

PAI Tools

PAI (Possitional Accuracy Improvement)

Improved survey techniques mean that OSGB can create digital maps that match more closely with the results that you can get with a GPS.

Introduction

The dhp11 Ltd PAI tool (Module MU01) allows MicroStation users to migrate their asset data from old (pre-PAI) maps to new (post-PAI) maps. (The Ordnance Survey have more information about Positional Accuracy Improvement.)

OSGB notified us when they started the PAI programme. We have worked closely with OSGB to ensure our systems work well with the data they provide. OSGB have consulted us on various aspects of PAI and have used our software to evaluate their choice of link points.

How It Works

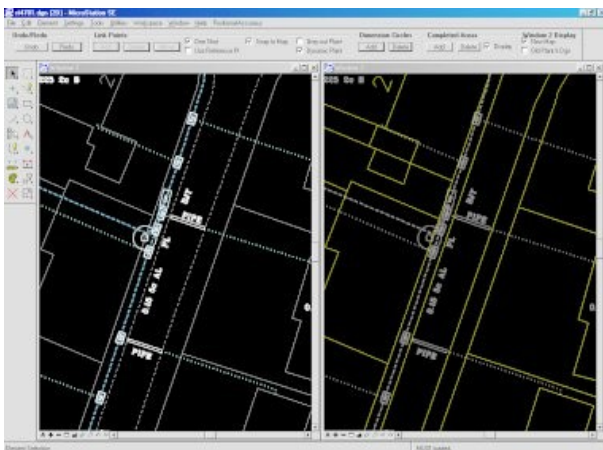
In simple terms, common features in an old map (pre-PAI) need to be mapped on to a new map (post-PAI) this is done using Link Points. A link point is basically 2 points, a start and an end which defines a mapping.

In the dhp11 PAI tools you can manual identify common points between the two maps and create links points that way. Fortunately OSGB have already recorded these link points.

Our system uses the link points to move the plant. Basically we scan round a piece of plant and if it is 'near' to a link point (or points) we move it by a certain amount in the right direction.

The precise definitions of 'near', 'a certain amount' and 'the right direction' are tuneable to suit the peculiarities of the data in question.

The PAI Tool interface uses SyncView technology which maintains the same geographic position in multiple views. In the PAI tool the SyncView is configured as a dual view, which displays the old map and the new map side by side in two tiled views allowing faster navigation.



The operator identifies common points on the old and new map which will create a link point. The operator adds link points until the assets are located correctly. In more complex areas the assets moves dynamically so the operator can see the effect of placing the link point in real time.

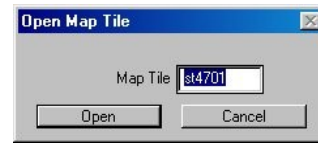
The process can be also be automated by using link point files supplied by OS. These are imported and applied to the map automatically. The user can then review the effects and add more or delete link points to fine tune the results to suit there assets.

The Tools Interface

The tools are driven using a pulldown menu and/or docakable tool bar.



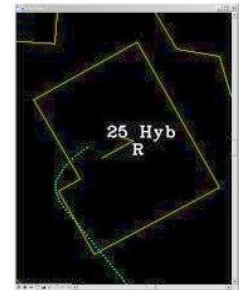
Choose the 'Open Map Tile' option from the 'Positional Accuracy' menu, this will open a dialog where you can enter a maptile name and open it.



The tile is opened in two views. The left hand view shows the old map and old assets.



Old (pre-PAI) map and plant. The cable (light blue) curves round the front of the building



New (post-PAI) map. The building has moved so now the cable appears to go under the corner of the building

The right hand view shows the new map and the assets in their new positions. Assets that have not been moved are shown 'greyed-out'.

Undo/Redo - A multi-level undo/redo that allows you to place link points to see their effect without worrying that you will 'mess up' the file.

Add Link Point - This is the most used command. Click on this button and then place a link point in the left hand view (old). Identify the same point in the right hand view (new). The tools adjust the position of nearby assets automatically.

Delete Link Point - If you have placed a link point in the wrong place, click on this button and then click on the link point you want to delete. You can delete link points from the left or right views.

Move Link Point - Use this tool to adjust the location of a link point in the right view only.

'One Shot' - You can add link points in two different ways. If 'one shot' is on, you place a link point in the left view and then place its partner in the right view. i.e. You alternate between the left and right views. If 'one shot' is off, you place any number of link points in the left view and then click 'reset' to place all the corresponding partners in the right view. Snap to Map - If snap to map is on, when the cursor is 'close' to a snappable point the link point symbol is automatically snapped to that location.

Use Reference Point - When this is on, the link point is placed as an offset to a known point. In the example below the yellow cable in the left view is known to be 2.08m from the corner of the building. With 'Use Reference Point' on we are able to click on the corner of the building and place the link point at the same bearing and distance from the corner in both views.

Click on the corner of the building and then on the cable. When we click on the corner of the building the linkpoint is automatically placed at the correct distance and angle.

Grey-out Plant - If this is on, when a link point is placed in the right hand view the assets are greyed-out to make it easier to see the effect of the linkpoint. This is particularly effective when combined with 'Dynamic Plant' (below).

Dynamic Plant - Turn this on to see dynamically what effect the link point will have as you move it around in the right view.

Dimension circles - Click on a line or piece of text to draw a circle with that radius in the right view. These are useful if there are dimensions in the old design files that could be re-used to place assets very accurately.

Completed Areas - To help the operator keep track of which areas they have completed this tool allows you to 'block out' parts of the left hand view.

Post Processing

All organisations have special rules regarding their features. We have a comprehensive set of post-processing tools to perform these and other validations. They generally follow similar themes, but the details do vary. For examples, pipes often have a direction arrow on them. It is common to want this arrow to be parallel to the pipe. Certain fittings might be shown perpendicular to a linear asset, others might always be shown vertical, i.e. un-rotated. Perhaps the commonest requirement is that connectivity is maintained.

Validation

We don't think there is any substitute for a 100% eyeball validation. This of course is time consuming and expensive. However, it does not have to be done all at once. We supply a 'completed areas' tool that allows the operator to mark an area as verified. This allows verification to take place incrementally, possibly as part of the normal usage cycle.



Summary Of The Tools

The system is a native MicroStation application. We use a DLL (our own) for some of the computationally intensive bits, but all the element reading and writing is done in MicroStation. All linkages (FRAMME, ODBC etc.) are preserved and generally even the file position of the elements is maintained. There is no translation!

The system has been tested on lots of FRAMME data: SWW, Welsh Water, Anglian Water. It has also been tested on lots of pure MicroStation systems: SEW, Dee Valley Water, Western Power Distribution, Central Networks, Oldham MBC. None of these organisations have reported any data loss problems at all.

The system uses link points. This makes it easy to use and very fast. However, if you don't like the results that link points give then maybe another solution would be better for you.

CASE STUDIES AND PROJECT OVERVIEWS

0838 WPD PAI

- <todo - Used intelliscan batchwarp>

0844 EUS WW PAI

-<todo>

0882 OMBC PAI

(OMBC) have asset data contained with a number of DGN files (40-50) - that have been placed against Pre-PAI OS Map Backgrounds. OMBC have access to both pre/post OS Map Backgrounds - along with link files (supplied by OS) for all map tiles that cover their existing asset data.

PREPARING THE DATA

The supplied background map tiles needed to be 'cut/split' into separate 1km tiles. The modules required to this are called: IS13 (OS Shape File Creator), IS14 (Shape File Map Cutter)

The IS13 module is used to generate an 'index' shape file - that can then be used by module IS14 to 'cut up/split' and existing design file into 1km map tiles:

The process to generate an 'index' file is as follows:

1. Open an empty design file.
2. Attach as a reference file - the design file that needs to be 'cut/split'.
3. Make sure that the 'working units' match both the active file and the attached reference file(s).
4. Enter the following into the 'keyin' window: IS14 process area
5. A 'grid' will be created within the active files containing 1km squares for each map tile where data exists. Within each of the 'squares' the map tile name will exist - which will have a matching 'graphic group' number.

Save and rename the active file - this file will be used by module IS14 to 'cut up/split' an existing design file. The module allows an 'active' Microstation V7 design file into separate 1km DGN 'map tiles'. The module uses an 'index' shape previously created by module 'IS13'. The steps that need to be followed to 'cut up' these files are:

1. Open - as the active file - the design file that needs to be 'cut up/split'.
2. Load the module IS14 - this will open the 'Active DGN Tile Cutter'

3. In the text item 'Output Dir:.' - enter the directory where the new 'cut up/spilt' DGN 'map tile' file(s) are to be created
4. In the text item 'Index shape file:.' - enter the full filename/path to the 'idex' shape DGN file previously generated by modfule 'IS13'
5. In the text item 'seed file:.' - enter the name of a seed file to be used to generate the 'new' DGN 'map tile' file(s) from.
6. Toggle 'on' the 'Process design file range'
7. Toggle 'off' the 'Create empty design file'

The following steps were followed to allow OMBC data to be processed by dhp11 Ltd PAI module MU01.

PREPARING THE DATA FOR MODULE MU01

The module MU01 only works with Microstation V7 2d design files which meant that all the supplied files had to be translated. To do this the following actions were carried out on each of the supplied files:

1. Open the file to be translated in Microstation V8
2. Export the 3d file as a 2d design files using the 'Save 3d as 2d' option accessed from the 'File->Export->2d' pulldown.
3. Save the Microstation V8 file as a Microstation V7 file using the 'Save as..' option accessed from the 'File->Save as...' pulldown menu. Once open select the 'Microstation V7' format - then save the file.

PROBLEMS WITH THE DATA

The following problems were found with the supplied data and needed to be resolved before the data could be used with the MU01 module.

PLANT FILE DATA

All plant/asset information were supplied in seperated files. This meant that a number of plant/asset files existed for the same area. These files will need to be combined combined/merged into a single file before they could be processed.

ARC ELEMENTS WITHIN CELLS

The supplied plant data files had a number of cells elements which contained 'arc' elements. This caused a problem for the MU01 module - which does not recognise 'arc' elements with cells as valid elements.

To 'workaround' this problem the asset files were opened - and all design file elements were selected and then dropped using the 'drop element' tool with the following options toggled: complex, dimensions, line string/shapes, multi-lines, shared cells.

LINK FILES

The supplied link files with a 1km naming convention were successfully read by the PAI module MU01. The link files with a 500m naming convention are not recognised by the MU01 module.

PROCESSING THE DATA

To process a map tile the following actions are required:

1. Open MU01 module
2. Open the 'Open Map Tile' dialog by selecting from the pulldown menu 'Positional-Accuracy->Open Map Tile'

3. Enter the name of the map tile to be processed within this dialog: sd9201

NOTE: If a .csv link file (with the same name as the map tile being processed) exists in the directory c:\pai\ustation.lnp\ - then the link points will be applied, re-positioning the plant/asset data to the new 'post-pai' OS map background(s).

0887 QCADATA WW PAI

There 3 different but related systems were involved in this project:

dhp11 PAI Map Update Tools

aka 'The Tools'. This is a pure MicroStation based system. It can use OSGB linkpoints and the operator can add more linkpoints of their own. MicroStation tools can be used to edit the post-PAI drawing. There is no translation of the design file and all connectivity is maintained.

Intelliscan/dhp11 hybrid Warp

aka 'Raster Warp'. A MicroStation wrapper surrounds Raster Warp. The design file geometry is exported in a format that Raster Warp can use. Background maps are also exported in a two formats (TIFF and NTF). The operator uses Warp to to realign the maps. The chosen points are saved in 'session files'. These are used at a later stage by Batch Warp to transform the geometry. Another MicroStation utility reads the transformed geometry and creates a post-PAI drawing. A set of 'post-process' tools sweep through the post-PAI drawing realigning symbols, text etc.

Intelliscan Vector Warp

This is similar to Raster Warp except that because it does not need to manipulate a huge raster background it is a lot faster. There is currently no MicroStation wrapper for this product.

0894 CABLE & WIRELESS PAI

Project spanning 10 weeks to realign C&W data with new maps. The new maps also needed to be created as design files map tiles (resulting in aprx 30,000 map tiles) from supplied OS MasterMap data.

A custom module was also created to post-process all C&W data that has been PAI'ed.

The module was run as an initapp and allows any data that has been incorrectly modified by PAI to be corrected. The type of corrections the tool carries out included:

- Re-alignment of linear feaures/symbols where connectivity has been broken
- Re-grouping of symbols where symbols have 'drifted' apart