# Tempest for Eliza

# Download

tempest_for_eliza-1.0.5.tar.gz

# NEWS

since version 1.0.5 you can now listen to your mp3 in your radio!! it looks like this:

the quality of the music is not exactly what you are used to :-) but at least it works!

# Too Lazy ?

no problem. you can also listen to this mp3 and just believe that it's true. what you hear here is recorded from my radio while tempest for eliza is running. so this is not the new MP3 player output! it is the old tempest_for_eliza output!: tempest.mp3

# What's this?

The README file:

```
Tempest For Eliza
(c) 2001 by Erik Thiele

This program uses the GPL license. see the file
COPYING for details. a very important passage will be pasted here, too.:

                            NO WARRANTY
```

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POSSIBILITY OF SUCH DAMAGES.


this means if you get an electric shock from an old radio or
crash your aircraft because of radio signals, it is YOUR problem!


ok. now to the more interesting but less important topics:

What is it ?
------------

Tempest for Eliza is a Program that uses your computer monitor
to send out AM radio signals. You can then hear computer
generated music in your radio.

this document first describes tempest for eliza, the old program that
plays music like your cellphone does when you get a phonecall. then it
describes tempest for mp3 which you can use to play mp3 files :-)

How does this work ?
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All electronic devices send out eletromagnetic waves.
so does your monitor. and your monitor does it all the time.
and at very high frequencies. high enough for your short wave
AM radio.
all you have to do is display the "correct" image on your screen
and your monitor will emit the "right" signals.
Tempest for Eliza displays pictures on your screen. one for
each note in the song.

[Note: Markus G. Kuhn's and Ross J. Anderson's paper; "Soft Tempest:
Hidden Data Transmission Using Electromagnetic Emanations" was used as a
reference when programming Tempest-AM. This paper is a must read before
going further testing Tempest-AM. The paper is availabe from
   http://www.cl.cam.ac.uk/~mgk25/ih98-tempest.pdf
I strongly recommend to read the paper thoroughly.]

Why this program ?
------------------

You need no additional hardware to understand that it is
really possible to observe your computer without
physically touching it. (tempest).
I wrote this program because it was fun and because
it teaches in an amusing way that tempest really exists.
i want people to understand that their computers can
be observed.
And last but not least you can listen to music without a soundcard!

More information on Tempest

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Tempest and electromagnetic radiation is an interesting topic. There
aren't very much public literature on this topic. Luckily, there are a
few technical papers and web sites on the net that are a must read.

Papers to read:

o Markus G. Kuhn's and Ross J. Anderson's, "Soft Tempest: Hidden Data
  Transmission Using Electromagnetic Emanations"

        http://www.cl.cam.ac.uk/~mgk25/ih98-tempest.pdf

o Wim van Eck, "Electromagnetic Radiation from Video Display Units: An
  Eavesdropping Risk?"

        http://jya.com/emr.pdf

o Christopher Seline, "Eavesdropping On the Electromagnetic Emanations of
  Digital Equipment: The Laws of Canada, England and the United States"

        http://www.eff.org/pub/Privacy/Security/tempest_legal.draft


Here's a few links to start from:

o Ros Anderson's website, is a good starting point and has links to
  go further.

        http://www.cl.cam.ac.uk/users/rja14/#Tempest

o The Complete, Unofficial TEMPEST Information Page, a great site. A lot
  of links to other websites and papers.

        http://www.eskimo.com/~joelm/tempest.html

Compiling and runnning
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you must have libSDL installed.
see http://www.devolution.com/~slouken/SDL/

type
  ./configure
  make

now start X11. make sure that you choose low colordepth this gives much higher speed !!!
8 bpp is optimal.
if the cpu runs at 100% the music will slow down, i.e. short tunes will get longer than they
usually are. the song will sound bad :)

start xvidtune.
write down the values of
HDisplay
VDisplay
HTotal
Pixel Clock

now go and get a short wave AM receiver.
(pocket radio, put switch into SW position (if it is named this way;))
dial close to 10 Megahertz

now start

```
./tempest_for_eliza 105000000  1024     768      1400   10000000  songs/forelise
                    pixelclock Hdisplay VDisplay HTotal radio     music
                    *1000000                             frequency file
```

the program runs in fullscreen.

now SLOWLY move a little left and right on your radio
to find the 10 Megahertz. You will hear
a Song for Eliza from Ludwig van Beethoven

the song will be on the radio at multiple frequencies.
but the best transmission is at the frequency you gave on
the commandline.

if your computer makes too much noise on that frequency
you could also try some other radio frequencies.
it is up to you.

now go and try other songs included in the songs/ subdir !!

Let's be a spy
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Observe your computer from within another room !
take the radio into another room. play with the antenna
touch earth connections or other things. just play around.
depending on the distance and the quality of your monitor
you will hear good voice.
i have a TCO'99 monitor and i can still hear GOOD music !

Tempest for MP3
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get your favourite mp3 file to the current directory. let's call it
'foobar.mp3'. make sure you have "amp" and "sox" installed. you must
use X11 with 8 bits colordepth. use the old -bpp 8 option to your
xserver or the new -fbbpp 8 option if you have a newer Xserver.

first we need to find out what the correct sampling rate will
be. therefore start:

```
./tempest_for_mp3 115500000 1024 768 1350 810 1500000 0 20  notexist.raw
                  pixel-clock    resy     vtotal      playmode
                            resx     htotal   radio-frequency
                                                   amplification
                                                       filename
```

note that the vtotal parameter is a new one and must be read from the
xvidtune screen!

also note that the notexist.raw file does not exist. we just want to
see the output of the program, play no music yet.

it will display:

"audio file frequency should be 13519.890261 Hz"

now take this value and convert your mp3 like this:

```
./mksong.sh 13519 foobar.mp3 cool.raw
```

you can now listen to it with this command:

```
./tempest_for_mp3 115500000 1024 768 1350 810 1500000 0 20  cool.raw
```

notice the low radio frequency of only 1500 KHz. well... i found out
that you actually don't need a short wave radio if you put your
antenna close enough to your computer screen. lower frequencies also
work. and even nowadays most radios can receive AM waves :) so finally
you can send to any radio you have. (but no FM, sorry...)

the playmode and amplification parameters control the algorithm for
playback. you can choose between playmode 0 and playmode 1. playmode 1
produces a correct AM signal. amplification 1 is correct. if you
increase amplification the audio signal will be clipped. but since
there is so much disturbing noise anyway, this doesn't matter. you can

use playmode 0 to further increase output energy. the signal is not
very good anymore then :) but it is louder. the problem is i cannot
use the time when the electron beam does the blanking and retrace
phase. unfortunately there's no way around this, folks. if your song
has heavy basses, you shouldn't over-amplify, because you won't hear
the melody while the bass is drumming then...

Credits
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The original idea is from Pekka Riikonen. (see file AUTHORS)
he wrote the program
tempest-AM-0.9. i used a simplification of his routines
to create the signal.

(erikyyy at erikyyy dot de, Erik Thiele)

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