# Embedded System Design Lab4 Document

組別 : 11

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操作步驟 :請小心注意自己的 prefix directory

## Step 1 - 準備壓縮檔

事先準備好 alsa-lib-1.0.26.tar.bz2 , alsa-utils-1.0.26.tar.bz2 , libid3tag-0.15.1b.tar.gz , libmad-0.15.1b.tar.gz , madplay-0.15.2b.tar.gz , zlib-1.2.3.tar.gz

## Step 2 – 編譯 alsa-lib

依序執行下列指令
tar -xvf alsa-lib-1.0.26.tar.bz2
cd alsa-lib-1.0.26
CC = arm-linux-gnueabi-gcc ./configure --host=arm-linux
--prefix=/home/m/3rd/alsa/install
make
make install

## Step 3 – 編譯 alsa-utils

依序執行下列指令
tar -xvf alsa-utils-1.0.26.tar.bz2
cd alsa-utils-1.0.26
CC = arm-linux-gnueabi-gcc ./configure --prefix=/home/m/3rd/alsa/install --host=arm-linux --with-alsa-inc-prefix=/home/m/3rd/alsa/install/install/include --with-alsa-prefix=/home/m/3rd/alsa/install/lib --disable-alsamixer --disable-xmlto –disable-nls
make

## Step 4 – 編譯 zlib

依序執行下列指令
tar -xvf zlib-1.2.3.tar.gz

cd zlib-1.2.3
./configure --prefix=/home/ban/madplay/source
再來需要修改 Makefile.
CC=arm-linux-gnueabihf-gcc
AR=arm-linux-gnueabihf-ar rc
RANLIB=arm-linux-gnueabihf-ranlib
CFLAGS = -fPIC -O3
修改完就可以接著執行
make
make install
安裝完會在/home/ban/madplay/source/ 中生成 lib 跟 include

## Step 5 – 編譯 libid3tag

./configure --host=arm-linux-gnueabihf  --disable-debugging
--prefix=/home/ban/madplay/source
CPPFLAGS=-I/home/ban/madplay/source/include
LDFLAGS=-L/home/ban/madplay/source/lib
make
make install

## Step 6 – 編譯 libmad

## 解壓縮後依序執行

./configure --host=arm-linux-gnueabihf  --disable-debugging
--prefix=/home/ban/madplay/source
CPPFLAGS=-I/home/ban/madplay/source/include
LDFLAGS=-L/home/ban/madplay/source/lib
make
make install

中途會出現錯誤訊息
cc1: error: unrecognized command line option “-fforce-mem”
原因是高版本的 gcc，已經將-fforce-mem 去除了
解決方法 :  sed -i '/-fforce-mem/d' configure

再執行：

./configure --host=arm-linux-gnueabihf --prefix=/usr/local/libmad_arm --enable-shared --enable-static --enable-fpm=arm --with-gnu-ld=arm-linux-gnueabihf-ld --build=arm

出現錯誤：

```
/tmp/ccf2FxyW.s:1299: Error: selected processor does not support Thumb mode `rsc r0,r0,#0'
/tmp/ccf2FxyW.s:1435: Error: selected processor does not support Thumb mode `rsc r8,r8,#0'
/tmp/ccf2FxyW.s:1857: Error: selected processor does not support Thumb mode `rsc r0,r0,#0'
/tmp/ccf2FxyW.s:1996: Error: selected processor does not support Thumb mode `rsc r0,r0,#0
```

解决方法是：

vim fixed.h

將

```
#  define MAD_F_MLN(hi, lo)  \
    asm ("rsbs  %0, %2, #0\n\t"  \
         "rsc   %1, %3, #0"  \
         : "=r" (lo), "=r" (hi)  \
         : "0" (lo), "1" (hi)  \
         : "cc")
```

改成

```
#ifdef __thumb__
/* In Thumb-2, the RSB-immediate instruction is only allowed with a zero
operand. If needed this code can also support Thumb-1
(simply append "s" to the end of the second two instructions). */
# define MAD_F_MLN(hi, lo) \
asm ("rsbs %0, %0, #0\n\t" \
"       sbc %1, %1, %1\n\t" \
        "sub %1, %1, %2" \
        : "+&r" (lo), "=&r" (hi) \
        : "r" (hi) \
        : "cc")
#else /* ! __thumb__ */
# define MAD_F_MLN(hi, lo) \
        asm ("rsbs %0, %2, #0\n\t" \
```

```
        "rsc %1, %3, #0" \
         : "=r" (lo), "=r" (hi) \
          : "=&r" (lo), "=r" (hi) \
          : "0" (lo), "1" (hi) \
          : "cc")
#endif /* __thumb__ */
```

再執行 make 就可以了

## Step 7 – 編譯 madplay

解壓縮後執行

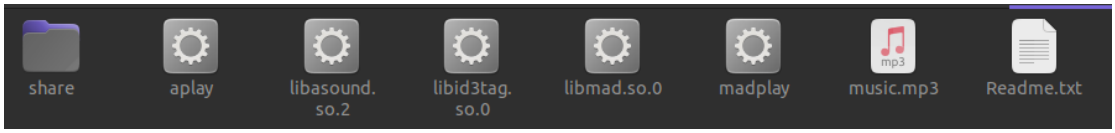
./configure --host=arm-linux-gnueabihf CC=arm-linux-gnueabihf-gcc --disable-debugging --with-alsa CPPFLAGS=-I/home/ban/madplay/source/include LDFLAGS=-L/home/ban/madplay/source/lib

make

make install

完成後將生成的 madplay 執行檔放入開發板

## Step 8 – 找到這些 share object




```
wengbing@wengbing-MS-7E13:~/lab_4_board$ readelf -d madplay

Dynamic section at offset 0xf3f4 contains 32 entries:
  Tag        Type                         Name/Value
 0x00000001 (NEEDED)                     Shared library: [libasound.so.2]
 0x00000001 (NEEDED)                     Shared library: [libdl.so.2]
 0x00000001 (NEEDED)                     Shared library: [libpthread.so.0]
 0x00000001 (NEEDED)                     Shared library: [librt.so.1]
 0x00000001 (NEEDED)                     Shared library: [libmad.so.0]
 0x00000001 (NEEDED)                     Shared library: [libid3tag.so.0]
 0x00000001 (NEEDED)                     Shared library: [libm.so.6]
 0x00000001 (NEEDED)                     Shared library: [libc.so.6]
 0x0000000f (RPATH)                      Library rpath: [/home/esd/2024/lab_4/lab4_package/madplay/lib:/us
r/local/lib:/home/esd/2024/lab_4/lab4_package/madplay/source/lib]
```

先 readelf -d madplay

你可以用 find / -name yourfile 2>/dev/null 找你的執行檔

找三個 shared obj

libasound.so.2.0.0 改名.2

libmad.so.0.2.1 改名.0

libid3tag.so.0.3.0 改名.0

## Step 9 – 執行 music.mp3 檔

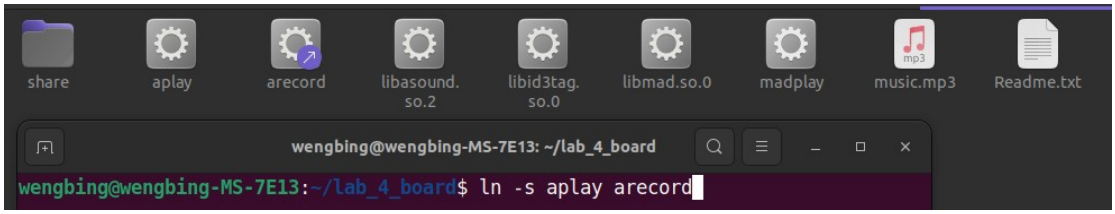
執行以下指令即可播放音樂
LD_LIBRARY_PATH=. ./madplay music.mp3
會先遇到問題


接下來把你的 madplay/share 整個資料夾從電腦複製到板子上
請注意板子上 share 資料夾要跟電腦上的路徑一樣

LD_LIBRARY_PATH=. ./madplay music.mp3
插上耳機音樂超大聲

madplay -o wav:-yourfile.mp3 | aplay

因為 aplay arecord 是同一個執行檔
(利用 argv[0]來判斷要錄音還是播音)
本來想說用 ln -s 來做 symbolic link 但是隨身碟的檔案系統不支援




因此用 cp aplay arecord
再來執行 LD_LIBRARY_PATH=. ./arecord -f cd -d 10 record.wav
用./aplay record.wav 播放

參考資料 :

https://blog.csdn.net/qq_31811537/article/details/104842097
https://blog.csdn.net/qq_28643619/article/details/108944064
https://www.cnblogs.com/cslunatic/p/3227655.html