

Co-ordinate Systems (cont)

This newsletter continues on from Newsletter No. 20, discussing how the different co-ordinate types are computed.

Step 3: Local Geodetic to Local Grid

Here a **Projection** is needed to convert. Literally hundreds of projections exist, all of them are used to convert **Geodetic** co-ordinates (on a curved surface) to **Grid** co-ordinates (on a plane surface).

In our example we use the **Universal Transverse Mercator 32** and standard algorithms to obtain the following grid co-ordinates:

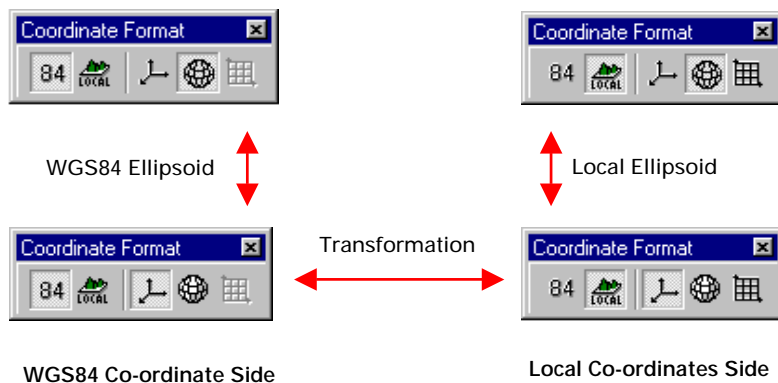
Easting = 790830.175m
 Northing = 319665.347m
 Ellipsoidal ht = 1486.783m

Summary

So we have now completely converted the co-ordinates of our point from WGS84 Geodetic co-ordinates to Local Grid. And of course it is possible to convert back from Local Grid to WGS84 Geodetic using the reverse algorithms.

This whole conversion process is best summarised below which shows how co-ordinates either exist on the WGS84 "side" or the local "side".

(Note: the buttons from the co-ordinate toolbar in SKI-Pro are used to represent the different co-ordinate types.)



But remember we needed several "elements" in order to complete this co-ordinate conversion – the **Transformation**, the **Local Ellipsoid** and the **Projection**.

In Newsletter No. 22, we explain how these elements are brought together to form a complete "Co-ordinate System" and how this is used.

Interesting to Know....

On the WGS84 "side", the ellipsoid will always be the WGS84 ellipsoid. If it wasn't, they would not be WGS84 co-ordinates!

It should be clear that it is possible to have local Geodetic and Cartesian co-ordinates which are identical in value to the WGS84 if you choose a "null" transformation (all parameters equal 0 except the scale which equals 1) and the local ellipsoid was chosen to be the WGS84 ellipsoid.

Notice also how it appears "WGS84 grid" is missing. It would be possible to compute "WGS84 grid" if you again use a null transformation, choose the local ellipsoid to be the WGS84 ellipsoid and then use a projection.

You may also now have realised that to use this "classical route" of converting co-ordinates, you need to know some elements of the local side – the ellipsoid and the projection...

If you did not know the ellipsoid and the projection, is it still possible to convert from WGS84 co-ordinates to local grid co-ordinates? Yes, using the **One-Step transformation**.

The One-Step Transformation

In SKI-Pro and on the sensor it also possible to convert directly from WGS84 co-ordinates to local grid using a "more direct route".

The **One-Step Transformation** is a special transformation which allows co-ordinates to be converted from WGS84 co-ordinates to local grid without needing to compute local Cartesian or local Geodetic co-ordinates.

How the One-Step transformation actually works and why it can only be used over a limited area will be described in a future newsletter. But one of the advantages of using the One-Step transformation is that you do not need to know the ellipsoid and projection associated with the local side.

Remember...

- An **Ellipsoid** is needed to convert between Geodetic and Cartesian co-ordinates.
- A classical **Transformation** converts between WGS84 Cartesian and Local Cartesian co-ordinates.
- A **Projection** converts between Geodetic and Grid co-ordinates.
- A **One-Step Transformation** allows direct WGS84 to grid co-ordinate conversions.