TRXAMADRM on CUBIEBOARD 2/3

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Abstract

The program **trxamadrm** for digital (DRM) SSTV was compiled and run successfully on the Cubietruck board under the Linux operating systems Qbee-X en Cubieez. The load of the A20 ARMHF dual core processor of this board was less than 24% during reception of a DRM-transmission and less than 28% during the sending of a picture.

Keywords: Cubieboard - Cubietruck - Digital SSTV - Hamradio - DRM - Linux - Qbee-X - Cubieez

INTRODUCTION

TRXAMADRM is a linux program used in hamradio for receiving and transmitting digital pictures using the HAMDRM standard and is generally run on a standard desktop or laptop PC with a linux distribution like Ubuntu, Debian, Suse, etc. Permanently monitoring the DRM frequencies 3.733, 7.058 or 14.233 MHz and displaying the received pictures on a website is very helpful for fellow hams to enable them to obtain reports "automagically". Permanently running a standard transceiver and desktop PC (and somewhat less so a laptop) is costly in terms of use of electricity.

SDR receivers like the LIMA-SDR (homebuilt) or the SDR-IQ (RF-SPACE) run on less than 5 Watts. Using these receivers in monitoring shifts the bulk of the power budget to the PC or laptop. This paper describes the results of attempts to lower the total power consumption of permanent monitoring on the side of the computer connected to the web.

Attempts have been made to run **trxamadrm** on a RASPBERRY PI. The attempts were half successful, but processor load was a problem [1].

The Cubieboard 3, also called Cubietruck [2], runs on less than 10 Watts and has more processing power and thus is a better candidate. It is a small single board microcomputer based on the dual core A20 processor with the ARM HF architecture. This board is very well suited for hamradio experiments. It has a lot of interfacing possibilities, 2 GB on board RAM, 8 GB Flash memory, Gigabit ethernet, Wifi, HMDI, RS232, VGA, sound and 2 x USB2-ports. On the web quite a number of linux distributions can be found for this board which can be run from the flash memory (nand) or from a microSD-card. It can also be equipped with a SATA harddisk or SSD.

So this project boiled down to a test whether **trxamadrm** could be made to run on this Cubieboard.

INSTALLING TRXAMADRM ON CUBIEEZ

cubieez is a debian wheezy linux distribution that runs on cubieboard 2 and 3 single board computers. Ready to use images for SD-card and nand can be downloaded from the internet [3]. These images contain the software to compile and link c/c++ - programs (i.e. gcc) for the armhf architecture, but not all the necessary libaries. To get started first install the following packages:

- expect
- libfftw3-3
- libfftw3-dev
- tk
- libtk-img
- g++
- make
- automake
- libtool
- libasound2-dev
- zlib-bin
- libghc-zlib-dev
- libX11
- libX11-dev
- libusb-dev

- imagemagick
- libjasper-runtime
- libjpeg8-dev

All these packages can be installed with the command:
`sudo apt-get install <package name>`
The next thing to do is to download **trxamadrmv3_5.tgz** [4], extract this archive in your home directory with:
`tar -xvzf trxamadrmv3_5.tgz`
change directory to **trxamadrm**'s main directory with
`cd trxamadrmv3_5`
and run the command
`make`

ENABLING LINE-IN ON CUBIETRUCK

In the cubieez and QBee-X images for Cubieboard 3 (Cubietruck) the LINE-IN pens are not accesible in alsa nor in pulseaudio. To use audio from the phone or LS-terminals of a classic transceiver the audio must be routed to the LINE-IN pins and the alsa recording device driver must recognize this input. To enable LINE-IN the following steps must be taken (in cubieez):

```
sudo su - root
mount /dev/mmcblk0p1 /mnt
cd /mnt
/root/sunxi-tools/bin2fex script.bin > script.fex
```

Now edit the audio parameter section in file script.fex to contain:

```
[audio_para] audio_used = 1
audio_pa_ctrl = port:PH15<1><default><default><1>
playback_used = 1
capture_used = 1
```

by adding the last two lines. Now the script.fex file must be reconverted to script.bin with the commands:

```
rm script.bin
/root/sunxi-tools/fex2bin script.fex > script.bin
```

Now reboot the system and check the success of the changes in a terminal window with the command
`arecord -l`
which should now show a capture device with its card and subdevice number.

If the system is to be used with an SDR-receiver like the SDR-IQ or a web-SDR, enabling LINE-IN is not needed. Then the received

audio can be routed to **rxamadrm** using snd-aloop or similar audio routing solutions. When you have LINE-IN working it is also possible to connect the headphone jack to the LINE-IN in the hardware way.

RESULTS

The system has been run in combination with a YAESU FT2000D transceiver to receive and send drm-sstv in normal as well as in hybrid mode. Its maximum processor load during reception in this mode mounted to 14%. Using the Iceweasel webbrowser on a web-sdr URL [5] as input running simultaneously with rxamadrm resulted in a processor load of 39%. In both these situations the programs were run from a SATA SSD connected to the cubieboard.

It is also possible to use the cubieboard with the complete system and programs in flash memory (nand) or on micro-SD memory. This increases the processor load somewhat, probably due to slower memory to CPU transfers. In this situations the loads were 18% and 52%, but **trxamadrm** still runs smoothly.

CONCLUSION

The A20 CPU of cubieboards 2/3 has sufficient processing power to run **trxamadrm** simultaneously with a (WEB)-SDR program and is a very power efficient means to permanently monitor the DRM-SSTV channels and publish the received pictures on a website.

References

[1] Richard Corfield (M0RJC), http://m0rjc.me.uk/2013/04/easypal-linux-raspberry-pi, (2013) .

[2] http://www.cubietruck.com.

[3] http://www.cubieforums.com/index.php/topic,1511.msg9448.html.

[4] http://www.pa0mbo.nl/ties/public_html/hamradio/txamadrm/index.html.

[5] http://websdr.ewi.utwente.nl:8901.