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Manual xtrack

1 Needed files

- Earth picture; GIF format, linear longitude (-180 ... +180) and latitude (90 ... -90)
- wget or curl: program to download Kepler files
- Kepler file (NORAD 2 lines format):
 - from menu File->Kepler file
 - enter files to download, left-button select which to download
 - right check button: which file(s) to use

2 Preferences

Under Edit->Preferences

2.1 Observator

- enter position observator
 - a gpx file 'cities.gpx' may be created/used, click on 'Cities' to get the list
 - select from here the location and click 'Set User location'
 - Or enter lon/lat directly
- Elevation levels:
 - limits for tracking satellites:
 - Only track if reaches the mentioned elevation
 - Start tracking at mentioned elevation
- Areas shown:
 - show radio horizon (around observator)
 - show radio horizon observator (taken into account 'start tracking at', see Elevation levels)
 - Sat visual area: area in which satellite is above horizon
- Time:
 - used for calc.: Offset UTC: should be normally zero (if internal PC time = UTC)
 - Presented time: time zone, what's shown in the gui, not used for calculations
 - E.g. summer time, Berlin: set to 2.00

2.2 Rotor configuration

- Rotorconfig:
 - Rotortype:
 - Elev-Azim
 - Prevent high rotation speed azimuth: (this will give a (small) aim error at vhigh elevation)
 - No pass flip, normal setting
 - Do flip if:
 - flip if maximum elevation higher than mentioned value
 - interpolate at elevations higher than mentioned value
 - X-Y, X rotates between east and west, Y rotates between north and south
 - Dish at: set to where dish is mounted on: X or Y rotor (i.e., the other one is fixed to ground)
 - X=0: pointing to east or west
 - Y=0: pointing to north or south
 - HW settings: show/alter rotor controller settings, only for 'my' controller
 - Only for 'Save track selected': simulation of limited rotor speed
 - DiSeqC rotors: currently supported via satellite decoder, (not always available!) using 2x HH390 rotors
 - deg2step: normally 16, range +/- 80 degrees, rotor can be adapted to range beyond +/- 90 degrees, with half resolution; then set deg2step to 16
 - Flip X, Y: same as X=0/Y=0 at rotorconfig?
 - Limit to: can be set by clicking on button 'Set lim HH390'
- Storm position: position if not tracking
 - for X/Y or E/A rotors
 - (Wait X, Wait Y: X/Y rotors may go to storm position one by one, not active now)
- Compensate rotor delay: go to next position in advance, so time of rotor to reach new position can be compensated (in tenth of seconds)

2.3 Files

- Files
 - Add 1 to 4 Kepler files, select which to use
 - Map file: background file, should be Plate Carree, with width 2x height, may be gif or jpeg
 - Ext. pos: name of external position file, to use instead of kepler file
 - Search: search and show all defined files
- Download program:
 - curl or wget
 - Aging: Define max. age in days, older will give a note
- Search locations:
 - shows locations where files are searched (cannot be altered)

2.4 Run options

- Run at program start: program runs at start, but does not necessarily send commands to rotor (see 'Rotor control to output', 'Enable at program start'))

- send also if below horizon: normally always on, but can be switched off (last sent position is to storm position)
- Rotor control to output:
 - Enable at program start: program starts calculation and drives rotor as soon as program starts executing
 - Use external program, can be used in parallel with one of next outputs: (see [1.2.4.1.Control rotor using external program|outline](#))
 - Choose which output to use:
 - none of below (use external program only)
 - serial/com (USB) (send commands one by one) (see [#1.2.4.2.Using USB |outline](#))
 - ethernet (send commands one by one) (see [#1.2.4.3.Using Ethernet, ESP processor as controller|outline](#))
 - Use remote SGP4 calc, ethernet: remote calculation of positions; send tracking parameters to external processor, after that xtrack can be stopped/closed or whatever

2.4.1 Control rotor using external program

This may be selected in parallel with other connection ways.

- tab 'Ext programs': enter program names:
 - *Run always*: runs always each second (after clicking button 'Run')
 - *Run 1x at sat up*: one run if sat comes above horizon
 - *Run 1x at sat down*: one run if sat goes below horizon
 - *Run during sat. up*: runs each second if sat is above horizon
 - Arguments for programs:
 - %n: replaced by name of satellite
 - %e: replaced by elevation
 - %a: replaced by azimuth
 - %x: replaced by X position (XY-rotor)
 - %y: replaced by Y position (XY-rotor)
 - %F: replaced by doppler (ppm)
 - %V: replaced by speed (in km/h)
 - %T: replaced by <YYYY>-<mm>-<dd> <HH>:<MM>:<SS>
 - %d, %m, %Y: replaced by day/month/year
 - %H, %M, %S: replaced by hour/min/sec

Example:

Run Always:

```
./extprog.sh name=%n %e %a
```

Program ./extprog.sh:

```
echo "$1 elevation=$2 azimuth=$3"
```

Gives as result:

```
name=NOAA 18 elevation=35.128700 azimuth=37.875229
```

```
name=NOAA 18 elevation=48.485432 azimuth=54.376877
```

....

2.4.2 Using USB

- tab UART/Ethernet:
 - set UART portnr to right port (portname will be shown)
 - baudrate: depends on settings in rotorcontroller
 - command format: depends on rotorcontroller:

- 2 numbers: azim+elev or x+y
- 3 numbers: eastpass=1/westpass=0 + azim+elev

2.4.3 Using Ethernet, ESP processor as controller

- IP1...IP4: Enter 1 to 4 IP addresses/names
- IPA: Enter IP address for access mode (direct WiFi to ESP processor)
- Use IP1...IP4, IPA: choose one of IP's to use
- Port: normally 23 (Telnet port)

2.5 Colours

- Colours used in map
- Enable shadow (day/night areas)
- Size map: will alter window size
- Autoplace Windows: subwindows will be placed besides (non-overlapping) other xtrack windows, if possible

3 Kepler files

Menu: File->Keplerfile

- Max. 4 kepler files are shown (see preferences, tab 'Files')
 - if needed adapt file and/or selection
 - At bottom, 'Currently edited Kepler file', actual filename is shown
 - click 'Use selected file(s)
- Select left one to download and click 'Download'
- Download command and info are shown
- Select right one or more to use
- To see the Kepler file content:
 - Select one under 'Download'
 - click 'View selected'

In main window Kepler age (in days) is shown. Will turn to red if age is above limit set in Preferences. Download: one-click download of Kepler file.

3.1 Select satellites to use

Menu: Edit->Select sat

- Select left satellite to use
- Click 'Add' to add it to the use list, at the right
- If ready: click 'Accept', in main window, at right, buttons for all satellites in right list are added
- 'Save' to save this selection in preferences file

Main window:

- select one or multiple satellites to show (left buttons)
- select one to track (right 'radio' button)

To show interpreted Kepler data:

- select in main window a satellite (right radio button)
- choose from menu Edit: -> Show Kepler
- You may change parameters, these will be used for tracking but not saved.

4 Zoom

- i = zoom in around observation point
- I=zoom in around cursor position

- o zoom out around observation point
- O=zoom out around cursor position
- f=full

5 Predict

From main menu->Predict

5.1 Show passes

- Select desired satellites in main window (check box, and/or radio button)
- Choose Start prediction time, Prediction range and lowest elevation
- Click **Predict**, a list of passes is shown right
- Select a line to see the pass in the main window
- For a ASCII list of the selected pass: click 'Save track selected'
 - for format see Preferences, tab 'Ext programs', 'Format track'
- For a graphical overview of passes:
 - select in main window satellite using radio button
 - reset daynr
 - select prediction range (months)
 - click 'Save as ps' to get a postscript graphical representation
 - click 'Save as text' to get an overview in text