LLUTMN_ A Microsoft Windows Program to Convert Between Longitude-Latitude and Universal Transverse Mercator Coordinates

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Abstract

LLUTMN_ is a Microsoft Windows program that allows the user to project coordinates between the Geographic Angular and Universal Transverse Mercator Coordinate Systems. Coordinates can be entered interactively or be obtained from coordinate pairs stored in the tables or queries of a Microsoft Access database. Coordinates in queries or tables can be for individual X,Y locations stored in two separate fields or chains of X,Y pairs stored in Binary Large OBject fields (XYBLOBs as used in the Windows-based Hydrogeologic Exploration and Analysis Toolkit (WHEAT). LLUTMN_ is based on NOAA's Generalized Cartographic Transformation Package (GCTP).

Introduction

The Universal Transverse Mercator (UTM) coordinate system is a widely-used projection that allows straightforward calculation of distances and preserves angles. UTM coordinates are included as tic marks on almost all topographic maps, and soon the base projection of USGS topographic maps will be UTM. Most publicly accessible geographic data is available in either UTM or geographic coordinates, so having a database in UTM or geographic coordinates is recommended. Because UTM allows straightforward calculation of distances while the geographic angular system does not, UTM should be used in geographic databases where distances and angles are important or map features need to be compared with published maps.

UTM Zone 14 (102° W to 96° W) includes most of the state of Kansas, and almost all of the present field areas of researchers in the Geohydrology Section of the Kansas Geological Survey. Because of this, many databases are available from KGS-GH

in UTM Zone 14 coordinates. LLUTMN_ is provided so that conversion between the UTM and latitude-longitude coordinate systems can be made as easily as possible.

LLUTMN_ allows/requires the user to select the UTM Zone number, so that users in any UTM Zone can perform this conversion. LLUTMN_ can also be used for the questionable practice of projecting coordinates from one UTM Zone to another zone in a two step process. (KGS OFR 95-10 describes LLUTM14_, which automatically uses Zone 14. KGS OFR 95-14 describes WHTGCTP, which projects to/from most commonly-used projection.)

The Visual Basic source code, which can be used in Microsoft Visual Basic, Excel, or Access, is available as Kansas Geological Survey Open File Report 95-13. The user can tailor the program to his/her needs, including other projections, if desired.

LLUTMN_ uses the Clark spheroid of 1866 and thus is equivalent to NAD27.

Choosing the UTM Zone

LLUTMN_ provides two ways to choose the UTM Zone: by command line and interactively. To have LLUTMN_ automatically use UTM Zone 15 at start-up, change its command line (using Program Manager) to LLUTMN_.EXE zone 15. To interactively change the UTM Zone, use the text entry box. Every time LLUTMN_ projects coordinates, it gets the UTM Zone number from the text box.

Projecting Interactively-Entered Points

It is very simple for the user to interactively project points with LLUTMN_.

If you have UTM coordinates and want to convert them to longitude, latitude pairs, enter the values of UTM Easting and Northing in the two text boxes on the right, then click the UTM_To_Longitude-Latitude button; the corresponding longitude and latitude in decimal degrees and in degrees, minutes, seconds will appear in the text boxes on the left.

If you have longitude latitude pairs in decimal degrees, enter them in the upper text boxes on the left side, click the Longitude-Latitude_To_UTM button, and the corresponding UTM Easting and Northing will appear in the boxes on the right, with the zone being whatever is in the text entry box for UTM Zone Number.

If you want to enter longitude-latitude in degrees, minutes, seconds format, the procedure is more complicated. For these, you enter the degrees, a blank, the minutes, a blank, and seconds, followed by ENTER. The location 100° 37' 30" W would be entered in the Longitude_Degrees_Minutes_Seconds box as   -100 37 30   Then the equivalent (-100.625) in decimal degrees will appear in the Longitude_Decimal_Degrees box. Once the decimal longitude and latitude are correct, you can then proceed as if you had entered decimal degrees by clicking the Longitude-Latitude_To_UTM button.

Copying and Pasting

To copy coordinates from another application into LLUTMN_, copy the coordinates in the other application, click on the appropriate type of coordinates in LLUTMN_, and choose Edit|Paste from the menu. To copy coordinates from LLUTMN_ to another application, such as Excel, highlight the appropriate type of coordinates in LLUTMN_, select Edit|Copy, go to the other application, and paste the coordinates.

With spreadsheet-like applications, you can copy and paste both X and Y at the same time. With other applications, you must copy and paste them separately.

## Projecting Coordinates Stored in a Database

In addition to projecting coordinates entered by hand, LLUTMN_ allows the user to project coordinates already stored in a database, in either a table, or retrieved by a query. The user opens the database using the FilelOpen menu item, then selects the feature class (Points–each record has one point contained in two fields or BLOBS–each record has many points in a chain contained in one field), chooses the input field(s), enters a name(s) for the output field(s) or chooses them from a list of pre-existing fields, and clicks the button indicating the direction of projection.

LLUTMN_ examines the field names when deciding what fields to add to the lists of fields. If you are maintaining a database with multiple coordinate systems, add a suffix to the field name to indicate the coordinate system. For X,Y paired coordinates, X_UTM14, Y_UTM14 and X_Longitude, Y_Latitude would be good field names. For XYBLOBs, XY_UTM14 and XY_LongitudeLatitude would be good field names. A query could be used to "rename" the fields for use in LLUTMN_.

Projecting Lines and Outlines

If the user wants to project lines or outlines, such as rivers or county lines, the operation of LLUTMN_ is straightforward. Click the XYBLOBs button, select the table or query from the list at the top, choose the input field you want to project from, choose or type the name of the output field you want to project to, and click the UTM_To_Longitude-Latitude or Longitude-Latitude_To_UTM button as appropriate. The bar at the bottom shows the percentage completion. LLUTMN_ will create a new field if the user enters a new name in the output field area, which depends on which button the user later selects. If the field already exists in the table, it will be overwritten. It is a good idea to always project into new fields.

To appear in the list of fields, a field must be a Binary Large OBject (a.k.a. OLE object) field. To appear in the list of longitude-latitude fields it must contain the string LAT . To appear in the list of UTM fields, it must contain the string UTM .
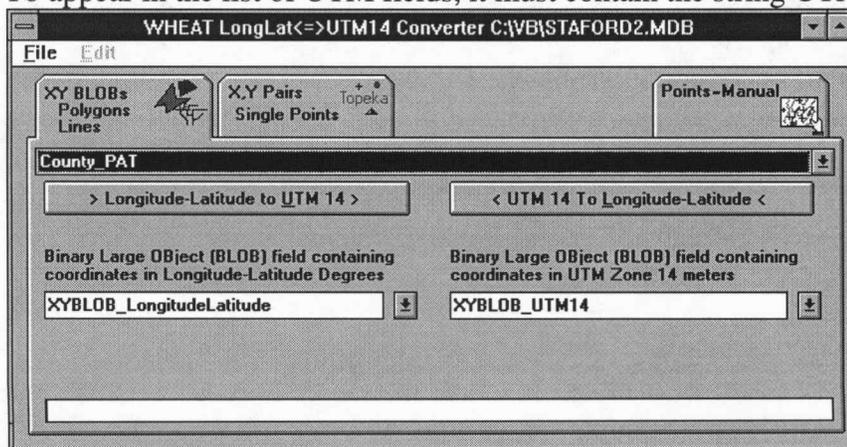
Projecting Individual Points

If the user wants to project individual point locations, such as those used for well locations, section centers, or spot locations to represent a polygons (for example, the mid-point location used to label a county) the operation of LLUTMN_ is more complicated. Click the X,Y Pairs button, select the table or query from the list at the top, choose the input fields you want to project from, choose or type the name of the output fields you want to project to, and click the UTM_To_Longitude-Latitude or Longitude-Latitude_To_UTM button as appropriate. It is a good idea to always project into new fields.

The procedure is very similar to that for projecting lines and outlines, except that instead of one field containing XY-chains, there are two fields, one containing X, and one containing Y. MAKE SURE BOTH COORDINATES ARE FOR THE SAME FEATURE.

For a field to appear in the list of longitude-latitude fields, its name must contain one or more of the following strings: ITUDE LL GEO LON LAT . To appear in the list of UTM fields, it must contain the string UTM .

To appear in the list of X coordinates, it must contain X_ or EAST

To appear in the list of Y coordinates, it must contain Y_ or NORT
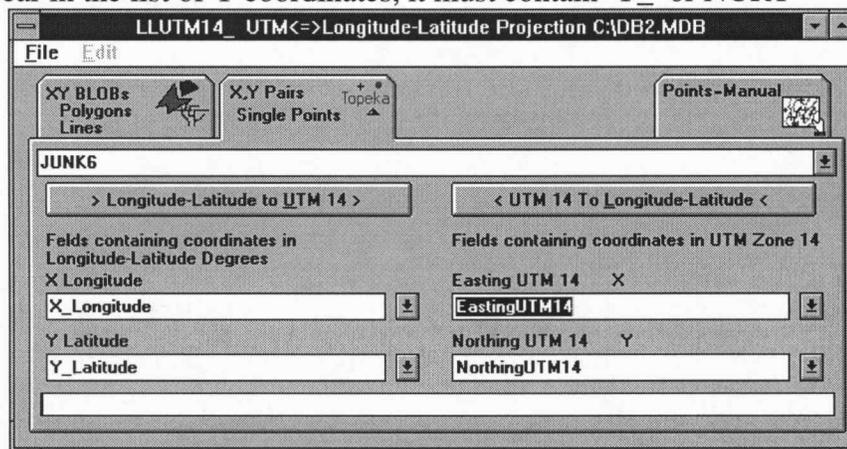
Tips

It may be useful to create a dummy query that simply retrieves the fields of interest under new names that LLUTMN_ will recognize.

Installation

If you have installed WHEAT E-MAP or other WHEAT-related software, see the directions in the README.TXT file on the included floppy. If this is your first piece of WHEAT-related software, run the SETUP.EXE program on the included diskette.

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