Ever wondered where our maps come from?

Mark Thompson has written part 4 in a series of 4 articles on how our orienteering maps are produced.

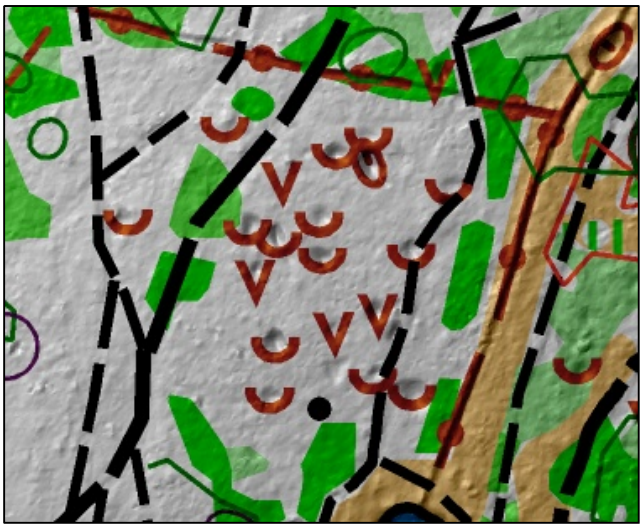
Previously Mark explained the workflow using the LiDAR data to update an existing map.

This article will consider more specialised topics: making the map easier to read, specialised application of Vegetation Base products from LiDAR data, and some speculation on the future of mapping.

Making the map easier to read

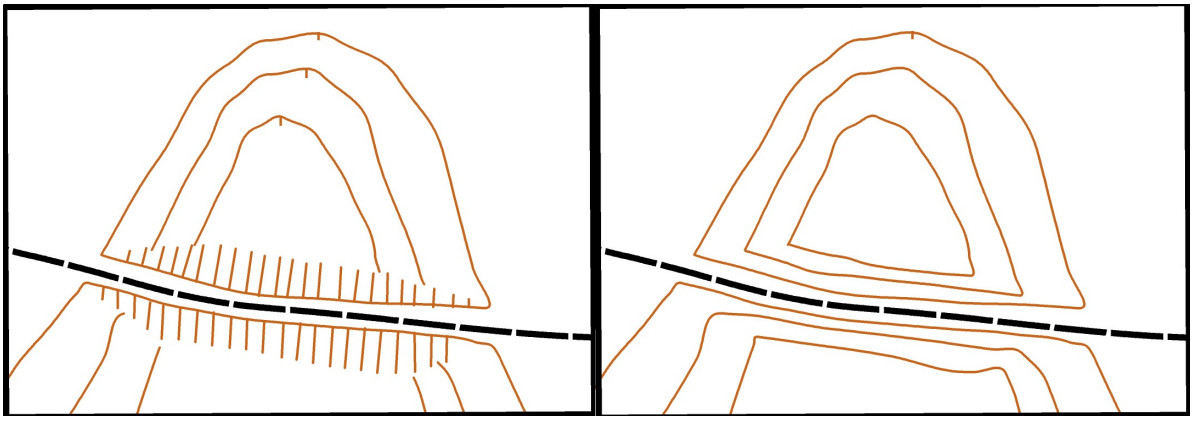
The customers for the maps are you, the orienteers. It is essential the map is easy to read. In the last article we discussed the legibility check using the OCAD software. This identifies areas where features of the same colour lie too close together and therefore merge into a hard-to-read blur at the print scale, and applies IOF standards (ISOM 2017-2 for forest maps) for the separation of such features. It also identifies features that don't meet minimum lengths and area criteria. This all helps to ensure the map is readable at the print scale. Let's consider an example of an area of complex pits and depressions.

The LiDAR Hill shading shows the exact position of the pits and depressions in this small area. It is clear that several are too close together and some even overlap (see left picture).



A site visit reviewing the depth of each feature and identifying whether they were in fact a depression or a pit, concluded that some could be removed or the symbol changed, and others were moved to improve clarity, at the expense of absolute accuracy, (see right picture), resulting in a much clearer result.

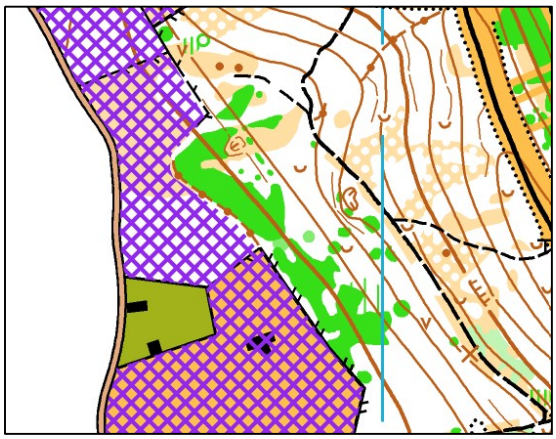
Next we come onto a personal example from a national event I participated in, several years ago. I have redrawn the concept for the purposes of illustration. An old railway runs through an area of complex contours. The railway tracks have been removed and converted into a public footpath, and where the former railway crosses a steep valley there are prominent embankments either side.



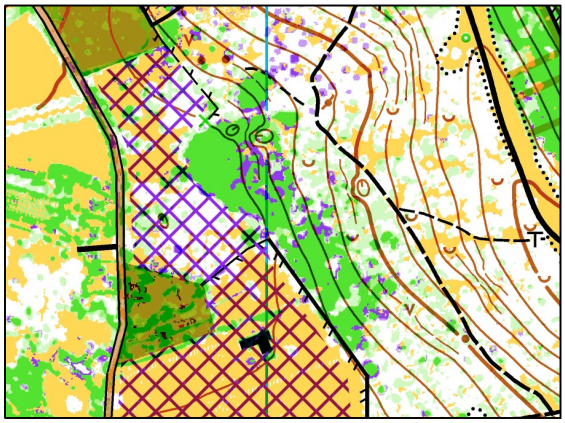
The previous version of the map is shown on the left with the embankment's slopes represented by slope lines indicating a steep incline (if you like this is an extended comb). The right image shows the contours only approach. Unfortunately, I missed the tick on the northern most contour (obscured by a line joining controls). I approached a steep slope of at least 10m height from the south and it took me a minute or two to work it out where I was. Which do you prefer? Certainly, there should have been more ticks on the contours indicating the direction of slope, which certainly would have helped. BTW several others had difficulties here, not just me. So, if we are going to use contours only, we need to put ticks on the contours to indicate the direction of slope, otherwise the interpretation can be ambiguous.

Specialised application of vegetation base

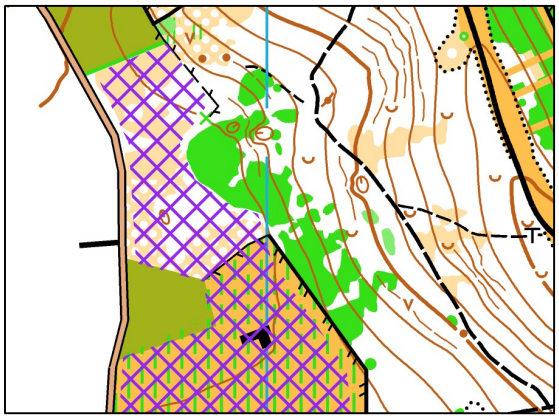
Next, we consider the undergrowth and how to map it. Bob and myself have already referred to use of the Vegetation Base using the LiDAR data. If you recall, this analyses the signal 3m above ground level and reflects the density of vegetation in this interval. I have found this product very useful for mapping brambles, rhododendron thickets and runnability in general. The default for the generation of this product is based on Swiss vegetation and mappers are encouraged to play with the parameters to best tackle the undergrowth in their areas. Bob and I have experimented with the parameters and think we have a good starting point for the undergrowth in the Chilterns. Let's review two examples, the first from the Hambleden map and the second from an award-winning mapper from our neighbouring club HH.



This is the original map (updated for the British Nights in 2020). The dark greens in the centre of the image represent rhododendron thickets. It was hard work mapping the shape.



The next image is the Vegetation Base using the parameters that Bob and I landed on as optimal for the Chilterns (basically a trial-and-error methodology until we get a good fit with the undergrowth). This is designed so that there are similar colours to the orienteering map, with purples representing undergrowth up to 1m above ground level. Normally purples would represent brambles.



Finally, here's the resulting ground proofed map. Although purples represent scattered low-lying bushes, I decided not to map them to emphasize the main thickets. The calibrated vegetation base did a great job in picking out the main shapes but tends to merge thickets together, hence the need for the ground survey.

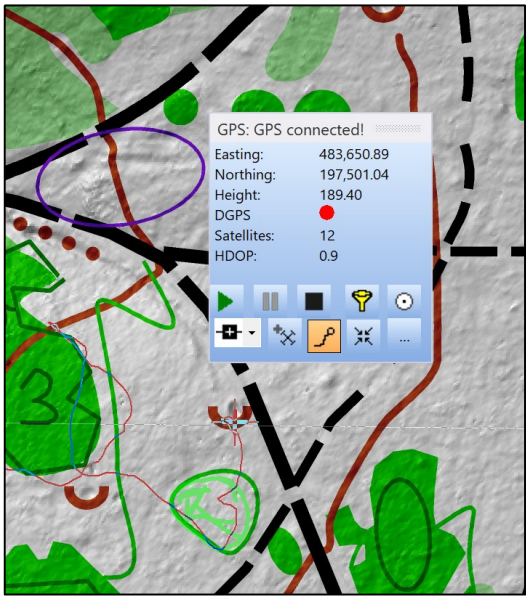
Opposite is a map extract from Ashridge South (taken from Routegadget for the Ace of Hearts event 27.2.23, with kind permission from Simon Errington to use it). Simon made good use of the Vegetation Base, playing around with the various parameters to produce a product that allowed the identification of the series of small paths through the thick brambles, allowing for significant route choice on the courses through this area. Simon won a British Orienteering mapping award 2022 in part due to this novel approach.

Speculation on the future of mapping

Here we will consider the tools that are used in mapping and what an O map might look like in the future.

The use of computers in the field to carry out mapping is growing, and Bob has been using this for a while. This is aided by the improvement in accuracy of GPS devices and the ability of OCAD to link the map directly with the GPS unit. The use of a Microsoft Surface Pro Tablet with Windows 11 for OCAD,

linked to a Garmin Glo 2 GPS unit provides real time GPS data with the current position shown on the map. The GPS is able to connect to multiple satellites (normally at least 10-18) even when using it in the woods. Garmin claim accuracy of 3m - so you shouldn't be lost in the woods! Below is a picture in Bradenham with OCAD showing the current location (at a depression with Hill Shading in the background) with a cross, and the co-ordinates, height, and satellites in overlay box. It can also show the accuracy. OCAD also creates a track from the GPS data and this can be imported into the map. This can be useful in checking paths and tracks. The right picture shows Bob with the Surface/Garmin GPS in the depression to prove accuracy is good, during a map update visit.



Using the Surface Pen with OCAD Sketch allows drawing on top of the map which can be interpreted at home and the actual map updated. The Garmin Glo is on the left of the picture.

What might an O map look like in the future?

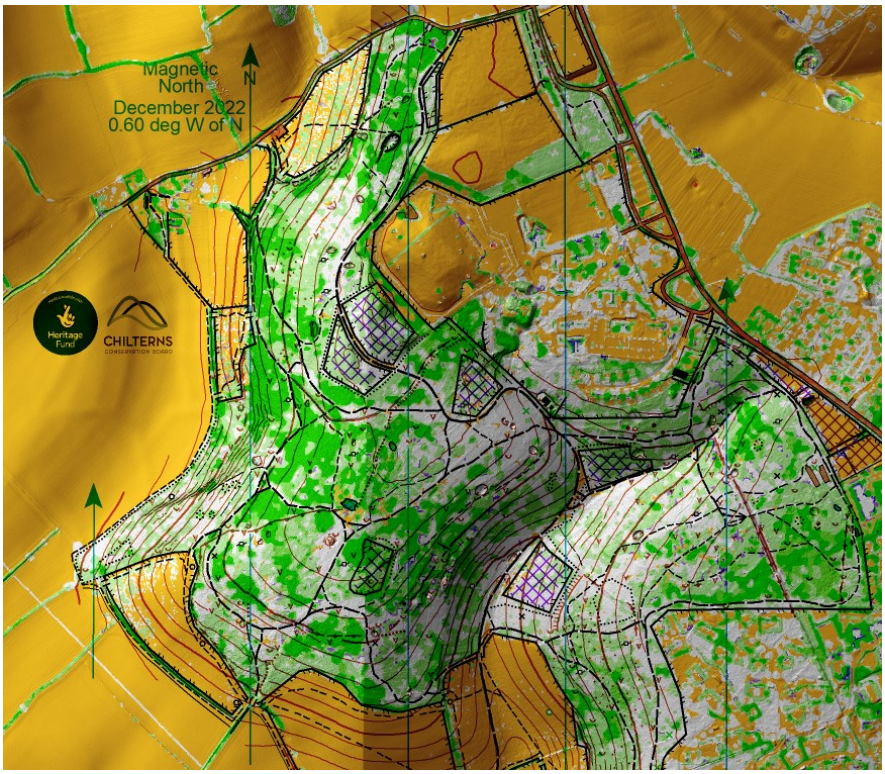
The LiDAR data provides the way forward here in my view. We can combine several principal products to make a more user-friendly map.

Many orienteers especially in areas of complex contours have difficulty determining what's up and what's down. The Hill Shading product from LiDAR creates a landscape image illuminated from a set direction (which can be varied) to emphasize the relief.

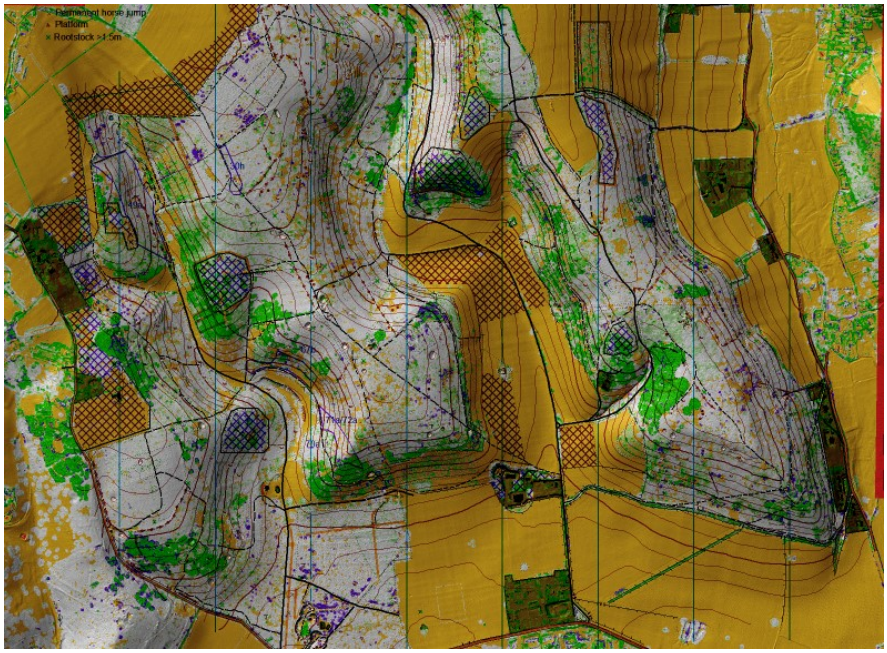
Vegetation Base if calibrated for the mapping area could be used as a first pass for runnability and it would be really useful if OCAD could create a way of vectorising the image so bringing the ‘greens’ onto the map without the time-consuming step of having to digitise them all.

And finally, I wonder if an algorithm could be developed that differentiates ground features by size – so ‘mappable’ pits and depressions are differentiated from ‘spurious’ holes associated with rootstock knolls and low lying earth walls. In this way the ground features could be calibrated in a similar way to the vegetation. Combining all three would give a first class start for an orienteering map that still needs to be ground proofed but would save on the hours of preparation. Bob has discovered that OCAD does in fact have an ‘Extract Features’ option to define the minimum height of trees, and minimum sizes of holes in the ground and knolls – this needs more investigation!

Here’s two examples.



This is the Bradenham map with Hill Shading (from the NW), ground proofed ground features and Vegetation Base.



This is the area of Hambleden used for the British Relays in March 2023. Similar format to that above.

I think the shaded relief does add a lot to the maps. It certainly helps determine the ups and downs. Many times, I have misread the contours and got confused as to why I was heading up hill and not down!

Hopefully these brief articles have given you an insight into how our maps are made. If you have other mapping related topics, you'd like to see covered do drop us a line.

Mark and Bob.