Ever wondered where our maps come from?

Mapping in TVOC - mapper's workflow and how we progress from the original to the new map

Mark Thompson has written part 3 in a series of articles on how maps are produced

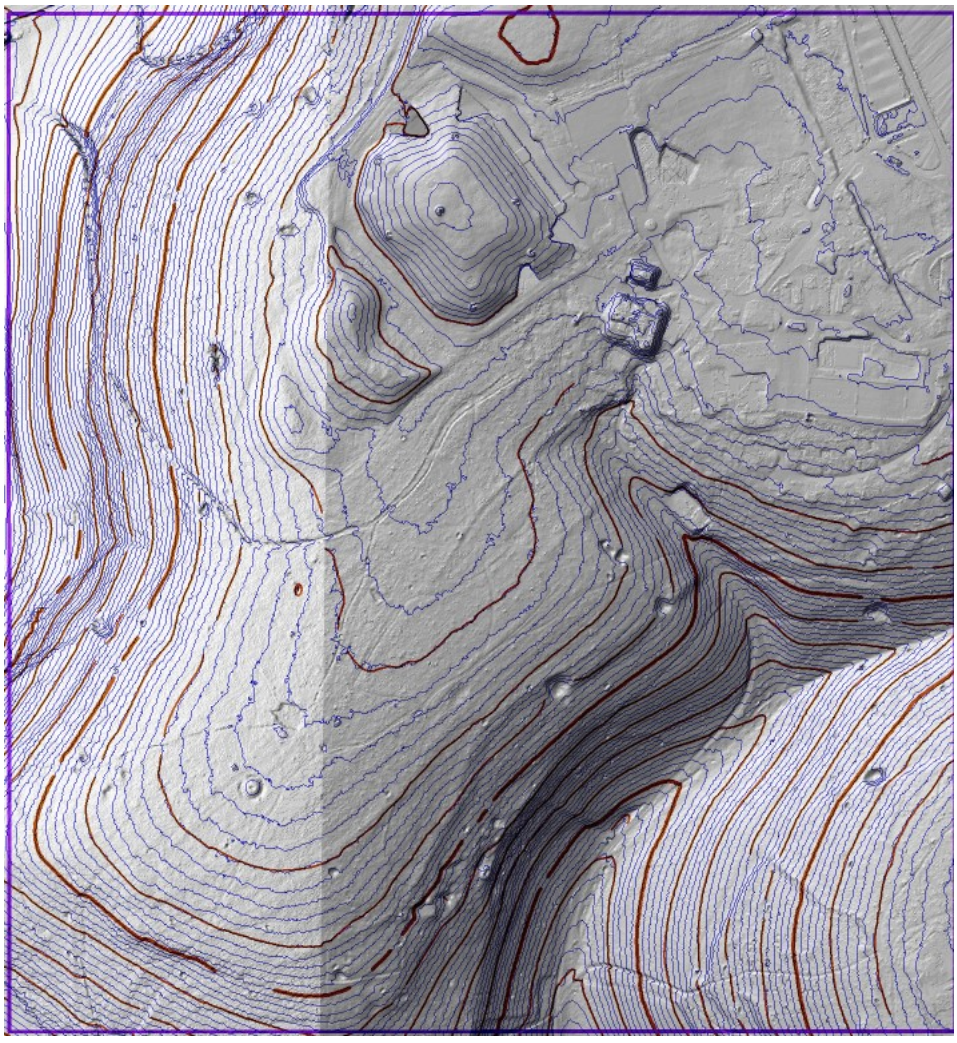
In the last Newsletter Bob explained what LiDAR data is and how it is used to generate the various products we use for mapping. He described how to set up a new map file, how to georeference it, how to create contours, hill shading, classify vegetation height and vegetation base. In this article we will describe how the mappers use this information to produce the maps we use for orienteering across the Chilterns and consider how long this takes.

Mapping workflow

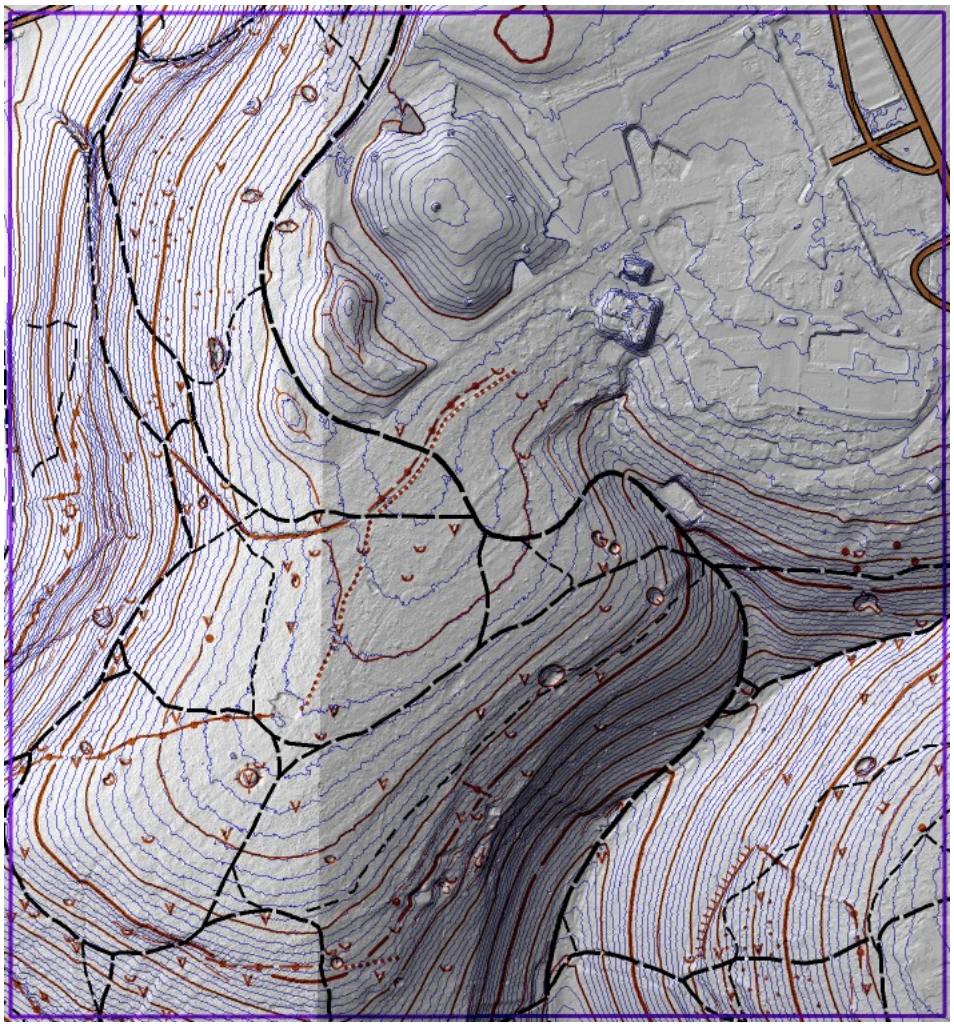
All mappers do it differently in detail but there is a basic workflow to produce an orienteering map. We will start with the georeferenced map with the contours that Bob described. Contours can be generated every 1m but we use contours either at 5m or exceptionally at 2.5m intervals. These contours are then smoothed for inclusion on the map.

Step 1: The Base Map

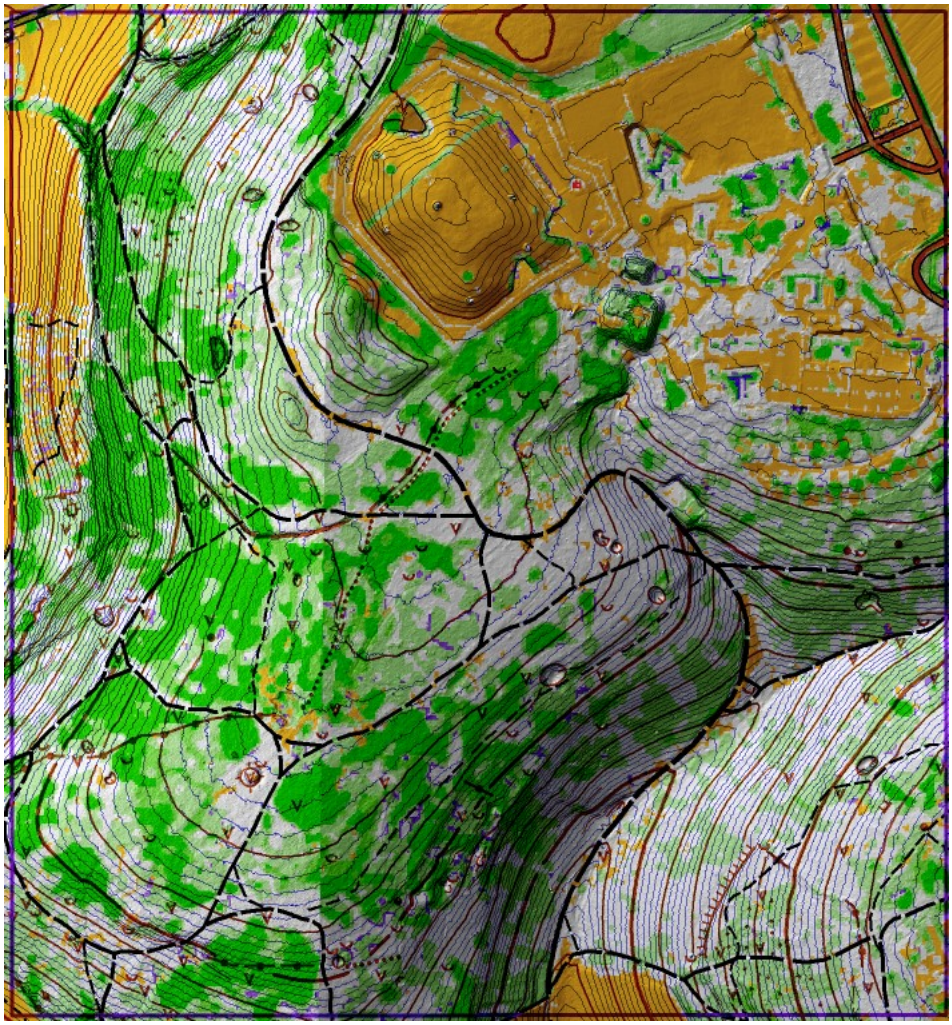
Below are the generated unsmoothed 1m contours, the smoothed 5m contours and the hill shading map that allows us to identify the ground features, for part of the Bradenham map. Large depressions are evident as are some gullies and earth walls.



Next, we need to interpret the paths (and any roads and tracks) to establish a path network. Many paths are evident on the LiDAR but some of the indistinct paths or new paths may be need to mapped by GPS on the ground. The images below add the paths. Also interpreted are the obvious ground features such as earth walls, gullies, pits and depressions.



We now need to add the vegetation using the difference between the DTM and DSM – the vegetation height map. This is great for adding in the clearings and open areas. Bob also described the vegetation base map which analyses the 3m above ground level and helps establish areas of holly or rhododendrons which constitute fight or slow walk.



The colours try to mimic the colours used in OCAD for mapping the vegetation. This is starting to look like an orienteering map!

We can compare the vegetation with the previous version of the map, assuming we are updating an old map. A short cut is to load the old version as a background map and using a rubber sheeting technique (where key points are fixed across the map and the rest stretched as if it was a rubber sheet) we could use this as a starting point assuming we are happy with the vegetation interpretation. However, most of our maps are out of date and the vegetation changes a lot over several years, especially in working forests where thinning and harvesting operations occur. Generally, it is in my view better to start from scratch so the hard work starts with digitising the vegetation from LiDAR. In order to do this at least one visit is required to understand what the different colours mean practically in terms of runnability.

The Beacons of the Past LiDAR survey was carried out in early 2019, so is 4 years out of date! Google maps can help with mapping new plantations for instance. OCAD has the facility to bring in a georeferenced image as a background map. Very useful for vegetation and paths in open areas!

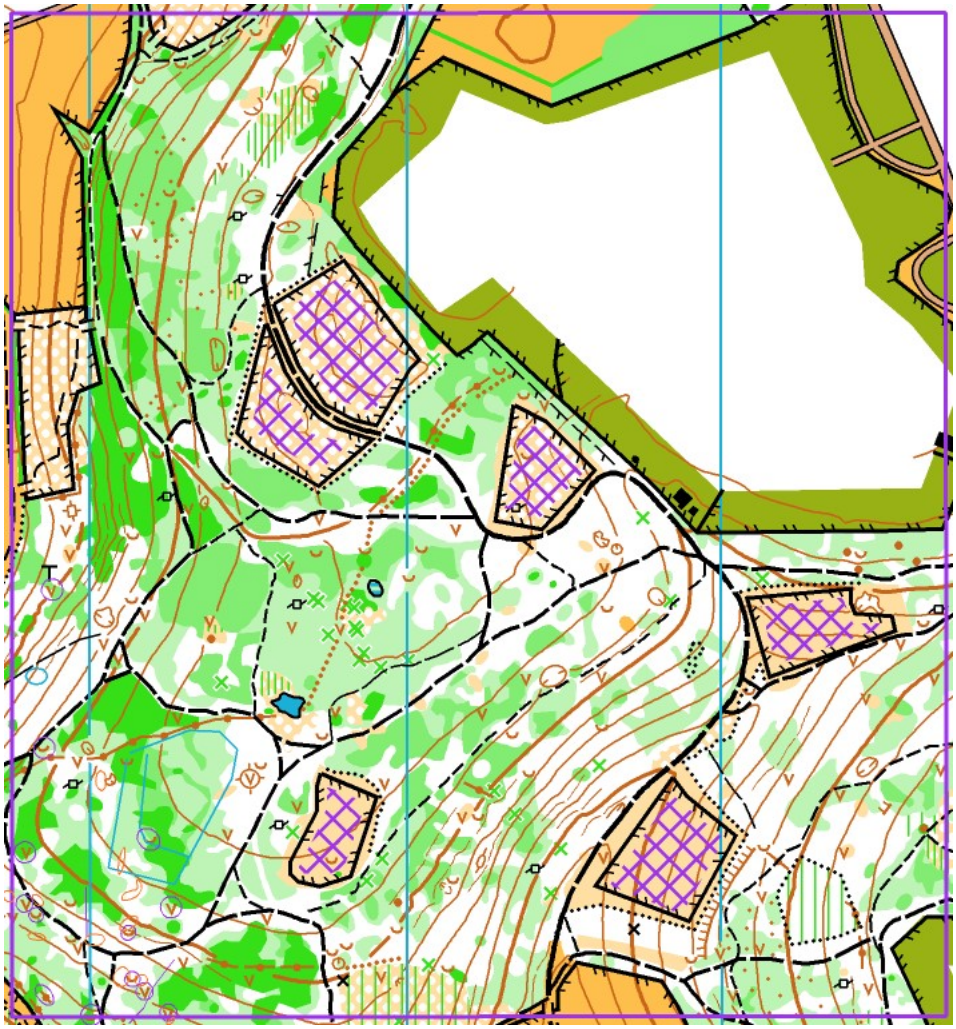
The final detail on preparing the base map is to identify any ground features, vegetation or clearings etc that need to be checked on the ground. Numerous new potential holes in ground will have been identified on the hill shading (most of which are rootstock knolls which probably don't need to be included as potential control sites).

Once we have interpretated the paths, ground features and vegetation we have completed step 1! In the case of the Hambleden map this took me 60 hours (working 3-4 hours per session) over a month or two working in comfort from my armchair. This is painstaking but satisfying work but takes a long time. Hambleden has few holly areas so Bradenham has probably taken longer.

Step 2: The Field Survey

Now the real work starts doing the ground work to amend the base map we have created using the LiDAR products. I usually try for 4 hours maximum in the forest per trip as after that my concentration waivers and mistakes are made. Below is one of my field sheets (I use sepia overlying a 1:5,000 scale colour print for a 1:10,000 scale map). I will come onto methods and equipment in a while. This is work in progress. You can see the areas I have not worked yet and the circles on ground, clearings etc note features that need to be checked on the ground, or be included or not. It is necessary to visit all the features on the map! Once home the changes have to be made to the OCAD file adding another 1-2 hours per visit.

Bradenham, or Park Wood is a working forest and there are several new plantation areas on the above image with large uncrossable fences around them. There are also numerous ground features which were identified as potential sites but failed to make the standard and changes to the vegetation base for instance dark green fight to medium green walk.



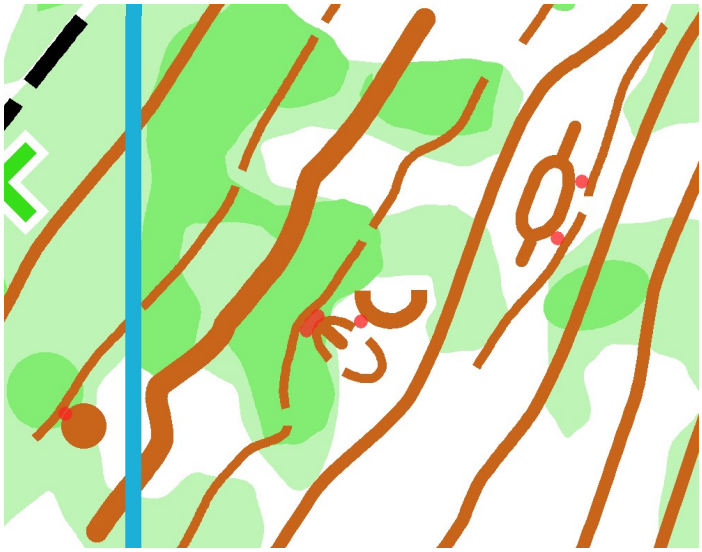
This is the orienteering map, close to completion (areas in the west and south west are the next visit).

So how many visits? I know the area from updating the map in the past at various times. I'm working half the area north of Bradenham Wood Lane (with Bob and Pattie working south). I will have completed the survey area in about 10 visits so say 4-6 hours per visit including time to correct the OCAD file but excluding travel time (30mins each way) adding another 50 hours or so. I know Bob and Pattie are having to work harder on Naphill Common where the vegetation and paths have changed drastically due to major clearing work a few years back. It takes a significant amount of time. I received a nice letter from Peter Hart thanking me for my efforts in planning the British Relays a few weeks ago. The mapping must have taken myself and co-mapper John Farren much longer than the planning. Seems a bit disappointing that the mapping efforts go largely unnoticed!

Back to the article! Bob and myself are somewhat opposite end members when comparing how we do our mapping. I'm at the Luddite end of the spectrum using pen and paper as already noted and Bob has a Microsoft Surface Tablet which can run OCAD in the field and allows him to sketch changes on the map as he goes. He has a high spec Garmin GLO GPS unit (linked to the Tablet and OCAD by Bluetooth which provides excellent positioning accuracy from multiple satellites) usually installed in his hat. Fortunately, Pattie is there with a paper map to stop him being arrested as some spaceman lost in the woods. She also carries an older Garmin Montana GPS which has the current map installed to assist with positioning.

Step 3 The Legibility Check

So, we now have the orienteering map. The final step is to check legibility. This is a new facility in OCAD that allows us to check whether the map can be read or not. This uses IOF agreed parameters (for forest maps this is ISOM 2017-2) to check where features of the same colour lie too close and therefore merge into a hard-to read blur at the print scale. It also runs a check on minimum lengths and areas, that are hard-to-read at the print scale. Below is a blow-up of a small area on the east facing slope. The red dots and dashes indicate where features have been deemed to be too close and need adjustment. This will mean moving contours or features slightly to ensure the competitor can in fact read the map we provide.



Sadly, I'm not sure how much this legibility check is used looking at some maps. Our customers of the maps are orienteers and it is essential they can read them. Orienteering is not an eye sight test!

The next article will consider more specialised topics, making the map easier to read, specialised application of vegetation base for the Chilterns and some speculation on the future of mapping.

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