The New *GeogWin* Software   G4JNT July 2018

Background

Back in the 1990s I wrote the *Geog2* suite of programmes for distance and bearing calculation and terrain plotting, making use of a 500 metre spatial resolution height database available at that time, and the *Sites.dat* database of operating sites originally put together by G4ELM, G3YGF and others back in the 1980s. That software suite was all written in 16 bit PowerBasic for the DOS environment and ran quite happily in a command prompt in all versions of Windows up to Win-XP. After Win-7 came out and couldn't run 16 bit applications, it was discovered that DOS emulators such as DosBox would run it perfectly – in fact even better than before!

Many ops used that software for site evaluation and bearing calculations during microwave operating sessions. Round about 2006 Mike G0MJW developed his *Profile* software which duplicated, in the Windows environment, what some portions of my software did, and more importantly added in RF path loss calculations which it was really geared towards. Of even greater import is that Mike used the higher resolution Shuttle Radar Terrain Mapper (SRTM) height database which has about a six times better spatial resolution than the one I used and is officially available to all (whereas mine was of dubious 'hacked' origin whose source had to remain anonymous. Its original author, the Ordnance Survey themselves, were apparently bemused in latter years to find in it widespread use). What *MJW_Profile* didn't offer was the faster easier terrain viewing and height checking that my suite was intended for.

I wrote a windows version of the distance and bearing calculation, using *Sites.dat* which has now been expanded to allow for the ten character locators like IO90IV58AK that were beginning to appear on GPS units as well as eight digit, 10 metre resolution NGRs. That *SitecalcWin* programme was written in VB6 and is a proper Windows application with its standard GUI interface. Unfortunately, once the site database *Sites.dat* started to include these higher resolution locators / NGRs, it was no-longer compatible with the older DOS suite which crashed when trying to read a 8 digit NGR. I tried updating some of those programmes, but running the 16 bit PowerBasic compiler in a DosBox emulator was rather fraught! So it was all put aside for a long time.

As Mike's software was already around for the height stuff, I never did anything with the SRTM data other than working out the database structure and testing with a simple height plotting routine. Mike recently stated that he was unable to do any more updating of *Profile* due to problems with the old compiler, so with a long run of really hot weather that made staying indoors preferable to anything outside, I decided to have a go at updating the most popular of the original suite.

Command Prompt Based

VB6 programming is tedious, having to spend 90% of effort on GUIs and I/O, then having limited and messy functions to do the 'real stuff'. Also VB6 is deprecated for Win-7 onwards; it does run, but with some complications. So I decided to do the *GeogWin* follow-ons in *PowerBasic Console Compiler (PBCC)*, a very powerful 32 bit command line compiler for the Windows environment. Being a command line compiler meant it has all the nice and easy programming and feel of the old 16 bit one, but with a very powerful set of commands. Graphical output is straightforward and even better than the old 16 bit one; some limited mouse support is included. (For the 16 bit versions I had had to use BIOS interrupts that sometimes crashed when running it in Win-98 and XP command screens although the Dosbox emulator does appear to handle them correctly). All the complex mathematical routines were imported from the 16 bit version of the original, with only minimal changes needed for the vastly improved 32 bit language. The SRTM database reading routines were already in existence. The result is *ProfileJ*, *Localmap2, 3DMAPwin, HorizonPlot* and *ViewWin* . *SiteCalcWin* and *NearestTrig* do not use the height data.

Copy all the included files into one directory / folder, ideally under C:\ and preferably not under any "*My Documents* or *App data*" tree; and certainly not under Program Files! *C:\Geog* is as good a folder name as any. Note also where the SRTM height data files used for Mike's software are kept. If downloading these fresh, it is useful to place them in their own folder, again ideally directly under C:\, as there are so many it can make finding anything else in that folder complicated. If you use Mike's *Profile* software, store them where this requires. There are some Icons in there to use via the Windows Properties settings. I haven't been able to embed them in the .EXE files (yet !).

Common Features

First of all, these are NOT windows programmes; they run in the Windows operating system but are command line based input with graphical output. Initial data entry has to be done in the classical way, line by line.

Users need to have the SRTM data stored somewhere - look where your *MJW_Profile* software is installed and note its location - you can't browse to it from this software as you would in a normal Windows prog. The reference at the end gives the location where individual SRTM Tiles can be found for the entire World.

You also need to note where *Sites.dat* is stored. The site database does need to be called that; I don't allow for other site database names. If you have previously stored these files in a complicated Windows folder tree, including bits such as "My Documents", "Users" etc etc etc, it can prove difficult to know what the full install path is for the next stage. In these circumstances it may be easier to just copy the SFRTM database files (all the .HGT ones and *Sites.dat*) to a single folder directly under C:

On running any of these programmes for the first time you will initially be prompted for the location of the SRTM data. Type in the full path name for this, eg. *C:\MJW_Profile*. Do the same for *Sites.dat* (for example, in my case, *C:\Geog* A size for the plot window is then requested. This has been made variable to allow users to optimise to their own laptops / desktops etc. If you're not sure, choose something like 600 or 640 to start with, it can be changed later if the bottom of the plot is lost These settings are saved to a file called *GeogWin.ini* when the programme terminates. This is called up when any of the programmes are next run and can be edited using Notepad, or similar, to change values like the graphical window size or directories, or deleted to allow the software to generate a new *.ini* file from scratch.

When prompted, enter your base station location. As with the original Geog suite, this can be either a (unique) portion of the site name which is searched for in *Sites.dat*, an NGR or a Locator. The format is detected automatically. Apart from *ProfileJ*, the programmes can also be started by including the base location on the command line, eg. "*viewwin jnt*" or "*viewwin su49901257*". Then enter the base mast height (a default of 2m is offered just by pressing [rtn]), after that, enter whatever is required for the programme in use. The tropo propagation K factor is always requested with the value of 1.3 for V/UHF propagation offered as a default. For true optical visibility enter a value close to unity.

When all the data has been entered, the software works out which of the many individual files in the SRTM set are needed and loads the chosen ones into a large array. The file names are shown as they are being loaded . (If you look at Windows TaskMaster while these programmes are running, observe just how much memory is in use – the entire height data for up to a maximum of a 600km square is stored in an array. The exception is *ProfileJ* which just opens each SRTM file in turn as it is needed.)

Exiting the software

As this is not a full Windows environment, there is a subtle difference in the way the programmes have to be terminated. For all except *3DMAPwin* , when you are finished with the graphical plot click on the red box with a black X in it in the upper right . Do not click the normal Windows close box – that is disabled and will do nothing on the graphical plot window. It had to be done this way as PBCC does not trap return calls from child windows (or at least I couldn't work out how to trap them) so cannot tell if the graphical window has been closed. *3DMAPwin* is an exception as there there is no other mouse interaction with this package, so the normal close procedure could be used. For *Localmap , HorizonPlot* and *View*, closing the graphics window returns you to a command prompt ready to run the programme again from scratch. For *ProfileJ* it returns you to the prompt to enter a new distant site, keeping the same base and mast height, and offering the old entry as a default. It was done this way to speed up checking paths with minor location changes and mast height or K options. If you really want to exit, either type '*endendend*' as a new location, or close the command window.

ProfileJ
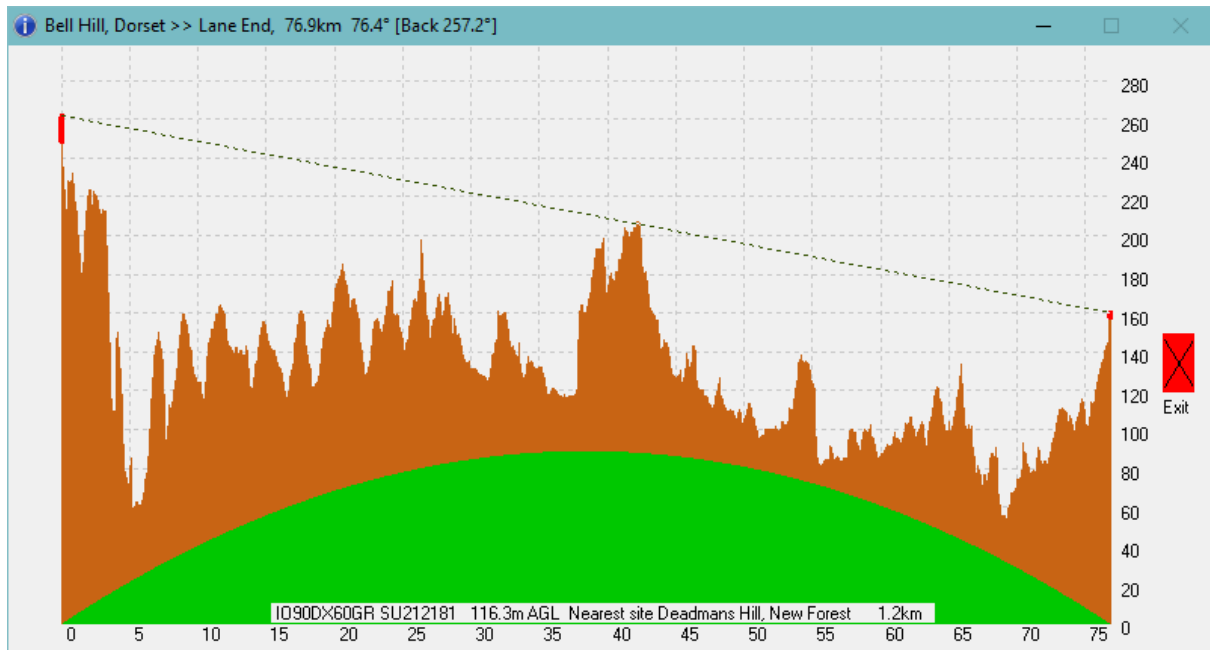
Generates a terrain plot for the path between two stations and has been quite deliberately made to look like Mike's output for the same plot when using the 'curved Earth' display. Unfortunately mouse support for the PBCC language does not allow mouse coordinates to be read off continuously (no 'mouseover' routine in *Windowsspeak*) , with only mouse click and double-click supported. A single mouse click on the profile plot reads out the location on the path under the cursor, showing as NGR and Loc. It will also search *Sites.dat* and show the nearest stored site to that position and the distance to that site. This allows for quick identification of obstructions on any path. A double click just draws LOS lines from each site to the cursor position – nothing special.

***Localmap2***   (replaces *LocalMapWin*)
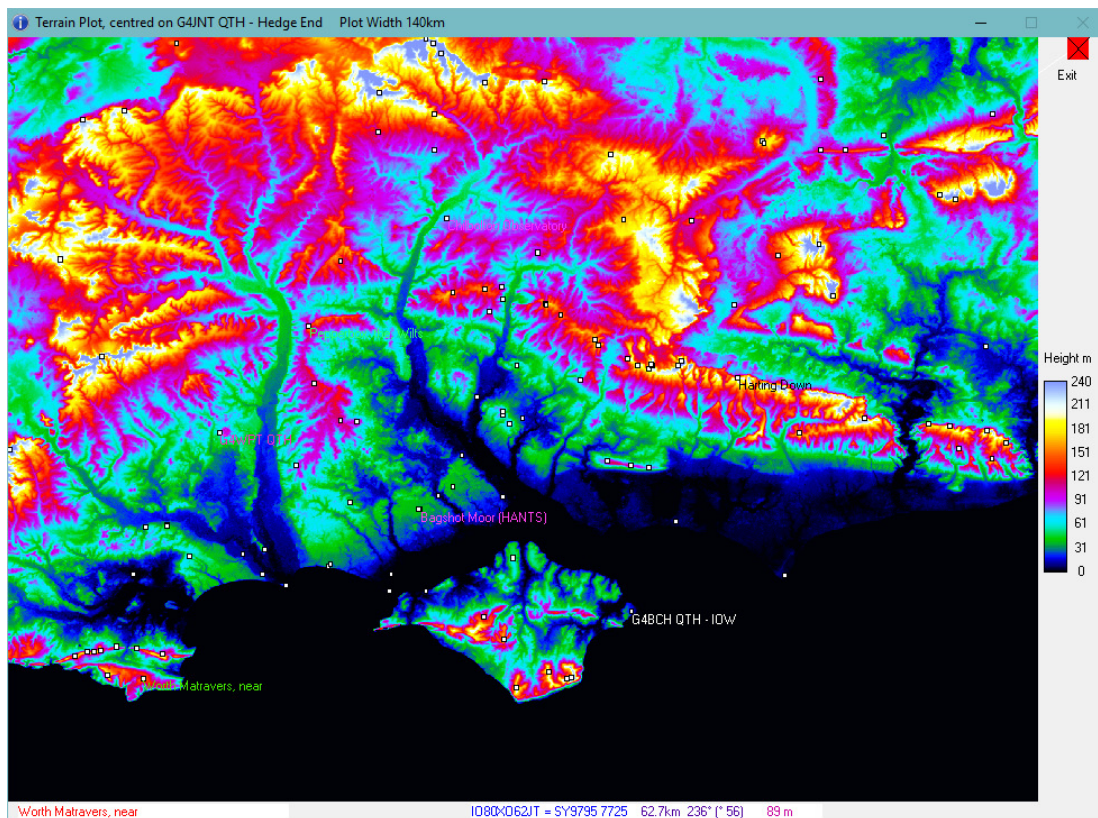
Does the same as its old *Geog2* counterpart *LocalMap* – showing a colour map of the area requested; anything up to a 600km square.   A default maximum height is offered at the entry stage by hitting [rtn], with no value specified. This is the highest location found in ALL the 'tiles' loaded, and could actually be outside the requested plot area. The older *LocalMapWin* with less functionality still remains in the archive.

Clicking anywhere on the map shows, at the bottom of the window, the NGR, Locator and spot height of the point under the cursor, as well as the distance, bearing and back-bearing from the centre

Double clicking searches for the nearest stored site in *Sites.dat* and shows this on the plot. Useful for identifying high spots and 'interesting sites'.   There are other palette files included. To choose one of these, edit *LcLMP.ini*


3DMAPwin
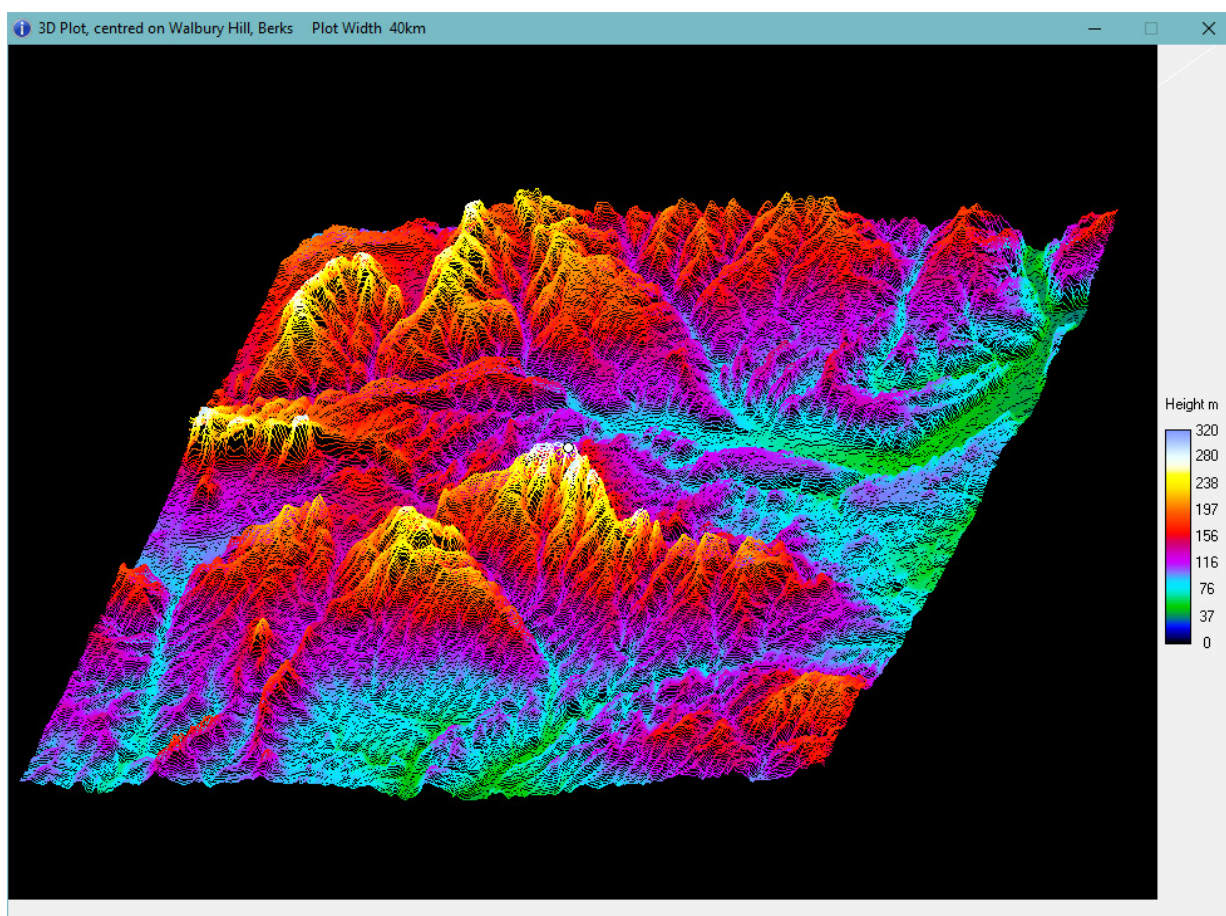
Does much the same but showing as an orthogonal 3D version of the terrain.   No sites are shown and no mouse navigation is provided since for any 3D orthogonal image it is impossible to recover X / Y readout directly.   To close this graphic window, use the normal Windows close control button in the top right.

ViewWin
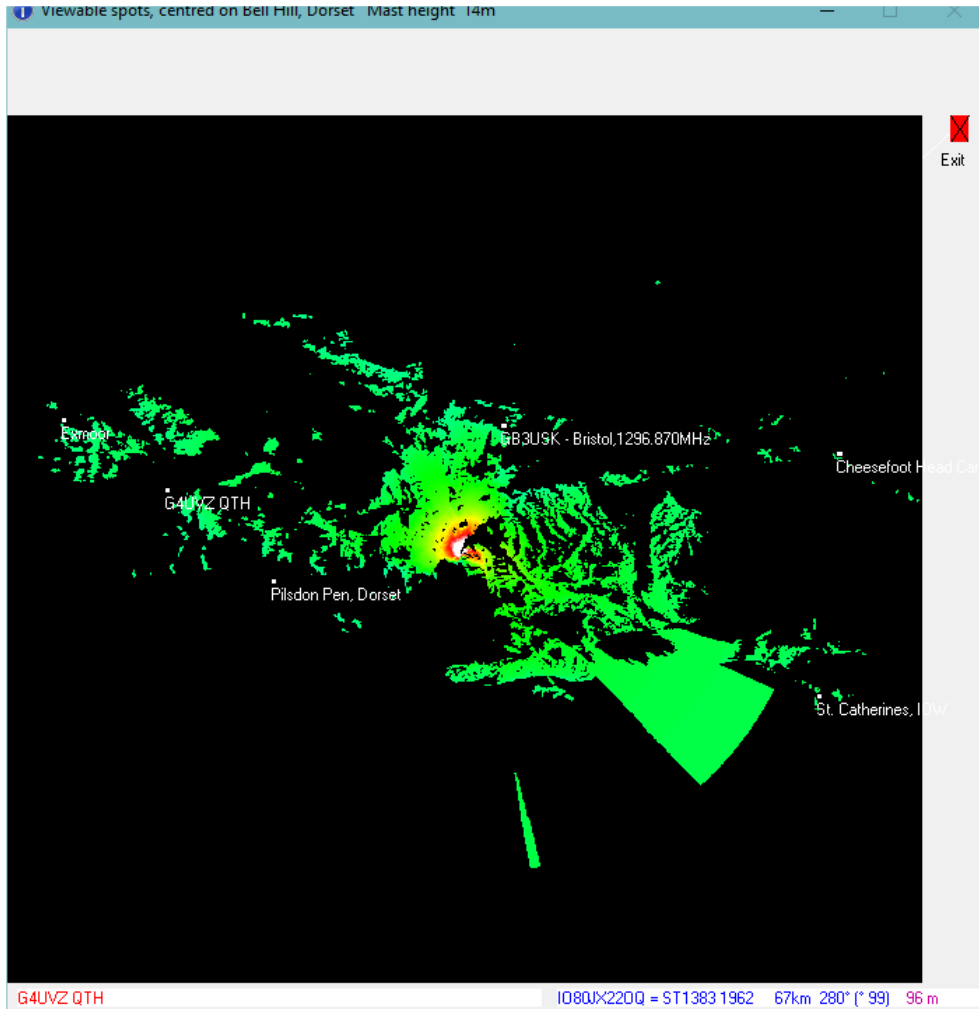
ViewWin shows all visible land that can be seen from a particular site; the plot colour is representative of the horizon angle. Same as its original DOS version but has been updated to show distance and bearing from the centre to the cursor position and the nearest site name. Click and double click in the same manner as for *LocalMap2* .

HorizonPlot
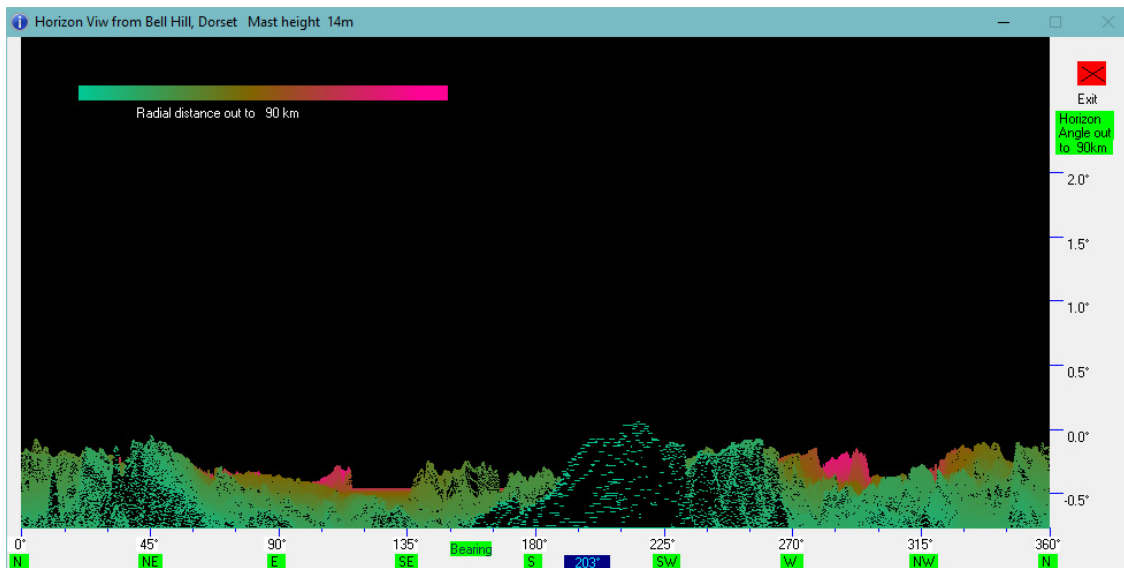
The early *GEOG2* suite from 1997 included *Horplot* but that was left out of later versions. By popular demand it has now been resurrected as *HorizonPlot* which shows a representation of the view from any site, rotating through 360 degrees. Vertical scale is the visible horizon, with the colour representing the distance to that point. It clearly shows small bearing windows that can be difficult to visualise in the *Viewwin* plot. Click the mouse to read out an exact bearing under the cursor. Distance cannot be determined from the cursor position.

Sites_Heights

Is a command line only programme for site database lookup, locator conversion, distance and bearing calculation and spot heights. No graphics

NearestTrig

Finds all the listed Ordnance Survey benchmarks within a radius of a defined spot. The OS have made available a complete archive of all their Trig points with NGRs and the status / condition of each one. The listing can be downloaded as a Zipped .CSV file from the link shown at the end and shows over 60000 entries, although many have by now been destroyed or replaced. The OS no longer maintain these benchmarks with all mapping being now based on GNSS and exact TRF conversion algorithms.

Unzip and store *CompleteTrigArchive.CSV* into the same folder as this programme. Run *NearestTrig* then enter your own NGR and a distance out to search. There is then an option to ignore destroyed benchmarks, and also just to just list triangulation pillars (the ones on hill tops we all love). Look at the OS website for more details.

The results are shown on screen and written to a file *LocalTrigs.txt* in the same installation folder.

SiteCalcWin

This programme is the exception to all the rest as it is a true Windows programme with GUI entry. It provides a complete locator / NGR conversion, site database lookup, distance and bearing calculator with filtering and print to file options. A single button press will call up the Google maps web site with display centred on the location currently specified.
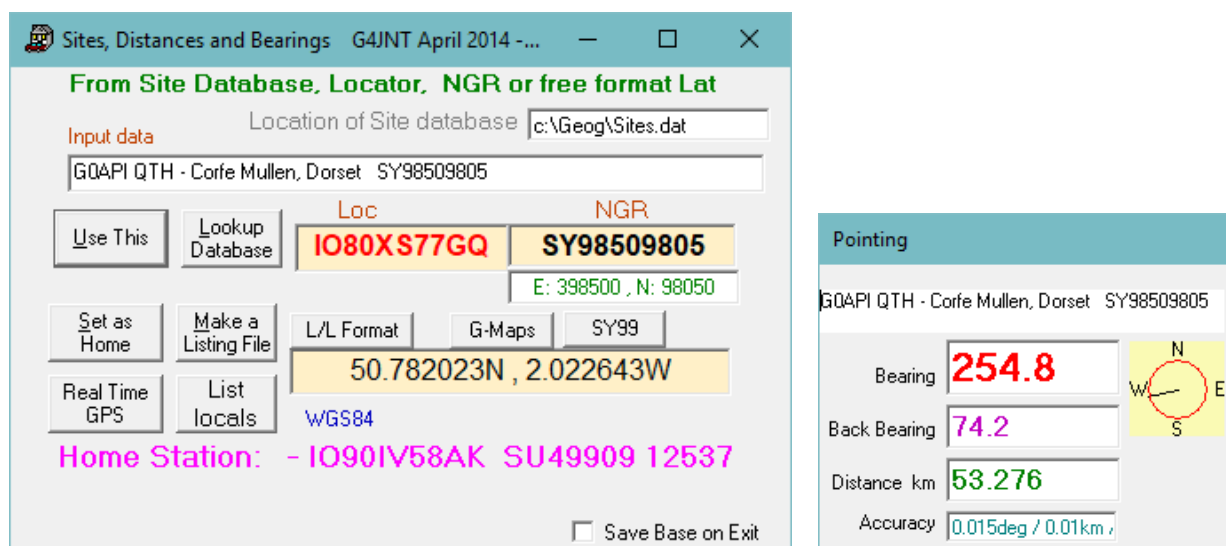
The real time GPS option will read NMEA data , (using the RMC message only) from a GNSS module on a COM port. This may give problems with installation if you do not already have the MSCOMM.OCX installed. If attempting to run *SiteCalcWin* generates an error message, download the full installation package from the URL given at the end which will install the COM support. Later versions of *SiteCalcWin* can then just overwrite the one generated from within that installation package.

Editing *SITES.DAT*

The database format for *Sites.dat* was set back around the year 1990 and I saw no reason to change it, apart from updating to allow higher resolution NGRs (like SU49901254 or even SU49901 12543) and 10 char LOCs (eg. IO90IV58BK). The former are accurate to 10 metres or 1 metre, the latter to around 19m in Latitude and 24m in longitude in the S of England; both appreciably higher resolution than the pixel size in the SRTM data. 6 Digit NGRs (100 metres resolution) and eight character locators (~ 400 metres accuracy) are barely sufficient. 6 character Locs most certainly are not!

SITES.DAT is a simple text file with each line holding the site name followed by a tilde ~ as separator. This is followed by the location as either an NGR or a Locator. Some sites then have a second tilde separator followed by a few letters and numbers which in the old Dos versions flagged 'popular' sites and a stored mast height. Neither of these secondary pieces of information are called up in this latest suite, and I don't intend to use them for now. It has been suggested, secondary site information could be included here.

The database has grown massively over the years, been passed backwards and forwards between software authors who have all added their own sites – note the number of purely local spots around Didcot, Newbury and the Hedge End, Southampton areas, along with other personalised clusters. It can be edited to add your own sites, delete old ones and SKs and for general personalisation. But note that for this suite of programmes is must keep the same file name *Sites.dat*. Mike's *Profile* software may allow any name for it, mine doesn't.

NGR Calculations and Height Accuracy

The versions of all programmes after 18 July 2018, now include the proper WGS84 to NGR conversion. Previously the old GBR36 Terrestrial Reference Frame and spheroid was used and when compared with WGS84 lead to appreciable positioning errors over much of the country, making it unsuitable for accessing the SRTM data.
An additional programme has been included in the suite *SpheroidConversion.exe* to illustrate the conversion between the two spheroids, Airy and WGS84.

This does mean that *SITES.DAT*, which has most of its locations defined by NGR, is now of more value, and is more precise than before for spot height information. In fact, 8 digit NGRs are better than the latest 10 character Locs. It is also easier to update, just by reading the NGR from an OS map. Use a ruler with 1:25000 maps or online mapping to aim for at least 10 metre NGR resolution. Lat / Long values copied from online mapping can usually be pasted into *SiteCalcWin* for conversion to NGR – and vice versa.

The heights contained in the SRTM data are those relating to the WGS84 ellipsoid and are a few metres different from those in the Ordnance Survey data. Although the NGR / Lat long correction is correctly applied, no correction is made for the height. So be aware that spot heights generated from this software will not agree exactly with those shown on an OS map – but may be closer to those shown on a GPS receiver at that spot.

Plotting Speed

The SRTM height database has more than five times the spatial resolution of the old one in *Geog2*, and about 30 times more height pixels lie in a given plot area. Therefore the plotting speed can still seem slow, even allowing for the many times increase in processing power since that suite was originally developed.

Previous versions of this suite plotted the graphics in real time and would take an age for the plot to complete, although the plot time could be speeded up considerably by placing the mouse cursor on the graphics window title bar at the top and holding down the left button. The latest versions now generate the full plot before presenting the final result. While this may not be so interesting to watch, it is a lot quicker. A progress bar on the text screen gives an indication of time to finish.

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And that's it for now. I've checked output in each case against the old DOS versions and, apart from differences due to the improved height database resolution, give the same results. Also checked against the *MJW_Profile* software.

Few of the rest of programmes in the old *Geog* suite are worth updating – these four are the most useful to microwave operations, along with SitecalcWin available separately.

References and Links

The latest version of the software described can be found at   http://www.g4jnt.com/GeogWin.zip

The full Windows install package for *SiteCalcwin* can be found at   http://www.g4jnt.com/SiteCalcWin.zip which will be needed if you have install errors related to *MSCOMM.OCX*. The .EXE in this install package will not be updated. The latest version of *SiteCalcWin*.exe will always appear *GeogWin.zip*

The SRTM tiles of 1° squaroids can be found in the form of .ZIP compressed files at https://dds.cr.usgs.gov/srtm/version1/Eurasia/   for European locations,   or https://dds.cr.usgs.gov/srtm/version1/   for an index into files for the whole world.

The .ZIP   archive of all trig points in .CSV format can be found here: https://www.ordnancesurvey.co.uk/gps/legacy-control-information/triangulation-stations or for direct download https://www.ordnancesurvey.co.uk/docs/gps/CompleteTrigArchive.zip

Source Code

All source code is provided for information. It is written in PowerBasicCC and note that except for Global variables that do have to be declared, I choose otherwise not to explicitly declare local variables.   Default variable names without any type identifier are double precision floats; anything with an ampersand, such as *Xpixels&*   is a long (32 bit) integer; a dollar indicates a string. One or two other variable types can also be found with their associated identifiers.

Source code for *SiteCalcWin* written in VB6 can be obtained via the full installation package.

Please report bugs, errors etc.