



实用操作系统课程实验报告

实验名称:	实验二 编译鸿蒙 LiteOS-a 内核与 APP
实验日期:	2023-9-28
实验地点:	文宣楼 B313

学号:	33920212204567
姓名:	任宇
专业年级:	软工 2021 级
学年学期:	2023-2024 学年第一学期

1.实验目的

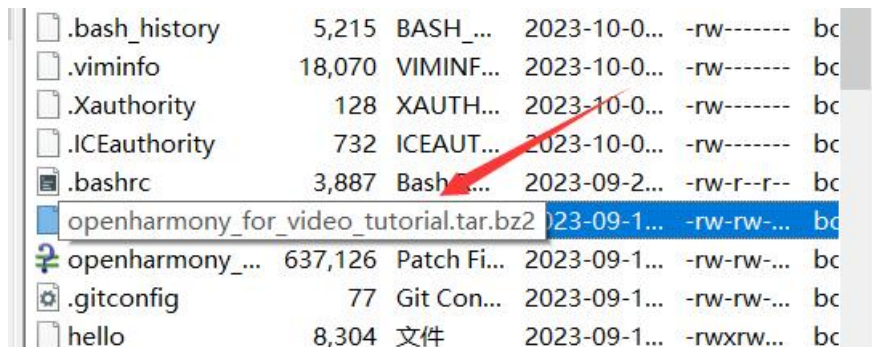
- 下载、编译鸿蒙内核 Liteos-a
- 在 IMX6ULL 上编译 Liteos-a
- 编译 APP

2.实验内容和步骤

(1) 在实验一中已配置好环境，因此直接下载源码即可：

```
cd /home/book
```

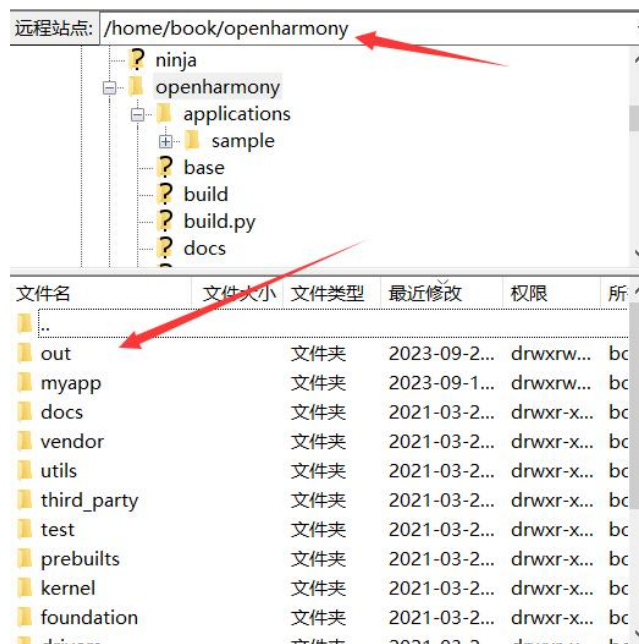
```
git clone https://e.coding.net/weidongshan/openharmony/doc_and_source_for_openharmony.git
```



.bash_history	5,215	BASH_...	2023-10-0...	-rw-----	bc
.viminfo	18,070	VIMINF...	2023-10-0...	-rw-----	bc
.Xauthority	128	XAUTH...	2023-10-0...	-rw-----	bc
.ICEauthority	732	ICEAUT...	2023-10-0...	-rw-----	bc
.bashrc	3,887	Bash...	2023-09-2...	-rw-r--r--	bc
openharmy_for_video_tutorial.tar.bz2			2023-09-1...	-rw-rw---	bc
openharmy_...	637,126	Patch Fi...	2023-09-1...	-rw-rw---	bc
.gitconfig	77	Git Con...	2023-09-1...	-rw-rw---	bc
hello	8,304	文件	2023-09-1...	-rwxrw...	bc

(2) 解压源码，得到目录：

```
tar xjf openharmy_for_video_tutorial.tar.bz2 -C /home/book/
```



文件名	文件大小	文件类型	最近修改	权限	所 ^
..					
out		文件夹	2023-09-2...	drwxrw...	bc
myapp		文件夹	2023-09-1...	drwxrw...	bc
docs		文件夹	2021-03-2...	drwxr-x...	bc
vendor		文件夹	2021-03-2...	drwxr-x...	bc
utils		文件夹	2021-03-2...	drwxr-x...	bc
third_party		文件夹	2021-03-2...	drwxr-x...	bc
test		文件夹	2021-03-2...	drwxr-x...	bc
prebuilts		文件夹	2021-03-2...	drwxr-x...	bc
kernel		文件夹	2021-03-2...	drwxr-x...	bc
foundation		文件夹	2021-03-2...	drwxr-x...	bc
drivers		文件夹	2021-03-2...	drwxr-x...	bc

(3) 下载补丁文件，并使用补丁文件修改代码：

```
cd /home/book
```

```
$ git clone https://e.coding.net/weidongshan/openharmony/doc and source for openharmony.git
```

```
├── .bashrc          3,887  Bash R...  2023-09-2...  -rw-r--r--  bc
├── openharmony_...  209,35...  B72 文件  2023-09-1...  -rw-rw-...  bc
└── openharmony_100ask_v1.2.patch  Fi...  2023-09-1...  -rw-rw-...  bc
├── .gitconfig       77    Git Con...  2023-09-1...  -rw-rw-...  bc
└── ..               - - - - -  - - - - -  - - - - -  - - - - -  -
```

```
cd /home/book/openharmony
```

```
patch -p1 < /home/book/openharmony_100ask_v1.2.patch
```

```
book@ry-virtual-machine:~/openharmony$ patch -p1 < /home/book/openharmony_100ask_v1.2.patch
patching file drivers/hdf/frameworks/include/platform/i2c_if.h
patching file drivers/hdf/frameworks/support/platform/src/i2c_if.c
patching file drivers/hdf/lite/hdf_driver.mk
patching file drivers/hdf/lite/hdf_lite.mk
patching file drivers/hdf/lite/manager/BUILD.gn
patching file drivers/hdf/lite/manager/src/lite_driver_loader.c
patching file kernel/liteos_a/arch/arm/arm/src/startup/reset_vector_up.S
patching file kernel/liteos_a/.config
patching file kernel/liteos_a/.config.old
```

```
patching file vendor/st/stm32mp157/driver/stm32mp157-uart/uart_stm32mp157.c
patching file vendor/st/stm32mp157/driver/touch/Makefile
patching file vendor/st/stm32mp157/driver/touch/touch_gt9xx.c
patching file vendor/st/stm32mp157/driver/touch/touch_gt9xx.h
patching file vendor/st/stm32mp157/stm32mp157.mk
book@ry-virtual-machine:~/openharmony$
```

(4) 编译内核:

```
cd /home/book/openharmony/kernel/liteos_a
```

```
cp tools/build/config/debug/imx6ull_clang.config .config
```

```
make clean
```

```
make -j 8
```

```
make rootfs
```

```
cp out/imx6ull/rootfs.img out/imx6ull/rootfs.jffs2
```

```
book@ry-virtual-machine:~/openharmony/kernel/liteos_a$ make -j 8
make[1]: 进入目录"/home/book/openharmony/kernel/liteos_a"
/home/book/openharmony/kernel/liteos_a/tools/menuconfig/conf --silentoldconfig /home/book/openharmony/kernel/liteos_a/Kconfig
mv -f /home/book/openharmony/kernel/liteos_a/include/generated/autoconf.h /home/book/openharmony/kernel/liteos_a/platform/include/menuconfig.h
make[1]: 离开目录"/home/book/openharmony/kernel/liteos_a"
make[1]: 进入目录"/home/book/openharmony/kernel/liteos_a/arch/arm/arm"
src/startup/reset_vector_up.S:138:2: warning: deprecated since v7, use 'dsb'
mcr p15, 0, r0, c7, c10, 4 @ DSB
^
src/startup/reset_vector_up.S:139:2: warning: deprecated since v7, use 'isb'
mcr p15, 0, r0, c7, c5, 4 @ ISB
^
make[1]: 离开目录"/home/book/openharmony/kernel/liteos_a/arch/arm/arm"
make[1]: 进入目录"/home/book/openharmony/kernel/liteos_a/platform"
make[1]: 离开目录"/home/book/openharmony/kernel/liteos_a/platform"
make[1]: 进入目录"/home/book/openharmony/kernel/liteos_a/kernel/common"
make[1]: 离开目录"/home/book/openharmony/kernel/liteos_a/kernel/common"
make[1]: 进入目录"/home/book/openharmony/kernel/liteos_a/kernel/base"
make[1]: 离开目录"/home/book/openharmony/kernel/liteos_a/kernel/base"
make[1]: 进入目录"/home/book/openharmony/vendor/nxp/imx6ull/board"
make[1]: 离开目录"/home/book/openharmony/vendor/nxp/imx6ull/board"
make[1]: 进入目录"/home/book/openharmony/vendor/nxp/imx6ull/driver/mtcd/common"
make[1]: 离开目录"/home/book/openharmony/vendor/nxp/imx6ull/driver/mtcd/common"
make[1]: 进入目录"/home/book/openharmony/vendor/nxp/imx6ull/driver/mtcd/spi_nor"
make[1]: 离开目录"/home/book/openharmony/vendor/nxp/imx6ull/driver/mtcd/spi_nor"
```



```

/home/book/llvm/bin/./bin/ld.lld -static --gc-sections -L/home/book/openharmony/kernel/liteos_a/./../vendor/nxp/hdf/libs/ux6ull -L/home/book/openharmony/kernel/liteos_a/tools/scripts/ld -L/home/book/openharmony/kernel/liteos_a/platform -L/home/book/openharmony/kernel/liteos_a/out/ux6ull/lib -L/home/book/openharmony/kernel/liteos_a/out/ux6ull/lib/obj -L/home/book/openharmony/kernel/liteos_a/tools/build -L/home/book/llvm/bin/./../lib/clang/9.0.0/lib/arm-liteos/a7_softfp_neon-vfpv4 -L/home/book/llvm/bin/./../lib/arm-liteos/c++a7_softfp_neon-vfpv4 -L/home/book/openharmony/kernel/liteos_a/tools/build/liteos_llvm.ld -u task_shellcmd -ug usrVdoDataPage -uvm shellcmd -ucpup shellcmd -uhelp shellcmd -ufree shellcmd -usem shellcmd -umutex shellcmd -uqueue shellcmd -usysteminfo shellcmd -uswtmr shellcmd -uhsi shellcmd -ufindsym shellcmd -uzbar_scan shellcmd -udmesg shellcmd -update shellcmd -ureadExInfo shellcmd -uwatch shellcmd -udeadlock shellcmd -ukill shellcmd -upmm shellcmd -uarp shellcmd -utelnet shellcmd -uping shellcmd -unetstat shellcmd -uifconfig shellcmd -ucd shellcmd -uformat shellcmd -upartition shellcmd -uwriteproc shellcmd -upartinfo shellcmd -umount shellcmd -umount shellcmd -uvirtstats shellcmd -ulsfd shellcmd -usu shellcmd -uchmod shellcmd -uchown shellcmd -uchgrp shellcmd -uperf shellcmd -uwrp_dump shellcmd -ureset shellcmd -ustartup shellcmd -uhdds shellcmd -unand bad shellcmd -uizc_read shellcmd -ussp_read shellcmd -uuart config shellcmd -uusb debug shellcmd -urams fsmap -unfs fsmap -ufat fsmap -ujffs fsmap -uprocs fsmap -ug fsmap -ui2c_init -ugpio_init -uregulator_init -uMtdInitList -uhsi_init -uhifmc100_init -uhifmc350_init -unand_hifmc100_init -uhifmc100_parallel_init -usd_mci_init -uhimci_init -upl011_init -uhinfc620_init -uhisnfc100_init -uregulator machine_init -uhisimeidia regulator_init -ucpufreq_init -uhisilicon cpufreq_init -ucpufreq machine_init -udevfreq_init -umedia devfreq_init -udevfreq machine_init -uhieth machine_init -uhigmac machine_init -umachine_init -Map=/home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos.map -o /home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos --start-group -lclang_rt.builtins -lunwind --no-dependent-libraries -lcortex-a7 -lbsp -lrootfs -lbase -lboard -lmtm common -lspinor flash -lunx6ull-fb -lunx6ull-uart -lcup -ldynload -lvdso -ltickless -lliteos -ltpipe -lsc -lsec -lscrew -l++ -l++abi -lcpusupport -lz -lposix -lbsd -llinuxkpi -lvfs -lmulti partition -lbch -lrat -lvirpart -ldisk -lbcache -lramfs -lnfs -lproc -ljffs2 -lwp -lwhole-archive -lhdf -lhdf config -lunx6ull-i2c -ltouch -hello --no-whole-archive -lhievent -lmem -lmtm common -lvideo -lhi-log -lshell -ltelnet -lsyscall -lsecurity --end-group
/home/book/llvm/bin/./bin/llvm-objcopy -R .bss -O binary /home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos /home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos.bin
/home/book/llvm/bin/./bin/llvm-objdump -t /home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos |sort >/home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos.sym.sorted
/home/book/llvm/bin/./bin/llvm-objdump -d /home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos >/home/book/openharmony/kernel/liteos_a/out/ux6ull/liteos.asm
make[1]: 进入目录"/home/book/openharmony/kernel/liteos_a/apps"
make[2]: 进入目录"/home/book/openharmony/kernel/liteos_a/apps/shell"
make[2]: 离开目录"/home/book/openharmony/kernel/liteos_a/apps/shell"
make[2]: 进入目录"/home/book/openharmony/kernel/liteos_a/apps/init"
make[2]: 离开目录"/home/book/openharmony/kernel/liteos_a/apps/init"
make[1]: 离开目录"/home/book/openharmony/kernel/liteos_a/apps"
book@ry-virtual-machine:~/openharmony/kernel/liteos_a$

```

```

adding: rootfs/ld/ldc.so (deflated 45%)
book@ry-virtual-machine:~/openharmony/kernel/liteos_a$ ls out/ux6ull/
bin lib liteos liteos.asm liteos.bin liteos.map liteos.sym.sorted musl obj rootfs rootfs.img rootfs.jffs2 rootfs.jffs2.bin rootfs.zip
book@ry-virtual-machine:~/openharmony/kernel/liteos_a$

```

(5) 编译 hello 程序，并把 hello 程序放入 rootfs，同时重新制作 rootfs.jffs2:

```

cd /home/book/doc_and_source_for_openharmony/apps/hello
clang -target arm-liteos --sysroot=/home/book/openharmony/prebuilts/lite/sysroot/ \
-o hello hello.c
cd /home/book/doc_and_source_for_openharmony/apps/hello
cp hello /home/book/openharmony/kernel/liteos_a/out/ux6ull/rootfs/bin
cd /home/book/openharmony/kernel/liteos_a/out/ux6ull/
mkfs.jffs2 -s 0x10000 -e 0x10000 -d rootfs -o rootfs.jffs2

```

```

Your Hardware Enablement Stack (HWE) is supported until April 2023.
Last login: Tue Sep 26 21:16:25 2023 from 192.168.232.1
book@ry-virtual-machine:~/doc_and_source_for_openharmony/apps/hello$ clang -target arm-liteos --sysroot=/home/book/openharmony/prebuilts/lite/sysroot/ \
-o hello hello.c
book@ry-virtual-machine:~/doc_and_source_for_openharmony/apps/freetype$ cd /home/book/doc_and_source_for_openharmony/apps/hello
book@ry-virtual-machine:~/doc_and_source_for_openharmony/apps/hello$ cd /home/book/openharmony/kernel/liteos_a/out/ux6ull/
book@ry-virtual-machine:~/openharmony/kernel/liteos_a/out/ux6ull$ mkfs.jffs2 -s 0x10000 -e 0x10000 -d rootfs -o rootfs.jffs2
book@ry-virtual-machine:~/openharmony/kernel/liteos_a/out/ux6ull$ ls
bin lib liteos liteos.asm liteos.bin liteos.map liteos.sym.sorted musl obj rootfs rootfs.img rootfs.jffs2 rootfs.jffs2.bin rootfs.zip
book@ry-virtual-machine:~/openharmony/kernel/liteos_a/out/ux6ull$

```

(6) 把得到的 rootfs.jffs2 放到烧写工具的 files 目录，接着使用烧写工具，进入命令行后执行 hello 程序:

文件名	文件大小	文件类型	最近修改	权限	所
..					
rootfs.zip	863,634	压缩(zip...	2023-09-2...	-rw-rw...	bc
rootfs.jffs2.bin	1,043,...	BIN 文件	2023-09-2...	-rw-r--r--	bc
rootfs.jffs2	919,928	JFFS2 ...	2023-09-2...	-rw-r--r--	bc
rootfs.img	1,043,...	光盘映...	2023-09-2...	-rw-r--r--	bc
liteos.sym.sort...	271,563	SORTE...	2023-09-2...	-rw-rw...	bc
liteos.map	552,165	Linker ...	2023-09-2...	-rw-rw...	bc
liteos.bin	908,296	BIN 文件	2023-09-2...	-rwxrwx...	bc
liteos.asm	8,971,...	Assem...	2023-09-2...	-rw-rw...	bc
liteos	1,089,...	文件	2023-09-2...	-rwxrwx...	bc

```
DeviceManagerStart end ...
[ERR]No console dev used.
[ERR]No console dev used.
OHOS # ./bin/hello
OHOS # Hello, harmony!

OHOS # █
```

(7) 编译其他 APP :

```
cd /home/book/doc_and_source_for_openharmony/apps
for i in $(ls); do cd $i; make; cd -; done
```

```
book@ry-virtual-machine:~/openharmony/kernel/liteos_a$ cd /home/book/doc_and_source_for_openharmony/apps
book@ry-virtual-machine:~/doc_and_source_for_openharmony/apps$ for i in $(ls); do cd $i; make; cd -; done
make -C ./ -f /home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/Makefile.build
make[1]: 进入目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame"
make -C display -f /home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/Makefile.build
make[2]: 进入目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/display"
make[2]: 对"build"无需做任何事。
make[2]: 离开目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/display"
make -C encoding -f /home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/Makefile.build
make[2]: 进入目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/encoding"
make[2]: 对"build"无需做任何事。
make[2]: 离开目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/encoding"
make -C fonts -f /home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/Makefile.build
make[2]: 进入目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/fonts"
make[2]: 对"build"无需做任何事。
make[2]: 离开目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/fonts"
make -C input -f /home/book/doc_and_source_for_openharmony/apps/digital_photo_frame/Makefile.build
make[2]: 离开目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame"
make[1]: 离开目录"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame"
make[1]: 编译目标"/home/book/doc_and_source_for_openharmony/apps/digital_photo_frame"完成。
clang -target arm-liteos --sysroot=/home/book/openharmony/prebuilts/lite/sysroot/ -L /home/book/openharmony/out/ipcamera_hi3518ev300/libs/usr -lm -lfreetype -pthread -ljpeg -o digitpic_built-in.o /home/book/doc_and_source_for_openharmony/apps
make: "fb_test"已是最新。
/home/book/doc_and_source_for_openharmony/apps
clang -target arm-liteos --sysroot=/home/book/openharmony/prebuilts/lite/sysroot/ \
-I /home/book/openharmony/third_party/freetype/include \
-L /home/book/openharmony/out/ipcamera_hi3518ev300/libs/usr \
-lfreetype \
-o show_line_show_line.c
/home/book/doc_and_source_for_openharmony/apps
make: "hello"已是最新。
/home/book/doc_and_source_for_openharmony/apps
```

(8) 复制程序到 rootfs, 并制作 rootfs.jffs2:

```
cd /home/book/doc_and_source_for_openharmony/apps
# 拷贝应用程序
cp hello/hello /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
cp fb_test/fb_test /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
cp freetype/show_line /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
cp digital_photo_frame/digitpic /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
# 拷贝字体文件
cp freetype/simsun.ttc /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/
# 拷贝数码相框的图标
cp digital_photo_frame/rootfs /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/ -rf
# 拷贝库文件
cp /home/book/openharmony/out/ipcamera_hi3518ev300/libs/usr/libfreetype.so
/home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/usr/lib/
cp /home/book/openharmony/out/ipcamera_hi3518ev300/libs/usr/libjpeg.so
/home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/usr/lib/
cd /home/book/openharmony/kernel/liteos_a/out/imx6ull/
mkfs.jffs2 -s 0x10000 -e 0x10000 -d rootfs -o rootfs.jffs2
```

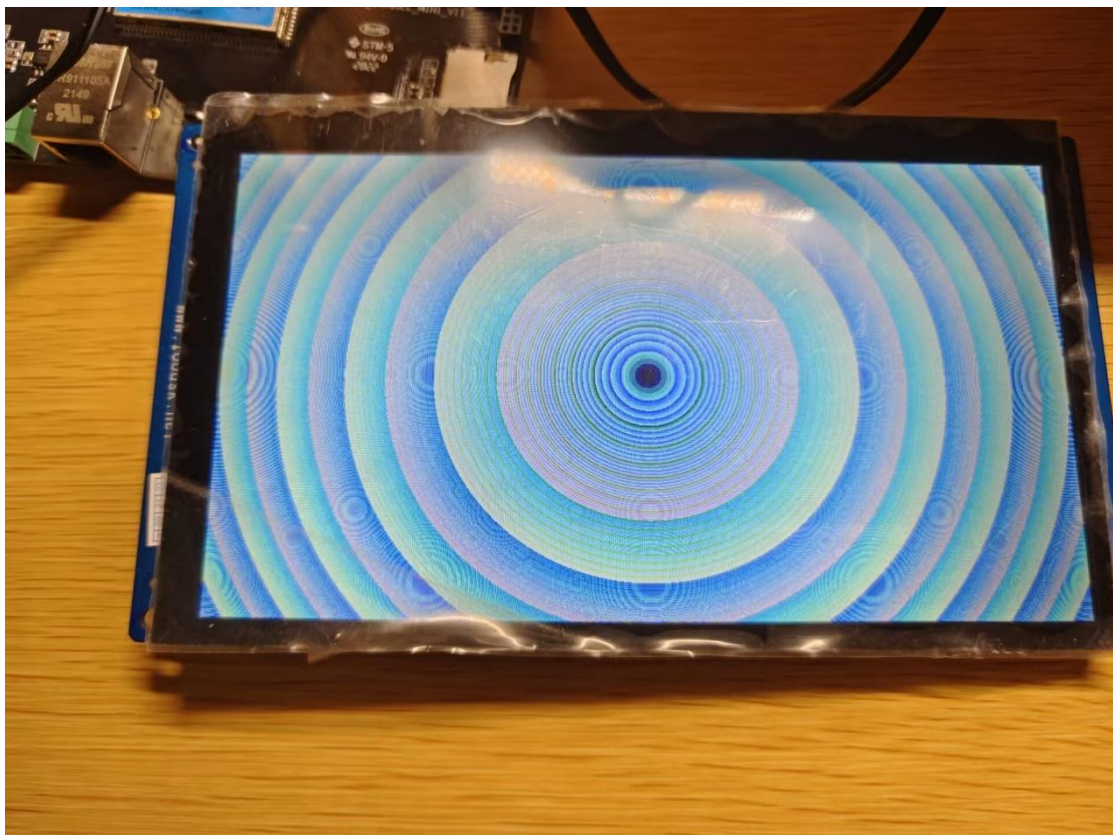


```
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cd /home/book/doc and source for openharmony/apps
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp hello/hello /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
cp fb_test/fb_test /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
cp freetype/show_line /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
cp digital_photo_frame/digitpic /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp fb_test/fb_test /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp freetype/show_line /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp digital_photo_frame/digitpic /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/bin
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp freetype/simsun.ttc /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp digital_photo_frame/rootfs /home/book/openharmony/kernel/liteos_a/out/imx6ull/rootfs/ -rf
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp /home/book/openharmony/out/ipcamera_hi3518ev300/libs/usr/libfreetype.so /home/book/openharmony/k
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cp /home/book/openharmony/out/ipcamera_hi3518ev300/libs/usr/libjpeg.so /home/book/openharmony/k
book@ry-virtual-machine:~/doc and source for openharmony/apps$ cd /home/book/openharmony/kernel/liteos_a/out/imx6ull/
book@ry-virtual-machine:~/openharmony/kernel/liteos_a/out/imx6ull$ mkfs.jffs2 -s 0x10000 -e 0x10000 -d rootfs -o rootfs.jffs2
book@ry-virtual-machine:~/openharmony/kernel/liteos_a/out/imx6ull$ mkfs.jffs2 -s 0x10000 -e 0x10000 -d rootfs -o rootfs.jffs2
book@ry-virtual-machine:~/openharmony/kernel/liteos_a/out/imx6ull$
```

(9) 执行 APP:

./bin/fb_test /dev/fb0

观察开发板，如图：



观察串口信息，如图：

```
OHOS # ./bin/fb_test /dev/fb0
OHOS # blank frame buffer
mire frame buffer
```

./bin/show_line /simsun.ttc 230 230 100

观察开发板，如图：



观察串口信息，如图：

```
OHOS # ./bin/show_line /simsun.ttc 230 230 100
```

`./bin/digitpic /simsun.ttc`

观察并点击开发板，如图：









观察串口信息，如图：

```
OHOS # ./bin/digitpic /simsun.ttc
OHOS # main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 47
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 47
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 47
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 47
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 47
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 0
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 0
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 0
main_page.c MainPageRun 190, iIndex = 0, tInputEvent.iPressure = 33
main_page.c MainPageRun 190, iIndex = 0, tInputEvent.iPressure = 33
main_page.c MainPageRun 190, iIndex = 0, tInputEvent.iPressure = 0
browse_page.c BrowsePageRun 824, g_strCurDir = /picture
browse_page.c BrowsePageRun 831, g_strCurDir = /
main_page.c MainPageRun 190, iIndex = -1, tInputEvent.iPressure = 0
main_page.c MainPageRun 190, iIndex = 1, tInputEvent.iPressure = 29
main_page.c MainPageRun 190, iIndex = 1, tInputEvent.iPressure = 29
main_page.c MainPageRun 190, iIndex = 1, tInputEvent.iPressure = 0
main_page.c MainPageRun 190, iIndex = 2, tInputEvent.iPressure = 28
main_page.c MainPageRun 190, iIndex = 2, tInputEvent.iPressure = 28
main_page.c MainPageRun 190, iIndex = 2, tInputEvent.iPressure = 28
main_page.c MainPageRun 190, iIndex = 2, tInputEvent.iPressure = 0
```


3.实验总结

通过这次实验，我在 Ubuntu 平台中编译了 liteos_a 的内核，对于鸿蒙系统的内核编译有了更深的理解。同时还学习如何在 Ubuntu 平台中编译 app 并将其加载到开发板中运行。

4.遇到的困难及解决方法

在执行 freetype、digital_photo_fram 程序时遇到报错：

```
OHOS # ./bin/digitpic /simsun.ttc  
OHOS # can't open /etc/digitpic/icons/browse_mode.bmp: No such file or directory  
y  
MapFile browse_mode.bmp error!  
GetPixelDatasForIcon browse_mode.bmp error!
```

解决方法：将 rootfs 文件夹中的 picture 文件夹和 etc 文件夹拿出，并重新制作 rootfs.jffs2。

