

Medway Modelling or Fitting Kent on to Two Church Hall Tables



3D modelling has become second nature to surveyors but creating a real physical model from digital data was new to Richard Groom and his colleagues at the Environment Agency's Geomatics group. So what do you need to do to create a model big enough to fit on two church hall tables?

Nowadays the task of the surveyor is normally to produce virtual models of the Earth's terrain and the features on its surface. But a few months ago the Geomatics team in the Environment Agency were asked to procure a physical model covering Kent, South London and East Sussex. The new model was needed to aid visualisation of the topography of the area and assist at local meetings in explaining flood management strategy.

The model was to replace a wooden model which was starting to show its age. This earlier model had been made by cutting layers of wood along successive contours and gluing them together. As a result, slopes appeared jagged rather than smooth and the effect was not pleasing to the eye.

3D Printing

We thought that 3D printing could be the answer and contacted a company in London, Lee 3D, to work up our ideas. The bread and butter of George Lee's business is 3D models of buildings and urban landscape for architects, which help clients and stakeholders to visualise developments, so he was keen to use 3D printing for our unusual application. His full colour 3D printer could be used to produce a physical 3D model from the digital terrain model (DTM) with an image printed into the surface.

The project brief was to produce a model that could fit 'on a pair of church hall tables'. We looked at two options: a model at 1:100,000 or at 1:75,000 and determined that 1:75,000 would fit the requirement. We decided to use a grid DTM derived from LiDAR with 20m cell size, which is equivalent to 0.3mm at printing scale. To decide what vertical exaggeration to use, we made oblique digital 3D views of the DTM with various options and decided that five times vertical exaggeration provided enough topography to show the river catchments clearly, without making south east England look alpine. You can not only see the topography of the Downs but also fine topographic detail such as quarries that pockmark the landscape.

Surface image

The client wanted a basic image printed on the model, similar to the layer shading that had been used for the wooden model. But you can print any image, so we also considered several other options, including draping orthophotography or small scale mapping over the model terrain. In the end we opted for layer shading from green for lower lying ground to brown for the tops of the downs. This reinforced visualisation of the third dimension. We took rivers from the Environment Agency's main river maps and the boundaries of flood water storage areas from previous surveys. To this, we added a basic road network and shading for builtup areas and then named the major towns and rivers.

Data preparation

Preparing the data for printing was not as straightforward as one might imagine. The solution finally chosen was for Geomatics to supply DTMs and images for each model tile. Each tile was 0.3032m × 0.2499m, equivalent to 22740m × 18740m on the ground. We calculated the coordinates of the corners of each of the 36 models and prepared the 20m resolution grid DTM data with grid data along the boundaries of each tile and images covering the same areas as JPG files. George then used his software to create a TIN (triangular irregular network) from the grid DTM and then the contour data which was needed by the printer.

Printing the models

It was at this point that the client decided to order the model only for his immediate area of interest, which covered six tiles from our planned layout. Although this might have seemed a disappointment, reducing the size of the model did mean that we would no longer have to consider how to fix the tiles to baseboards, as we had originally planned. We could concentrate on producing the model tiles, because

the six models could simply be placed together on the church hall table.

One of the submodels was printed as a trial and then the remaining five were printed over the following few days. The models are being used for a round of public meetings, after which a decision will be taken on whether to extend coverage to include the whole of the Kent and South London Area.

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