



NO, WOMEN CAN READ MAPS

RECEIVED WISDOM CAN AFFECT PEOPLE'S AMBITION AND SELF-BELIEF. BEST TO IGNORE IT, SAYS ALISTAIR MACLENAN

Received wisdom is a dangerous thing – just because most people believe something to be true, doesn't mean that it is. In the 1950s, most doctors believed smoking to be harmless. Indeed, many physicians advertised their favourite brands, although that may have been an attempt to ensure that they didn't run out of future customers!

Another urban myth that has grown up over time is that men are much better at reading maps than women. I admit that as a child, I believed this one to be true. I had to, based on the experience of watching my parents. My father could glance at a map and after three hours of flawless navigation, find his target destination in the depths of the countryside, whilst my mother would frequently get lost on her way to the car.

Of course, I'm exaggerating for comic effect – mum could always find the car. Just not always the house on her return journey. We once found her in cul-de-sac which she had driven into because she was following 'someone who looked like they knew where they were going'.

Before I am (rightly) taken to task by the loyal and growing feminist section of my readership for my stereotypical view of the spatial capabilities of the sexes, I am happy to publicly state that science has punctured another received wisdom – women can read maps just as well as men can.

A recent study, published in the journal *Psychological Science*, says the cultural belief that I have just described is also the cause of the problem itself – that is, women believe that they are bad at reading maps because it is received wisdom that they are and so they read maps badly.

The study's researchers Margaret Tarampi, Nahal Heydari and Mary Hegerty postulated that it wasn't inherent inability but received wisdom that led to this belief. So, they didn't mention any perceived difference in ability during their tests. Instead, they simply told participants that the goal of the tests was to help other people. In the subsequent task, men and women performed equally well.

All technical subjects including geographical-based disciplines are attracting more women but progress is slow. In 1904, two of the original 48 members of the American Association of Geographers were women (~4%); in 1972, that number had risen to 14%; and in 2015, it stood at 38%.

The figures are more encouraging if we look at the current US student population, where 42% of geography graduates are female. This seems to suggest that the trend will continue.

And so it should. Received wisdom is nearly always idiotic. African-American people can't swim because they're too heavy? No one told Olympic medallists Cullen Jones, Enith Brigitha, Anthony Nesta, Anthony Ervin, Maritza Correia, Lia Neal and Simone Manuel. Possibly a lack of access to swimming pools has more to do with that list being so short?

Social pressures and the impressions that they create, combined with restrictions of opportunity, lead to a lack of ambition and self-belief. Once those are removed, someone's gender influences their ability to read a map as much as their hair colour does. Long may women continue to discover that that's true. Not you Mum, you're beyond help.

ALL TECHNICAL SUBJECTS INCLUDING GEOGRAPHICAL-BASED DISCIPLINES ARE ATTRACTING MORE WOMEN BUT PROGRESS IS SLOW

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This image of Morges in Switzerland shows how Pix4dmapper v4.0 classifies 3D point clouds into categories such as buildings, roads or vegetation

MACHINE-LEARNING POINT CLOUD CLASSIFICATION

CHRISTOPH STRECHA OF PIX4D RUNS A RULE OVER THE LATEST ITERATION OF PIX4DMAPPER, THE DESKTOP SOFTWARE THAT GENERATES PROFESSIONAL 3D MODELS AND MAPS FROM DRONE-ACQUIRED IMAGERY, AND SEES A REVOLUTION-IN-THE-MAKING

First introduced to the market in 2014, the latest version (4.0) of Pix4Dmapper made its debut at this year's INTERGEO Expo in Berlin to an enthusiastic reception. For the first time, the desktop software embodies photogrammetric machine learning tools with which users can automatically classify dense 3D point clouds into a number of categories such as buildings, roads or vegetation.

This is just the beginning of the company's quest to revolutionise contemporary photogrammetry workflows and enable many new ones through machine learning. In the end, it will allow the conversion of raw imagery into 3D reality models with attributed semantic information.

In practice, it means that instead of having to manually inspect and measure 3D reality models, users will directly receive automatically-generated answers to questions such as:

How many trees are within the project area and at what locations? What is their height and species?

What is the total road surface area in your area of interest?

What is the amount and distribution of roofs that are suitable for solar cell coverage?

How many cars are at your parking lot and at what locations?

Answering such specific questions will enable the direct connection of photogrammetric processing workflows to GIS databases, thereby speeding and streamlining updates of vectorised information from newly-acquired drone imagery.

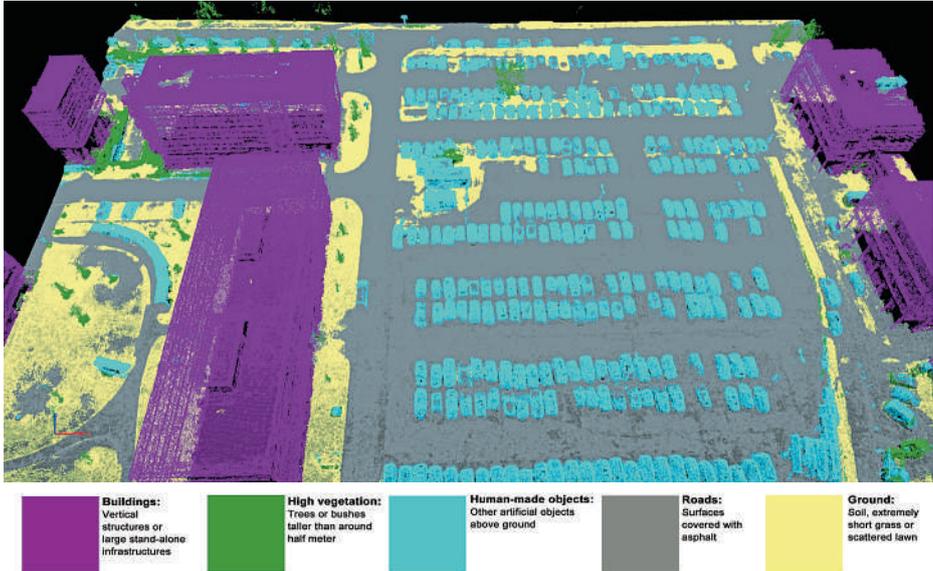
Work in progress

Of course, there is still work to be done. Machine learning techniques are only as good as the training data used to build the classification models. For this reason, Pix4D opted to give its users the tools to control and refine the classification. Just as a baby gradually learns how to see and interpret its environment, these machine learning techniques will evolve with the training data. The result will be more object categories and greater reliability.

As of today, professionals will primarily use the new machine learning-based point cloud classification to automatically generate Digital Terrain Models (DTMs). In the near future, this classification will form the basis to extract buildings and model them as a semantic composition of geometry. This composition will, for example, include elements such as roofs, facades, windows, doors and balconies. Needless to say, Pix4D's growing R&D teams in Lausanne, Berlin and San Francisco are dedicated to this challenge.

Trained algorithms

A first step in this direction has been the development of novel

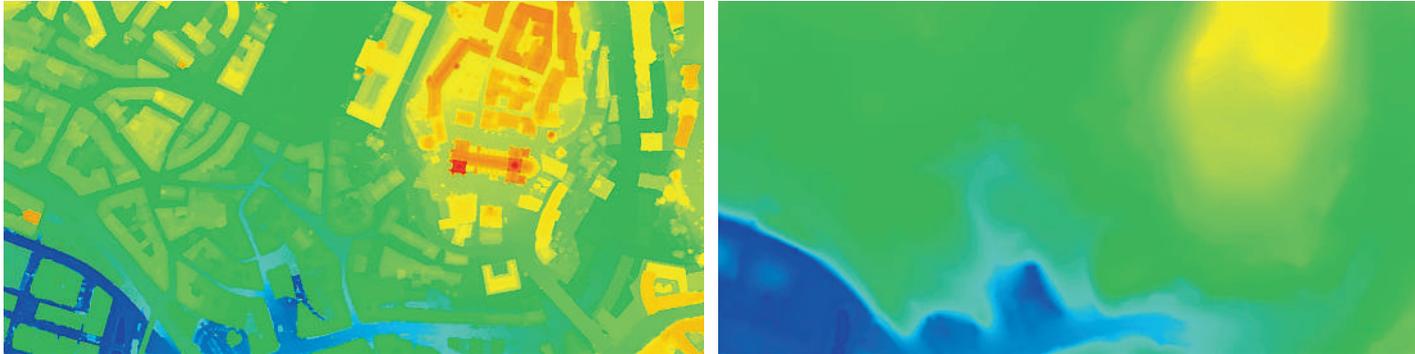


Pix4Dmapper 4.0

- Contains supervised machine-learning technology
- Automatically classify 3D points based on both geometry and color
- Visualize and improve the classified points in Pix4Dmapper rayCloud
- Classify 10 million points in 3 minutes

<https://pix4d.com/product/pix4dmapper/>

With Pix4Dmapper, object classes are automatically classified using trained algorithms, as in the above image



machine learning-based point cloud classification algorithms. Based on geometry and pixel values, these have been trained to understand object classes. Today, Pix4D is collecting user inputs with which to train algorithms that can adapt to many new topics, e.g., separating aggregates stockpiles from bare terrain; automatically measuring volumes with unprecedented accuracy, or automatically digitising newly-constructed road and buildings.

Bare earth terrain extraction

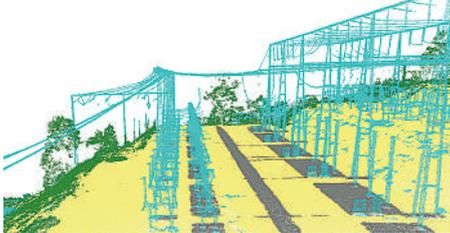
A considerable amount of hydrological or geological analysis needs to be performed using bare earth terrain models. In Pix4Dmapper, the point cloud classification function can be used to separate all the above-ground objects and improve the

classification using the point editing tools, as pictured above left and right.

Volume measurement

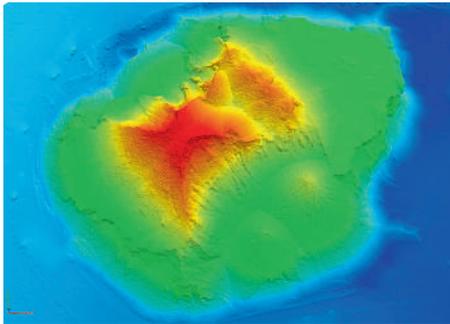
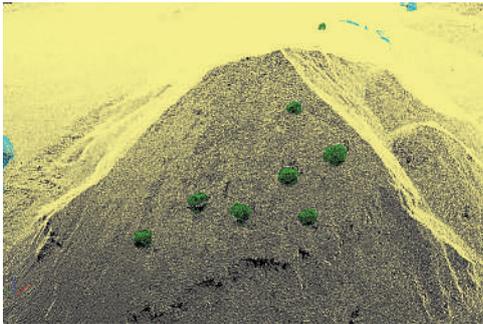
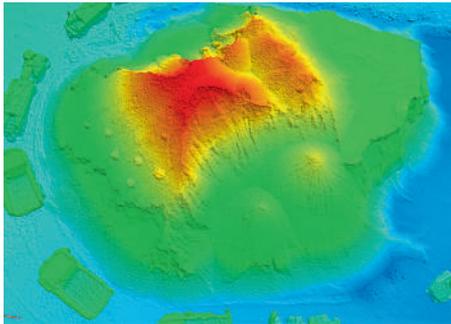
To get an accurate volume measurement, it is crucial to remove vegetation or human-made objects from the point cloud. With the point classification, it would be more time-saving to achieve more reliable volume calculations.

Examples of this technique are pictured below.



be grouped and manually digitised for further analysis, as pictured above.

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In this sequence, vegetation on top of a stockpile is ignored to obtain a more accurate volume measurement