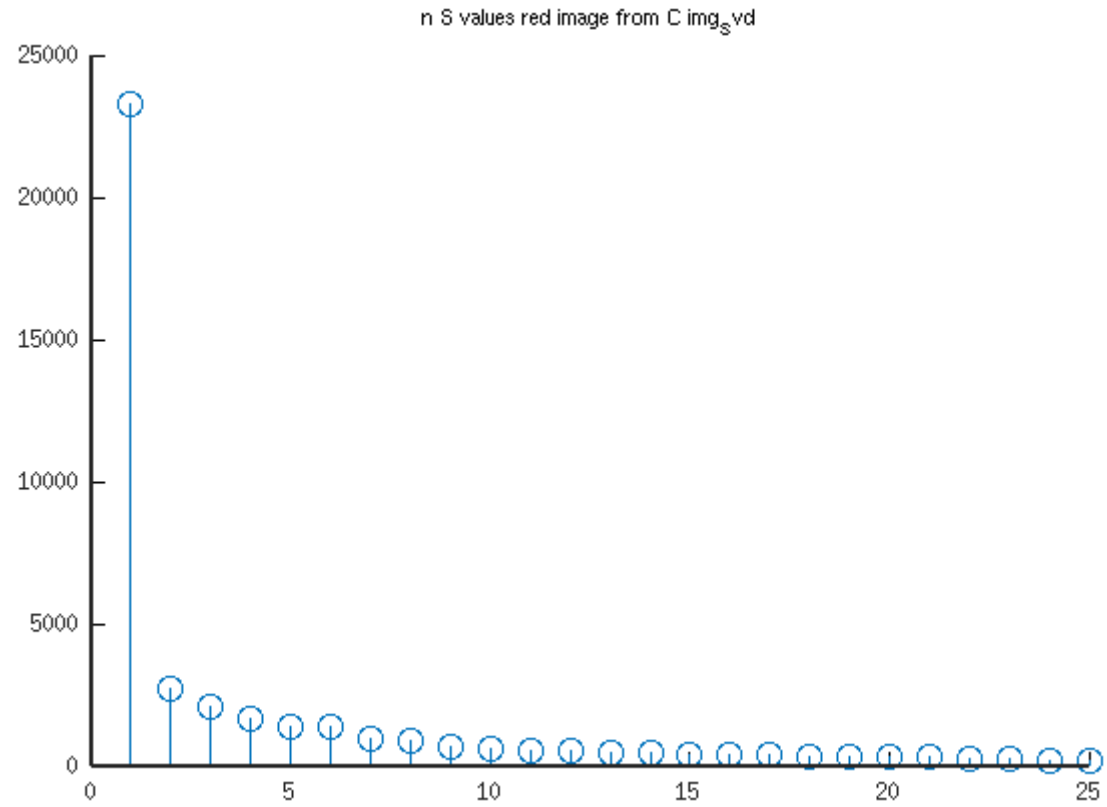
y2= 27.9341

oct5

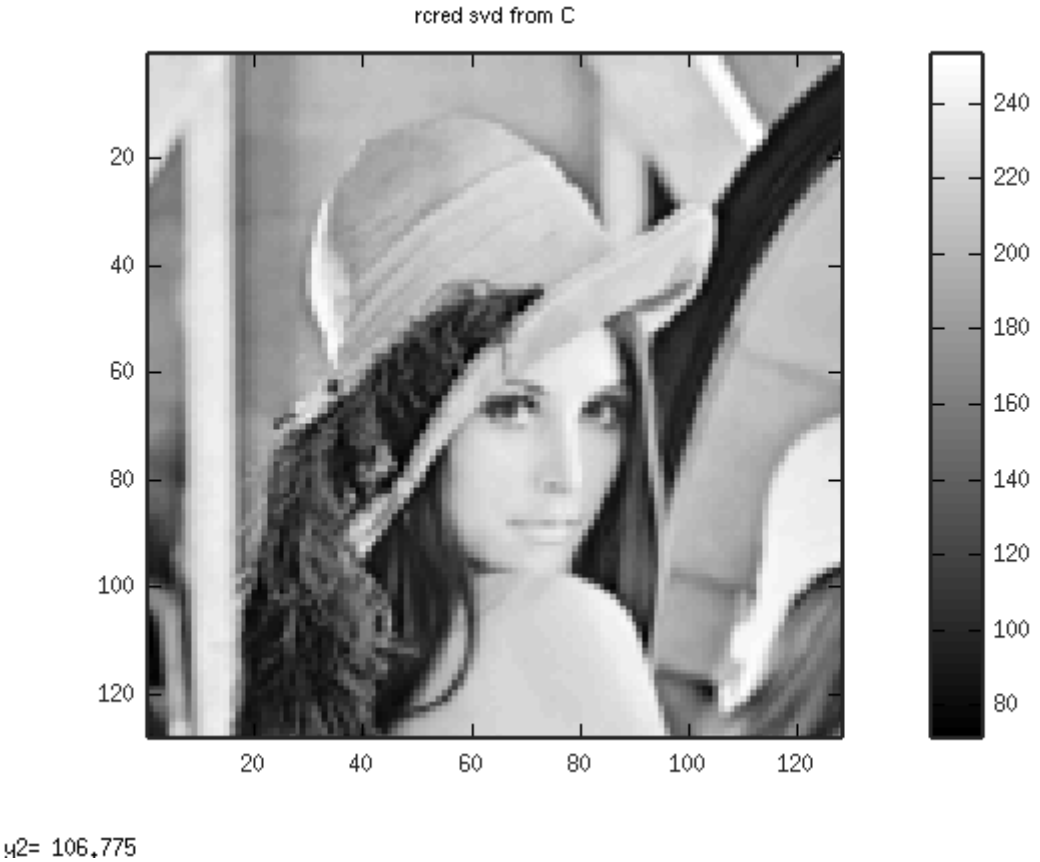


y2= 27.9341

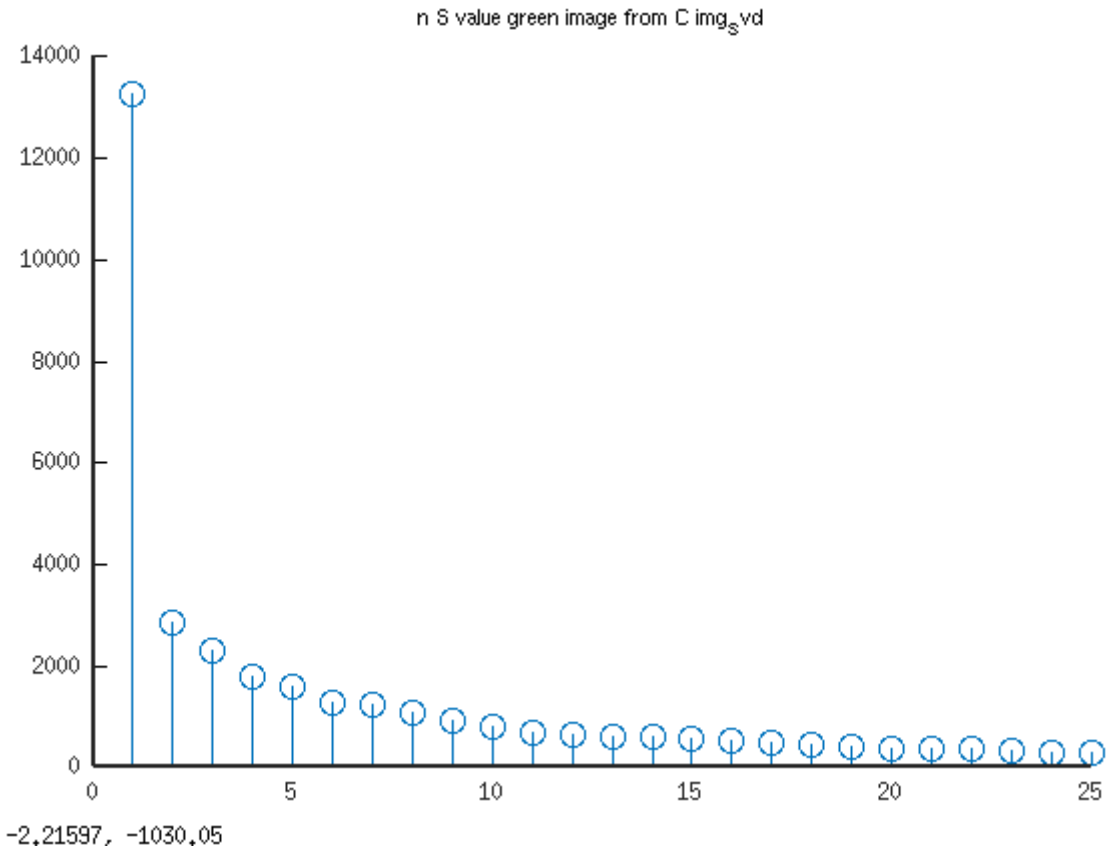
oct6


n S values red image from C imgsvd
25000
20000
15000
10000
5000
0
0
5
10
15
20
25
-2.21597, -1839.37

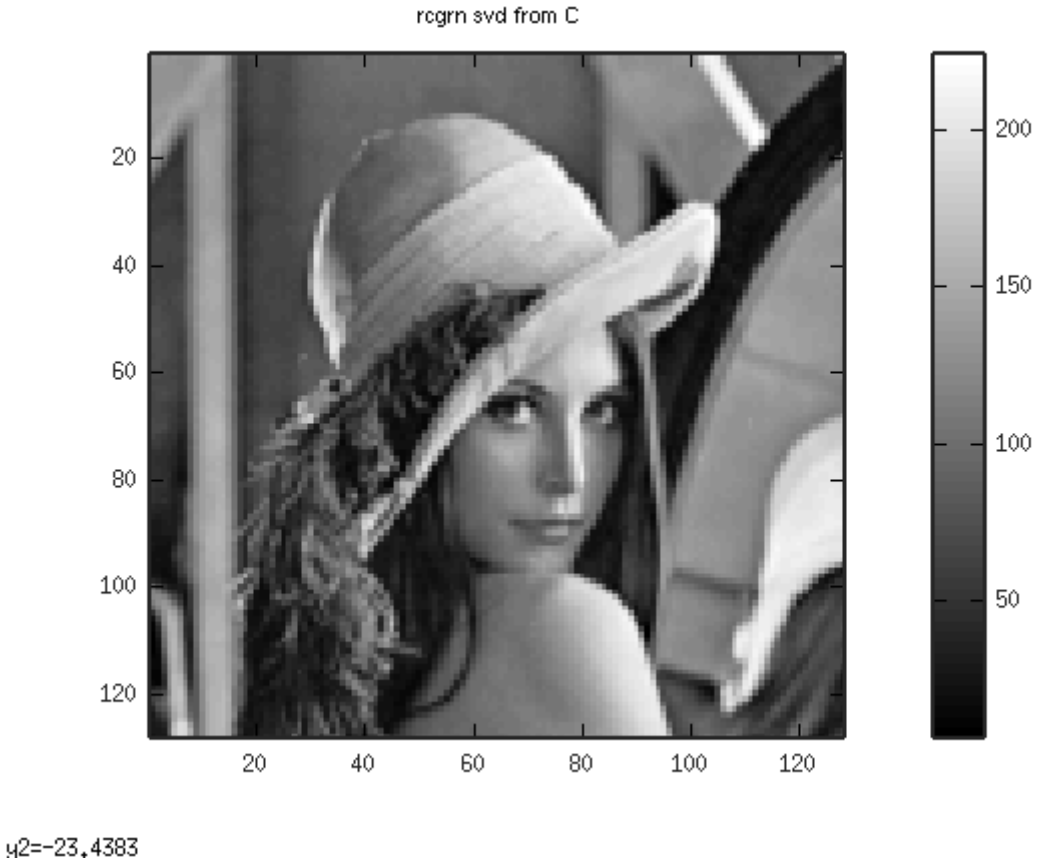
oct7


rcred svd from C
20
40
60
80
100
120
20
40
60
80
100
120
240
220
200
180
160
140
120
100
80
y2= 106.775

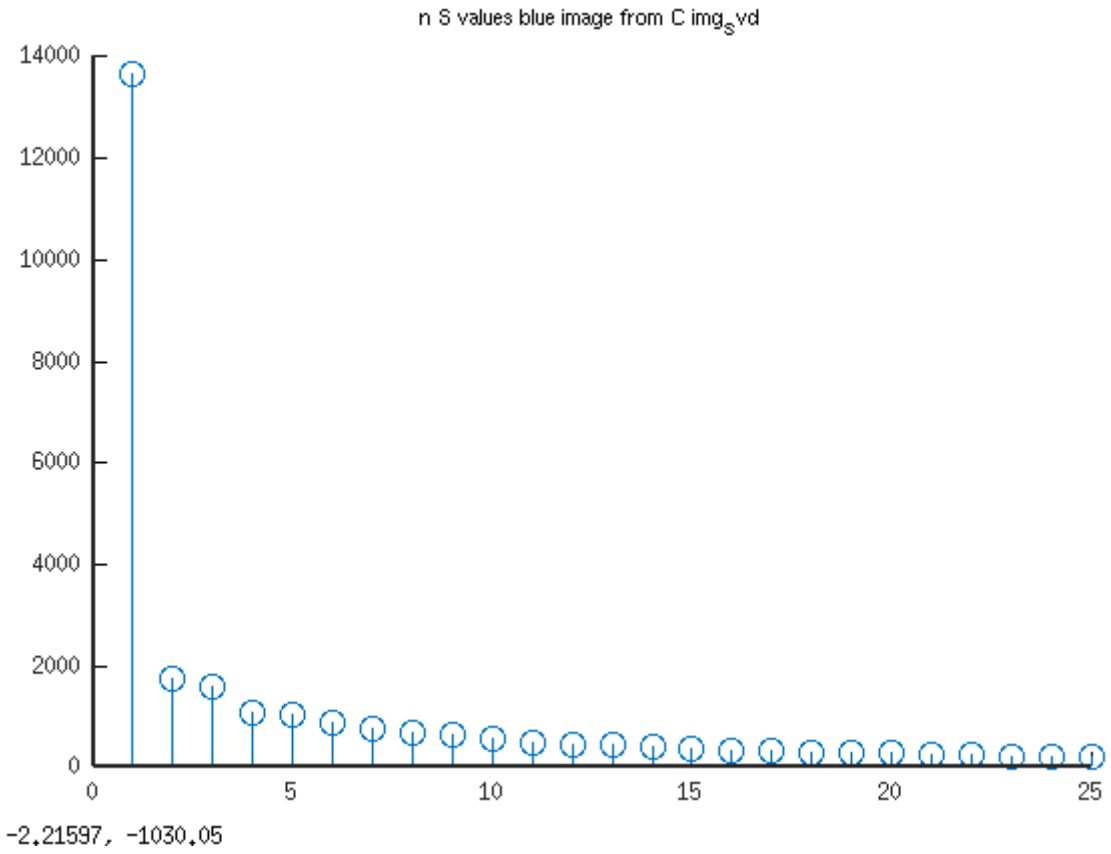
oct8


n S value green image from C img_svd
14000
12000
10000
8000
6000
4000
2000
0
0
5
10
15
20
25
-2.21597, -1030.05

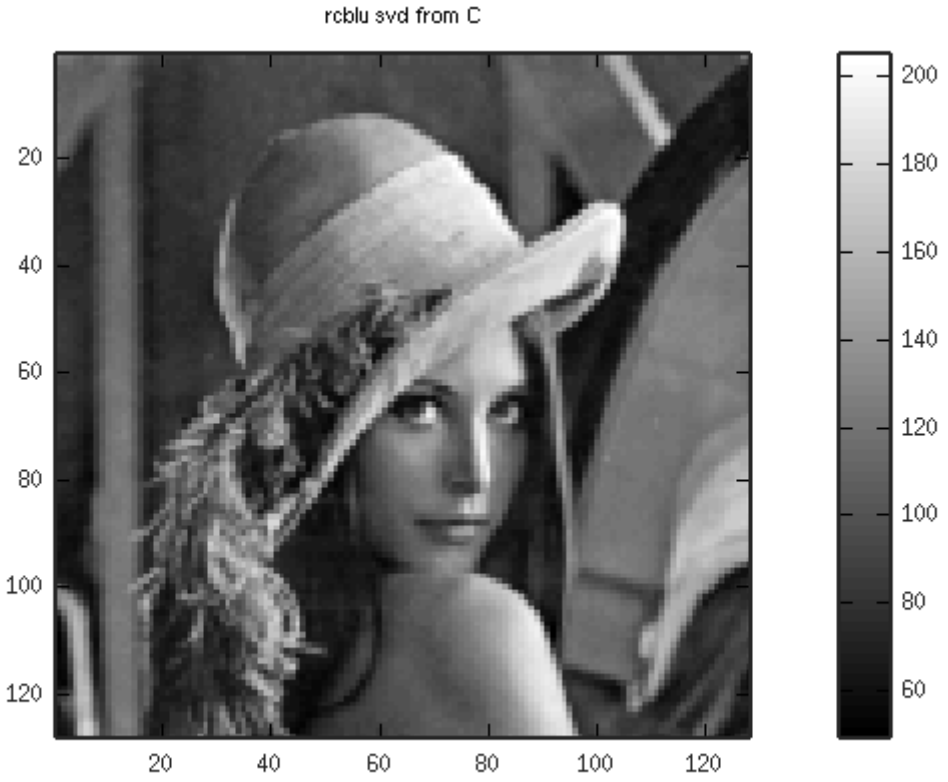
oct9


rcgrn svd from C
20
40
60
80
100
120
20
40
60
80
100
120
200
150
100
50
y2=-23.4383

oct10



oct11



y2= 27.9341

oct12