NAME

proj − Cartographic projection filter

SYNOPSIS

proj [**−beEfiIlmorsStTvVwW**] [args]] [+*args*] file[s]

invproj [**−beEfiIlmorsStTvVwW**] [args]] [+*args*] file[s]

DESCRIPTION

proj and **invproj** perform respective forward and inverse conversion of cartographic data to or from cartesian data with a wide range of selectable projection functions.

invproj may not be available on all platforms; in this case use *proj −I* instead.

The following control parameters can appear in any order

−b   Special option for binary coordinate data input and output through standard input and standard output. Data is assumed to be in system type double floating point words. This option is to be used when **proj** is a child process and allows bypassing formatting operations.

−d <n>

New in version 5.2.0: Specify the number of decimals in the output.

−i   Selects binary input only (see −*b*).

−I   Alternate method to specify inverse projection. Redundant when used with **invproj**.

−o   Selects binary output only (see −*b*).

−t<a>   Where *a* specifies a character employed as the first character to denote a control line to be passed through without processing. This option applicable to ASCII input only. (# is the default value).

−e <string>
Where *string* is an arbitrary string to be output if an error is detected during data transformations. The default value is a three character string: ***\t***. Note that if the −*b*, −*i* or −*o* options are employed, an error is returned as HUGE_VAL value for both return values.

−E   Causes the input coordinates to be copied to the output line prior to printing the converted values.

−l<[=id]>
List projection identifiers that can be selected with +*proj*. **proj −l=id** gives expanded description of projection *id*, e.g. **proj −l=merc**.

−lp   List of all projection id that can be used with the +*proj* parameter. Equivalent to **proj −l**.

−lP   Expanded description of all projections that can be used with the +*proj* parameter.

−le   List of all ellipsoids that can be selected with the +*ellps* parameters.

−lu   List of all distance units that can be selected with the +*units* parameter.

−ld   List of datums that can be selected with the +*datum* parameter.

−r   This options reverses the order of the expected input from longitude−latitude or x−y to latitude−longitude or y−x.

−s   This options reverses the order of the output from x−y or longitude−latitude to y−x or latitude−longitude.

−S   Causes estimation of meridional and parallel scale factors, area scale factor and angular distortion, and maximum and minimum scale factors to be listed between <> for each input point. For conformal projections meridional and parallel scales factors will be equal and angular distortion zero. Equal area projections will have an area factor of 1.

−m <mult>

The cartesian data may be scaled by the *mult* parameter. When processing data in a forward projection mode the cartesian output values are multiplied by *mult* otherwise the input cartesian values are divided by *mult* before inverse projection. If the first two characters of *mult* are 1/ or 1: then the reciprocal value of *mult* is employed.

−f <format>

Where *format* is a printf format string to control the form of the output values. For inverse projections, the output will be in degrees when this option is employed. The default format is **"%.2f"** for forward projection and DMS for inverse.

−w<n>   Where *n* is the number of significant fractional digits to employ for seconds output (when the option is not specified, **−w3** is assumed).

−W<n>

Where *n* is the number of significant fractional digits to employ for seconds output. When **−W** is employed the fields will be constant width with leading zeroes.

−v   Causes a listing of cartographic control parameters tested for and used by the program to be printed prior to input data. Should not be used with the *−T* option.

−V   This option causes an expanded annotated listing of the characteristics of the projected point. *−v* is implied with this option.

−T <ulow,uhi,vlow,vhi,res[,umax,vmax]>

This option creates a set of bivariate Chebyshev polynomial coefficients that approximate the selected cartographic projection on stdout. The values *low* and *hi* denote the range of the input where the *u* or *v* prefixes apply to respective longitude−x or latitude−y depending upon whether a forward or inverse projection is selected. The integer *res* is a number specifying the power of 10 precision of the approximation. For example, a *res* of −3 specifies an approximation with an accuracy better than 0.001. Optional *umax*, and *vmax* specify maximum degree of the polynomials (default: 15).

The +*args* run−line arguments are associated with cartographic parameters. Additional projection control parameters may be contained in two auxiliary control files: the first is optionally referenced with the +*init=file:id* and the second is always processed after the name of the projection has been established from either the run−line or the contents of +init file. The environment parameter **PROJ_LIB** establishes the default directory for a file reference without an absolute path. This is also used for supporting files like datum shift files.

One or more files (processed in left to right order) specify the source of data to be converted. A − will specify the location of processing standard input. If no files are specified, the input is assumed to be from stdin. For ASCII input data the two data values must be in the first two white space separated fields and when both input and output are ASCII all trailing portions of the input line are appended to the output line.

Input geographic data (longitude and latitude) must be in DMS format and input cartesian data must be in units consistent with the ellipsoid major axis or sphere radius units. Output geographic coordinates will be in DMS (if the **−w** switch is not employed) and precise to 0.001" with trailing, zero−valued minute−second fields deleted.

EXAMPLE

The following script

```
proj +proj=utm +lon_0=112w +ellps=clrk66 -r <<EOF
45d15'33.1" 111.5W
45d15.551666667N -111d30
+45.25919444444 111d30'000w
EOF
```

will perform UTM forward projection with a standard UTM central meridian nearest longitude 112W. The geographic values of this example are equivalent and meant as examples of various forms of DMS input. The x−y output data will appear as three lines of:

```
      460769.27      5011648.45
```

OTHER PROGRAMS

The **proj** program is limited to converting between geographic and projected coordinates within one datum.

The **cs2cs** program operates similarly, but allows translation between any pair of definable coordinate reference systems, including support for datum translation.

SEE ALSO

cs2cs(1), **cct(1)**, **geod(1)**, **gie(1)**

BUGS

A list of know bugs can be found at *https://github.com/OSGeo/proj.4/issues* where new bug reports can be submitted to.

HOME PAGE

https://proj4.org/

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