TXAMADRM - A LINUX PROGRAM FOR SENDING DIGITAL SSTV

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Abstract

A linux program was developed for the transmission of digital SSTV pictures conforming to the HAM DRM standard as developed by HB9TLK. The program is a modification of the Dream software that was developed by Alexander Kurpiers, Volker Fischer, Stephane Fillod, Andrea Russo, Julian Cable and Doyle Richard [1]. It generally follows the original modifications by Cesco (HB9TLK). Burst error protection is effected by Reed-Solomon coding using the rsbep-program developed by Phil Karn (KA9Q) [2]

Keywords: Digital SSTV - Hamradio - DRM - Linux Reed-Solomon coding

INTRODUCTION

The program **txamadrm** can be used to transmit (picture) files in the HAMDREAM standard as developed by HB9TLK [3]. In contrast to the programs based on HB9TLK's code like WINDRM [4], EASYPAL [5] and DIGTRX [6], **txamadrm** runs under Linux and its source code is available. It is published under the GNU General Public License (GPL), so you can freely modify and improve it. Its base is the Dream software package as can be downloaded from sourceforge.net version 1.12b. Correct configuration and compilation will produce a standalone executable **drm** that accepts the names of the files to be sent (can be any type) as command line parameters. Running **drm** generates the audio on the soundcard speaker output which should be connected to the the mike input of the transmitter, either directly or via some transformer interface for galvanic separation.
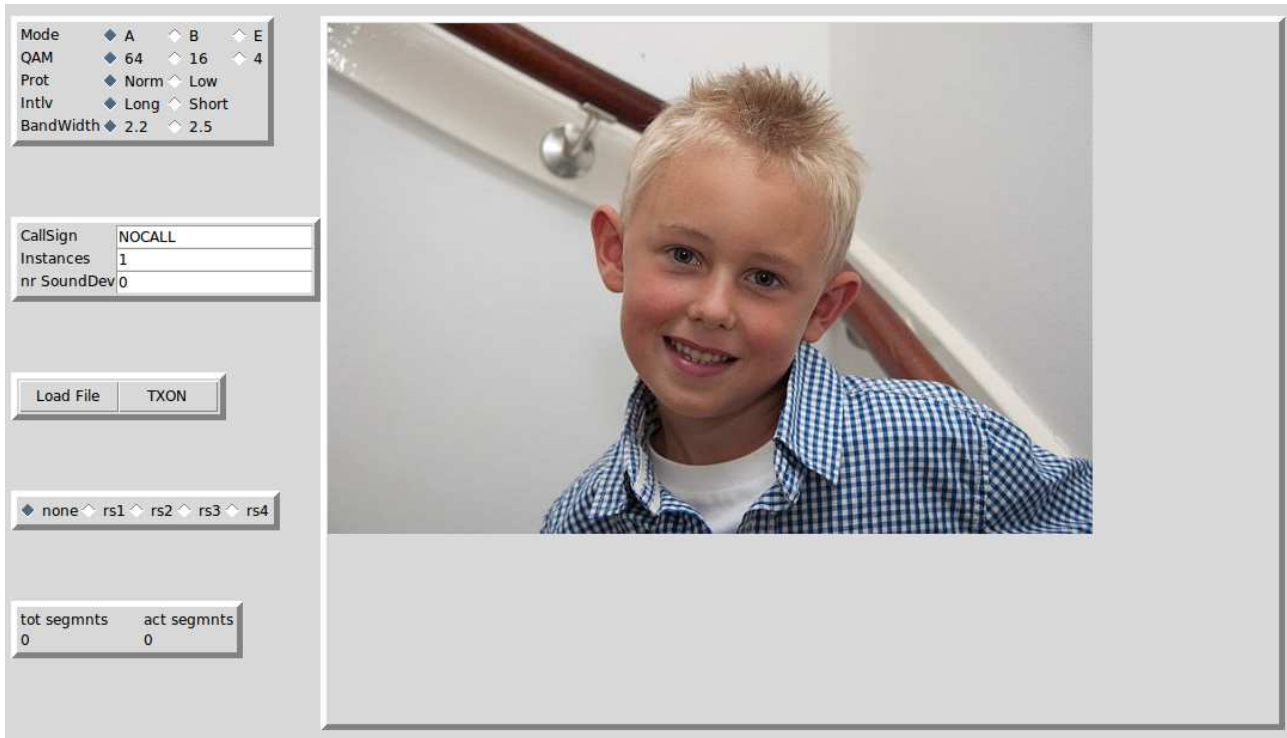
Figure 1: GUI with picture loaded

The mode settings for the transmission (robustness mode, bandwidth, etc.) are taken fron the file **txamadrm.ini** that should be in the same directory as the program **drm**.

If you do not like command line work in Linux, you can use a barebones graphical user interface as frontend to the program **drm**. This frontend is called **txamadrm.tcl** and is written in Tk/Tcl. Of course Tk/Tcl should then be installed on your system, together with the required packages **Expect** and **Img**. Figure 1 shows this user interface after a picture to be sent was loaded. In figure 2 a text file was loaded.

OVERVIEW OF TXAMADRM

The heart of the software is the Dream software version 1.12b as obtained from sourceforge.net. Its main routine was changed to start in tx mode. This routine reads the file **txamadrm.ini** in its working directory to obain the settings for the callsign, the sound device to be used and all mode parameters. This file is plain ascii and can be setup by any plain text editor. If using the graphical user interface it is written automatically using the settings of the radio buttons. The format of txamadrm.ini is described in the operation section. The ex-
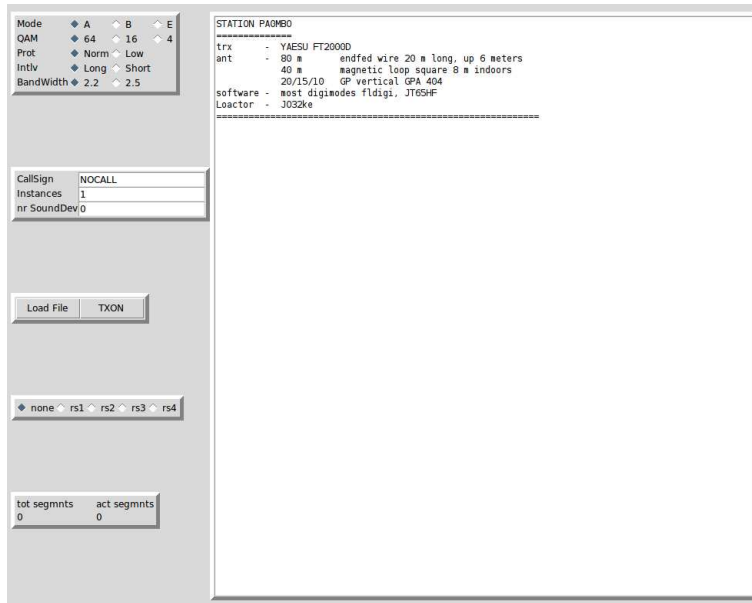
Figure 2: GUI with .txt file loaded

ecutable of the software can be found in the subdirectory **linux** of the main directory **txamadrm** that is created on untarring and unzipping the distribution package **txamadrmv0_2a.tgz** This executable is named **drm**. It should be called with the name of the file to be sent as command line parameter. When called with a single filename **drm** will generate a kind of prerun to allow the receiving station to synchronize before it starts sending the complete file. Durings its run it will show the total number of segments to be sent together with the number of the segment it is currently sending. When a complete picture has been sent **drm** will automatically start a new run with the next filename found on the command line. When all files given on the command line have been sent, **drm** starts again with the first one. To end a transmission **drm** should be killed by hand by typing control-C or using the kill command from another terminal.

The graphical frontend **txamadrm.tcl** automates a number of the steps needed in the standalone use of **drm**. When this script is started it reads an existing **txamadrm.ini** file and sets its buttons to show the values contained therein. To operate legally at least the callsign entry should be changed from NOCALL. Checking the radio buttons will change the parameters in **txamadrm.ini** accordingly. The **Load File** button opens a menu showing filenames in the subdirectory **./pics** which can be chosen for transmission. Files with image extensions will be opened in the right hand side pane of the user interface. Files with the extension ".txt" will be shown in textmode. Files with unknown extensions will produce an error message. Ignoring this message by clicking OK enables to send this file anyway. Click-

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ing **TXON** will start sending the file. The button text is changed to
TXOFF. Progress can be followed by comparing the numbers in the
tot segmnts and **act segmnts** fields. When done the sending stops
automatically and the button text returns to **TXON**. An ongoing
transmission can be aborted by clicking the **TXOFF** button.

If one of the radio buttons **rs1, rs2, rs3 or rs4** is checked before
clicking **TXON** the file will be sent reedsolomon coded and some
missing segments can be tolerated at the receiving end.

INSTALLATION

To install **txamadrm** untar and unzip the **txamadrmv0_2a.tgz**
archive in your home directory. This process will create a subdirectory
called **txamadrmv0_2a** where the sources as well as the executables
can be found in various subdirectories. To be able to run the program
the alsa soundsystem should be installed. In most linux distributions
this will be provided. Furthermore the following dynamic link libraries
will be needed:

- libasound
- libfftw (version 2 not 3)

For the graphical user interface Tk/Tcl is needed and thus should be
installed on your linux system. The **txamadrm.tcl** script calls the
wish-interpreter of Tk/Tcl. The name and place of this interpreter
depends on the version of Tk/Tcl. Try to find it (by the command
which wish) and change the first line of the script **txamadrm.tcl** if
/usr/bin/wish is not OK.

To compile txamadrm yourself use the following steps:

1. untar and unzip the distribution file **txamadrmv0_2a.tgz** in
   your home directory:
   ```
   tar -xvzf txamadrmv0_2a.tgz
   ```

2. cd to the main directory of the archive:
   ```
   cd ./txamadrmv0_2a
   ```

3. configure the software to disable the use of the libs faac, faad
   and qt and enable the use alsa: `./configure --disable-faac`
   `--disable-faad2 --disable-qt --enable-alsa`
   `--disable-hamlib`
   This will produce the makefile.

4. run the makefile:
```
make
```

See also the instructions given on sourceforge.net. This set of instructions produces the executable **drm** in the subdirectory **linux** which will be its working directory where also the Tk/Tcl script **txamadrm.tcl** should be located.

If the provided executables **rs1encode, rs2encode, etc.** don't run on your machine then download the archive **rsencodev0_1.tgz**, untar it in your home directory cd to it and run **make**. Then copy the resulting executables **rs?encode** to the directory **~/txamadrm/linux**.

OPERATION

Preliminaries

The collection of pictures or text files that you are planning to transmit should be transferred to the directory:
```
~/txamadrm/linux/pics
```
In principle any type of file can be sent with **txamadrm** but if you want your pictures to be shown in the right hand side pane of **txamadrm.tcl** it should be one of the types supported by the **Img** package of Tk, i.e. jpeg, bmp, gif, ico, pcx, pixmap, png, ppm, ps, sgi, sun, tga, tiff, xbm and xpm. Files with the extension.txt will be shown in text mode. Unsupported file types popup an error screen for the fact that they cannot be displayed, but ignoring this error by clicking on OK in the error screen will nevertheless allow sending the file.

Picture files should be converted to a reasonable size to keep their sending time in check (20 - 30 kB).

Sending pictures

sending from the command line

Change to the directory **~/txamadrm/linux** and edit the file **txamadrm.ini** with the use of a plain ascii editor like **vi**. As distributed this file has the following content:
```
[sounddevices]
devin=0
devout=0
[mode]
robustness=1
BW=0
intlvldepth=0
```

```
qam=4
protlev=0
[callsign]
mycall=NOCALL
```

Change the devout parameter to represent your sounddevice and change the NOCALL entry to your own callsign. The other given sending parameters set the robustness mode to B, the bandwidth to 2.2 kHz, the interleaver depth to long , the QAM mode to QAM-4 and the protection level to normal. Table 1 shows the coding of these parameters.

Table 1: txamadrm.ini parameter values

	0	1	2	4	16	64
robustness	A	B	E			
BW (kHz	2.2	2.5				
intlvldepth	long	short				
protlev	normal	low				
qam				QAM-4	QAM-16	QAM-64

When **txamadrm.ini** has been edited the sending of the file **mypicture.jpg** can be started with the command:

```
./drm ./pics/mypicture.jpg
```

This editing process can be circumvented by using the graphical user interface and checking the right radio buttons for mode, protection, QAM level, etc. and pressing TXON. After that a new **txamadrm.ini** file will have been written with the new conditions.

sending with the use of the Tk/Tcl frontend

To start sending your pictures with the **txamadrm.tcl** frontend you should change to the working directory:

```
cd ~/txamadrm/linux
```

and start the frontend:

```
./startdrm.tcl
```

Then load the file to be transmitted by clicking the **Load File** button and pick the right filename and filetype in the window that now pops up. Set the right sending parameters with the radio buttons and the number of instances of the file that you want to transmit. Finally hit the **TXON button** and watch the actual segment numbers being sent. When the name of the **TXOFF** button changes back to **TXON**

the work is done. If you want to abort a transmission just hit the **TXOFF** button.

N.B. There is no PTT-action by the program: you should either use VOX or otherwise operate the transmit On/Off switch of your set manualy.

Successful reception of the files you send depends very much on the right choice of the sending parameters. Mode A can only be used in very good quality channels. On hf mode B or E generally are used either in QAM-16 or QAM-4 when the going gets tough.

Burst error protection via Reed Solomon coding can be switched on by checking one of the rs-buttons before hitting the TX-ON button. The higher the rs-number the more protection, but the longer it takes to transmit a file.

RESULTS

Computer to computer testing

During the development of **txamadrm** the audio signal generated was received by **rxamadrm** on a second computer. The audio line output of the soundcard in the computer running **txamadrm** was connected to the microphone input of the Linux system running **rxamadrm**. All DRM-modes A,B and E with various combinations of interleave (long or short), protection (Normal or Low) and all possible QAM-modes. SNR was over 38 dB in this set up. Transmitted files were jpg's. Under all circumstances the reception was without missing segments.

Testing with the popular windows program Easy-Pal on the receiving end produced similar results, also with Reed-Solomon coding switched on.

DISCUSSION

The main reason to develop **txamadrm** was to provide a sending companion program to **rxamadrm**. Together this set of programs offers SSTV drm transmission and receiving under Linux.

This set of programs is compatible with the now very popular windows program EasyPal.

References

[1] Volker Fischer et.al., http:/www.sourceforge.net/projects/drm.

[2] Phil Karn, http://www.ka9q.net.

[3] Cesco HB9TLK, http://www.qslnet.de/member/hb9tlk.

[4] http://n1su.com/windrm.

[5] http://www.vk3evl.com.

[6] http://www.qsl.net/py4zbz/index.htm.