

AutoCAD plus survey

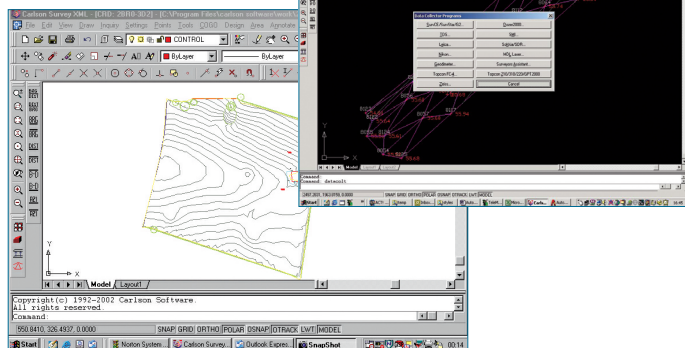
A fully functional survey and ground modelling package sub £1000 sounds bargain enough but this one throws in AutoCAD too! Is it too good to be true? Mike Fort takes the lid off a popular US package now available in the UK.

Carlson Software

Founded in 1983, Carlson is a leading American software developer. Recent mergers with C&G software and Simplicity software have given it a user base of over 12,000 and complemented its range of software which extends from surveying and construction to field systems, GPS and plant control. They have specialised in working within the AutoCAD environment and are committed to becoming the premiere independent software developer within that environment. In addition, they are expanding into the international market.

A feature which they stress is support; and this has been excellent whilst I've been investigating the software. First phase support is of course given by Loy Surveys and I have found their software guy, Alasdair Bain, extremely helpful. But second phase support is direct from America and I have had phone calls from Kentucky plus emails by return in answer to my queries. The best part of all this is that, despite the software being such a bargain, support is free and unlimited. No wonder Jim was impressed!

Below: the Carlson interface with the full tool set showing. Right: points can be imported from a good range of dataloggers and instruments.



I HAVE known Jim Loy for many years and hold him in the highest regard both as a surveyor and a businessman, so when I found out that Loy Surveys were promoting a software package I thought that I really must have a look at it. The software concerned is Carlson Survey XML and it incorporates a full range of survey commands and functions into the AutoCAD 2002 engine. It is not an "add-on" but a fully integrated package that gives you the benefit of most of the 2002 features plus very sophisticated surveying, DTM, COGO and design functions integrated into the AutoCAD layout. On top of that it is being offered at the unbeatable price of £990, which is a lot less than you would pay for just AutoCAD on its own. There is a limitation in that you cannot use other AutoCAD "add-ons", particularly as some of the AutoCAD commands have been replaced with more appropriate Carlson commands, but if that is important to you then you can get all the survey functions etc. through SurvCADD which is Carlson's "add-on" package. The Carlson Survey screen is shown below.

Into the software

After installation the first thing you need to do is set up a template to meet your own requirements and the easiest way to do this is to amend the provided survey template. This is American software so

the defaults are for the American user and you need to alter units and other functions to set things for the UK. This is done mainly through the "Settings" menu but there are also Point and Area defaults that need altering. In addition you can load up the toolboxes you require and the example screen shows all the toolboxes loaded. One thing you may search for but you will not find is a global configuration option to prompt and display co-ordinates in Eastings before Northings format. Input/output can be in Eastings before Northings, the co-ordinate file listing can be in Eastings before Northings and the labelling of points can be Eastings before Northings, but the general prompt screens and the Inquiry display will be in Northings before Eastings. OK for most of the world but a little bit of a handicap for us and most Commonwealth countries. However, I am assured that this option is on the cards and will be included in Carlson Survey XML2 whose release is imminent. It appears that our Australian cousins have been pressing for such an option and Carlson are happy to oblige. If you have not used American software before there is one other thing you have to know and that is the Americans' Bearing is a Quadrantal Bearing to us, so use the Azimuth if you want your Bearings displayed as Whole Circle Bearings.

A minor point if you already have AutoCAD drawings on your computer, or indeed AutoCAD, is that Carlson Survey will take over these drawings. The noticeable effect of this is that the DWG icon will change colour from red to blue and what that means is that if you double-click the icon in "My computer" or "Explorer" the drawing will go into Carlson Survey. There is no difference if you call up the drawing in AutoCAD, it will load up as

normal so there is complete compatibility between Carlson Survey and AutoCAD. I have AutoCAD LT 2000 and 97 on my review computer and I experienced no problems in using them.

Data in and processing

At its simplest you can use the CAD to draw your designs, insert whatever points you want and convert entities to points if you are building up something for setting out. The software will read any DWG file or DXF file and you have complete control of the points you wish to establish through the entities-to-points conversion. The drawing in the example screen was an existing DWG and points were extracted as mentioned so that a ground model could be set up and the contours checked against the original. There was an almost perfect overlap.

ASCII import is the next simplest and you can set the import file to read Point number, Eastings, Northings, Height and Description (Code) or any similar format. The points are imported straight away and you are prompted for a Co-ordinate (CRD) file to put them in. The CRD file is effectively the database file to store all the points. These points will not be shown on the screen until you enter the Draw/Locate Points command and define the point symbol plus other options and initiate that. An important option here is to "tick" the Layer by Description box so that you will set up separate layers for all your codes.

However, Carlson Survey is geared up to importing points direct from data loggers and instruments. They have a good range of these – Leica, Sokkia, Nikon, Topcon, Trimble etc – and data is downloaded into a RAW file for processing. I did not have a convenient instrument at hand but I had some raw SDR data and this worked perfectly. The Raw data is displayed in a spreadsheet which you can edit and amend as necessary before converting the data into points through the processing commands. This works very well and is a powerful feature of the software.

The spreadsheet will also take Traverse data and adjust this using the Compass (Bowditch), Transit or Crandall

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rules or by Least Squares. The latter is purely a Traverse Adjustment routine but better by far than all the others and is well worth using. I stress Traverse adjustment as there appears to be no way you can enter network observations, so don't throw away your Star*Net – it is still the best Least Squares program around. However, having said that, Carlson will be releasing their own Network Least Squares program, SurvNet, to the international market by the end of the year.

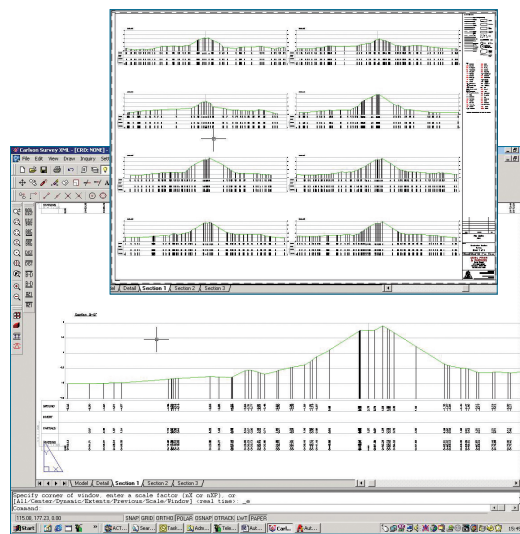
You can enter Traverse and Sideshot data manually through the spreadsheet, which makes it a valuable teaching tool as you can quickly see the effects of bad data. But beware if you intend to enter the data as horizontal distance and difference in height, as there is a bug in the system that causes the program to crash. No such problems if you enter the default Slope distance and Zenith angle and the crash can be easily avoided by turning off the Graphic screen below the spreadsheet. This screen displays the points as they are established which is useful as you have a visual display of your input, bearing in mind that the points are not shown on the main screen until they are Drawn and Located. So, with horizontal distance/difference in height input, turn off the graphic screen whilst you input the data and then turn it back on when you finish and you will get a display of your input. That seems to work.

It is worth mentioning that you can enter traverse data through the Traverse command in the COGO menu. This does let you enter horizontal distance and difference in height but will not perform an adjustment. To do this you go into the Raw data spreadsheet and just enter the station numbers and the type of observation (Fixed Point, Azimuth or Angle Right, etc). Click the command to extract the data from the main screen and, hey presto, all your observations are extracted and you can then adjust them.

Field to Finish and Contouring

You can, of course, just draw/locate the points and complete your survey by joining the points and adding

Drawing profiles is quite involved but there is a very comprehensive edit screen with options for generic road and rail profiles.



symbols which can include those drawn by yourself. You have all the AutoCAD and Carlson commands to make things easier for you. However, the drawing can be fully automated by linking your coding to the Carlson "Field to Finish" library or indeed by designing your own coding library. The Carlson system is pretty comprehensive giving you a wealth of codes to draw lines, curves and insert symbols etc but the way in which the system works is open and you have all the facilities to design your own library. I did this in a small way and it worked very well.

Contouring was very straightforward and very good. You enter the parameters into the "Triangulation and Contouring" box and set up a file for your TIN. Every line is considered to be a breakline so you do not have to worry about these and when you initiate the contouring you are prompted for inclusion and exclusion polylines before you select the points and entities to contour. The contouring is then carried out with labelling at the intervals you specified and index contours drawn to your specified width. Colours can be altered from the default through the normal layer commands and you can experiment with the smoothing settings (Bezier or Polynomial) quickly and easily with the switch setting to erase previous contouring for the area so you don't complicate the drawing when you repeat the contouring.

All in all, Carlson Survey works very well in preparing

fully contoured survey plans and, with the benefit of AutoCAD commands and Blocks to set up your plan layouts, you will be producing professional survey drawings in record time.

Areas, Volumes and Profiles

Areas are a case where the AutoCAD commands have been replaced by Carlson commands and these have simplified the process. You can set up the units in which you are working and which you would have displayed – Sq.m, Hectares etc. There are a number of options to calculate the area and I limited myself to just a couple and they worked fine.

Volumes is again a fairly straightforward operation giving you options of working with a triangulation model derived from contouring (recommended) or grid models set up from layers or entity selection. The volume routines are between two surfaces or one surface, to a defined elevation and both worked equally well. I have never been a fan of grid volumes as they cannot be controlled by breaklines but I got a fairly good answer on my test volume with agreement to 7cu.m on a volume of 2,235 cu.m so perhaps Carlson have worked that in somehow. Still, with the triangulation option using the TIN model and prisms there is no need to go into the grid options.

Something I could not find though was a way of calculating the slope area, which can be quite useful in earthworks. I was rather surprised at this as a

3D faces file can be set up when doing the triangulation so the information is there to perform the calculation. Mind you, you require this file when you want to generate a 3D picture.

Profiles were also a bit of a disappointment. Although you have a number of options there is no interactive screen where you can see the profile generated and work on it and there is no option for cross sections (profiles). In addition, drawing the profile was quite involved requiring a bit of experimentation with the scaling and the layout to get something presentable. One thing I did note was that the edit screen for the profiles was very comprehensive with options for generic, road and rail profiles with vertical curve entry and K-Values so you can enter a comprehensive vertical alignment if you wish. Not a lot of use though unless you can tag a cross-section template onto it, and I rather suspect that this input/edit screen is shared with Carlson Roads which most probably has the information I was looking for. Nevertheless, you can get profiles generated along any line you choose and it is easy to generate a road polyline for this purpose.

Design and data manipulation

I only went into the roads options and the pad layout and these worked very well with the latter calculating an excavation volume using design slopes. With the roads you draw a polyline using line and curve commands and then convert it to a roadline creating a road file with the horizontal alignment information generated. There are other options but creating a polyline appeared to me to be the easiest way of doing this.

There are options for Lot design that appear to automate the procedure as far as possible, and standard features such as cul-de-sacs can be inserted as required. Other features such as legal deed layout etc are specific to the American market but generally the COGO options and calculation functions are very good enabling you to produce a fairly comprehensive design.

Data manipulation through the Points menu is very comprehensive with the ability to work direct on files or with groups of points. The geo-

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graphical conversions are set up primarily for the American market but there is a UTM conversion that looks as if it can be modified to our National Grid.

An area that I did not investigate was the GIS menu. I find it amazing that such inexpensive software has this option and can link-up to Microsoft Access for the database.

About LandXML

Carlson Survey can import and export LandXML files which is the reason for XML being in the title. This is important because LandXML is set to become the universal data exchange standard for all types of surveying and design data; and such exchange formats as DXF, Genio, ASCII and indeed DWG will become obsolete. Essentially, if your software can read a LandXML file then all the information for the survey and the design is converted into the format used by your software so there is no need to re-process the information in any way.

Autodesk initiated LandXML in December 1999, not as a

propriety system but as an independent industry-driven system, and it has gone from strength to strength since. Its supporters include Bentley, Infracore, Trimble, Leica and a host of other well known companies so it is well established and is set to become the data exchange format that the industry has been asking for over many years.

Conclusions

If you buy this software purely for the AutoCAD element then you may be a little bit disappointed as a lot of the commonly used AutoCAD commands have been superseded by Carlson commands, so you cannot really use it to teach AutoCAD. That makes sense because a company such as Autodesk is not going to stand idly by and see its software undercut by over a third by an OEM developer. Nevertheless, in my opinion the Carlson commands are an improvement on the AutoCAD ones they supersede making it easier to use and you still have the bulk of

the AutoCAD commands at your disposal. You can certainly use the software for sophisticated CAD designs even if you do not intend to use the surveying element. That, however, would defeat the purpose as Carlson Survey is an extremely competent and comprehensive DGM package which is easy to use and easy to learn particularly if you know your way around AutoCAD.

Where it would fit in the UK market is questionable as most companies in the UK have established software policies and programs such as LSS, nForce, MX and most of the others are superior to it in their particular specialisms, e.g. LSS for volumes and virtual reality. But these programs are a lot more expensive and have their own limitations but I could see users getting Carlson Survey as a second or a third system, particularly to deal with clients requiring AutoCAD drawings. Small survey companies and consultants who may balk at the cost of full AutoCAD and

have a limited requirement for ground modelling, could find this the software that could meet all their requirements at a budget cost.

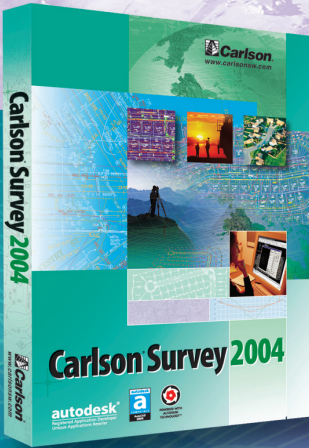
One area I am sure will be attracted to Carlson Survey XML is education. Approved educational establishments can get a site licence per department for £938 that permits an unlimited number of installations within the training room and includes off site copies for development providing the software is used at the education establishment. At that price it is worth going a few AutoCAD specific commands and using Carlson as the general CAD teaching tool with the added bonus of all the Carlson Survey functions. Ideal for colleges teaching civil engineering and construction. Mind you, it may be worth waiting for the upcoming Carlson Survey 2004 if that is going to resolve the Eastings before Northings problem.

• Contact Loy Surveys on 0800 833 312 for a 30-day evaluation CD.

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