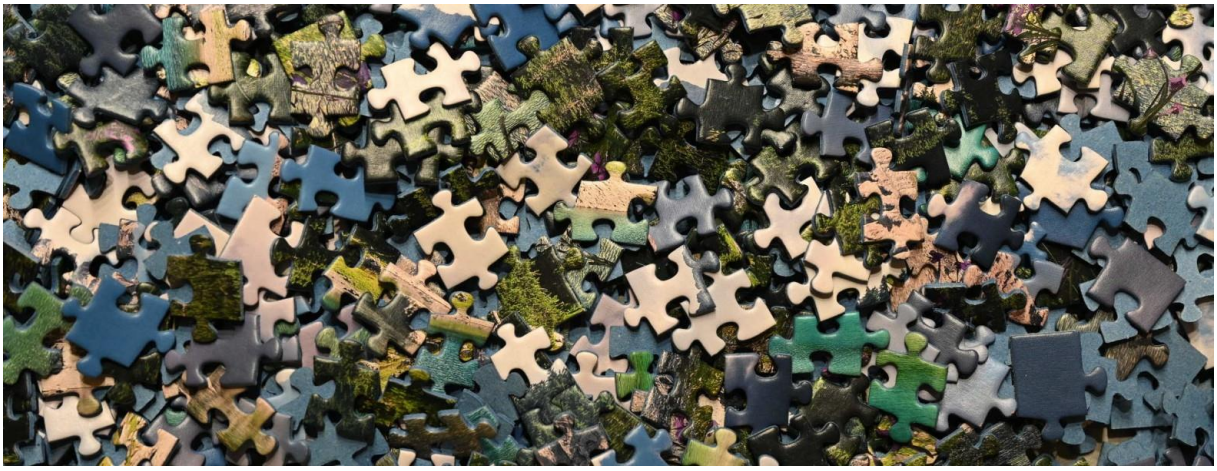
Taming errors... pt. 6:
The Men Who Stare at Points

Daniel Wujanz – daniel.wujanz@technet-gmbh.com

2nd April 2020



3. The Men Who Stare at Points – Network design, quality assurance and dealing with errors

If I'd be asked how to depict the current workflow that the vast majority of users follow during registration of laser scans, I'd say the following: You capture scans with a scalpel and then register the data with a big rusty hammer – while wearing a blindfold. The blindfold symbolises the fact that the vast majority of users do not trust numerical quality measures that stem from the registration process. Instead, they tend to look a lot. While it is normal to perform a visual plausibility check before sending data to a customer, it is definitely not normal to base your entire QA process chain on daydreamingly staring at huge point clouds! Unfortunately, the latter case has become a common standard in practice in the context of registration. While you may be able to visually detect large blunders, the shear amount of points and limitations in perspective do not allow you to spot small subtle deviations that at latest become a problem once they accumulate. Please bear in mind: Looking at points and lines are definitely appropriate tools - yet for artists and not engineers. So, if you charge engineering prices for your services, at least try to do more engineering than art!

How did we got to this stage where engineers do not trust numbers anymore? Imagine a world where structural engineers verify the load capacity of a bridge by simply looking at an appealing 3D-visualisation of it. Would you commute over such a bridge on a daily basis or rather take a detour? I'm pretty sure you would choose the latter.

Let's get back to the reason of mistrust: The vast majority of algorithms that is used for processing laser scans originate from computer science, electrical engineering, robotics and the like. This is not necessarily a bad thing since this collaboration led to

very performant algorithms. The crux is, that well-established methods from the mystical science that deals with spatial data acquisition and processing for more than 2000 years (Ἐρατοσθένης 246 B.C.), which is called Geodesy by the way, were not considered - or just in homeopathic doses. Some of the last sentences may sound like I'm trying to blame the "computer people" – this is not the case – I'm blaming my own geodetic tribe! Criticising the work of other fields of expertise is one thing – yet, then you have to come up with innovative alternatives or at least tell "the others" why it is foolish to do things in a certain way.

To conclude, we have to re-establish sound quality assurance based on meaningful and reliable numbers from geodesy in registration and other laser scanning processing tasks. If people continue to work as they do, the credibility of an entire industry is at risk. The reason for this drastic statement is plain and simple: you cannot advertise a few millimetres and then give your customers data with centimetre or decimetre discrepancies due to registration errors. They will start to mistrust laser scanning as a whole (even though poor quality assurance is to blame) just the way most scanning folks don't trust numerical quality measures during registration.

The questions which geodetic quality measures are suitable to escape this medieval time of darkness and what they tell you about your data will be discussed in greater detail throughout this section and exemplified on practical case studies.

References

Ἐρατοσθένης (246 B.C.). πώς καθόρισα την περιφέρεια της γης. η βιβλιοθήκη της Αλεξάνδρειας.