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HOW HAS TECHNOLOGY IMPROVE THE WAYS THAT SURVEYS ARE DONE

INTRODUCTION

Surveyors use survey instruments and programmes to capture and process data in and out of the office. Over the years, technology on these instruments and programmes has improved drastically and still continues to improve. These instruments include levels, theodolites, total stations and the GPS's.

The improvements in survey instruments and programmes has had a positive change on the survey field as a whole. These improvements have changed the way that surveys are now done and therefore surveyors have to employ new ways of conducting surveys but not forgetting the basics of survey. With the improvement in technology of survey instruments and programmes, field surveys, reductions and processing of data are now done faster and the instruments are lighter than before but that does not mean that the accuracy of survey instruments has to be compromised.

GATHERING INFORMATION FROM THE SURVEYOR GENERAL'S OFFICE

The methods now used to gather and submit cadastral data from the Surveyors General Office have drastically change from the olden days. Previously if you required data from the SGO you would have to write to them, post the letter and they would also have to reply by post and this was time consuming.

As time went by an Auto Emailer was introduced which helped a lot because you would get the data that you required in a couple of minutes depending if the documents required were scanned. After Auto Emailer, came an SG Search which was accessible to anyone who had an access to the internet and you got the data very quickly if those documents were scanned. You can now submit the survey records to the SGO using an email and this method is called Digital Lodgement.

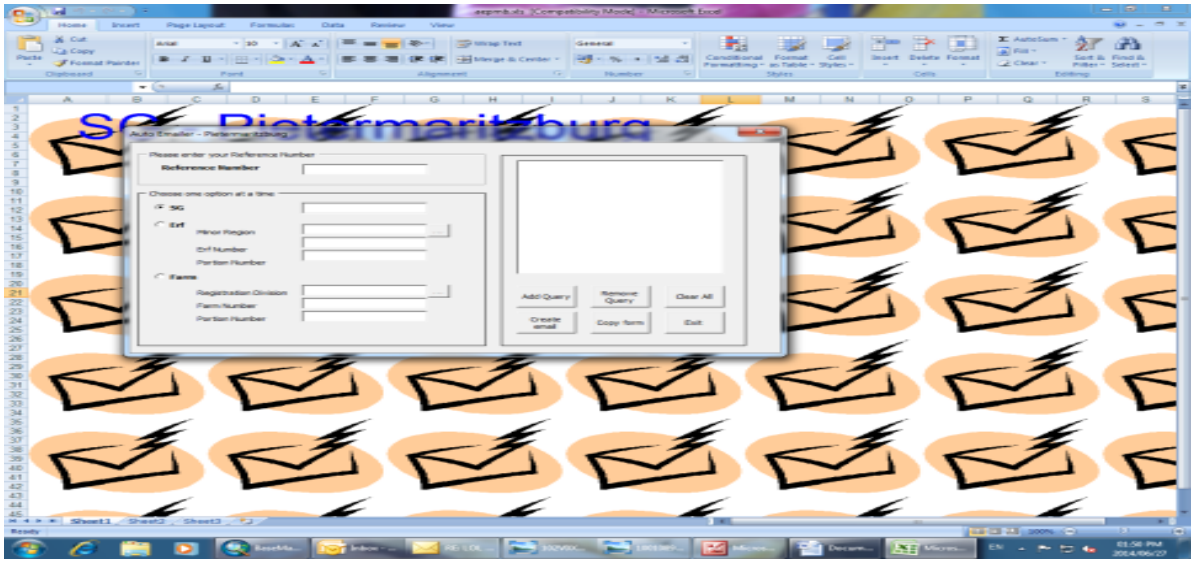

Figure 1 (Auto Emailer)

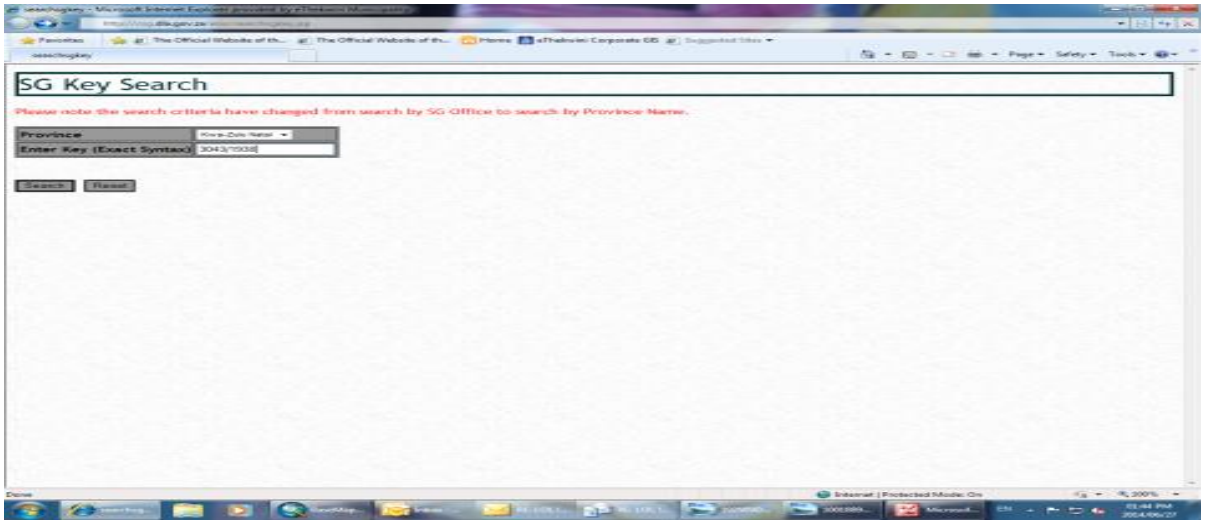

Figure 2 (SG Search)

LEVELLING

Levelling is the method used in surveying to transfer a height from a known point to an unknown point. This is done using the tripod, level, levelling staffs and the change plates. As the technology has improved over the years the instruments have become lighter and faster. In the olden days the readings were booked manually but these days we have a digital level which records readings automatically. When booking manually mistakes can happen when reading the staff and you could only see them at the end when your level doesn't close and you'll have to start again which is time consuming. When using the digital level bookings are done automatically and chances of making mistakes are very slim. The bar coded staff doesn't have numbers on it but it has bar coded staff readings on it and this bar coded pattern is converted into elevation and distance values using a digital image matching procedure within the instrument. The tripods and the staffs that were used in the olden days were heavy and the ones that are used these days are now much lighter.

Figure 3 (Dumpy Level and Staff)

Figure 4 (Level and Staff)

Figure 5 (Digital Level, tripod and a bar coded staff)

THEODOLITE

A theodolite is an optical surveying instrument with a rotating telescope for measuring horizontal and vertical angles. With the old theodolites you didn't have to use batteries. They were illuminated using mirrors and prisms which directed sunlight into the instrument. To measure distances, you had to use a steel tape which obviously didn't require batteries. With the improvement in technology, the new theodolites are lighter and you can read the horizontal and vertical angles using light generated from batteries. They can also measure distances with the Electronic Distance Measures (EDM) attached to them.

Figure 6 (Old Theodolite)

Figure 7 (Theodolite with the EDM attached)

TOTAL STATION

A total station is a theodolite with the EDM built inside it. The EDM is for measuring distances and the total station measures all three components simultaneously i.e. distances, and horizontal and the vertical angles. With the improvement in technology they have introduced a robotic total station that you can use by yourself without the help of a survey assistant as shown on Figure 9. With these robotic total stations you can even include the GPS receiver on the pole and use the GPS and the total station together as shown in Figure 9. The robotic total station automatically tracks the prism as it is moved around the site as shown in Figure 9. Some of the robotic total stations have a scanner built in them. The improvement in technology has made surveying inaccessible areas easy because you can choose to use the laser on your instrument. With the laser measurements, you select an option on your instrument to use the laser but the distances that you can measure are usually shorter than the ones that you measure with the prism. If the instrument measures a distance of 250 metres with a prism usually with a laser it will measure about 150 metres. With this instrument you could use an external data recorder to record readings but with the improvement in technology readings can be stored within the instrument.

Figure 8 (Total Station – measuring to a prism)

Figure 9 (Robotic Total Station)

GPS (GLOBAL POSITIONING SYSTEM)

GPS is a highly accurate navigation system using signals from GPS satellites to determine a location on the earth's surface, irrespective of the weather conditions. Over the years, GPS technology has improved from the ones with many cables and big receivers to the ones with no cables and small receivers. Previously you had to setup the base at a known point before you started your survey, but now with the introduction of the VRS (Virtual Reference Station) you don't need to setup a base. The VRS approach represents the network as a single based solution to the rover. Through a two-way communication using a mobile phone data link, the central processing server will acquire the rover's navigation solution in the NMEA format (National Marine Electronics Association). Once it receives this location, it selects the nearest three reference stations to calculate the corrections for the rover. This then creates a Virtual Reference Station in close proximity to the rover. Thus, in the end, the rover will receive a single baseline solution with a much shorter baseline length. The Surveyor only uses one pole with the receiver and the controller as shown in figure 11.

Figure 10 (Old GPS)

Figure 11 (New GPS)

SCANNERS

Laser scanning is a very efficient survey method to reduce costs. Surveys are undertaken by a laser scanner, which allows fast surveying (scanning) of landscapes, structures and their furnishings. Laser scanners are also used for 3D surveys of large components and complex structures. Scanners are used mostly in the mines, industries and where a lot of data has to be gathered. The scanner can be setup on a tripod at a known point or it can be mounted on a moving object such as a car or any other object. Although scanning in the field is quick, reduction of the resulting point clouds can be time consuming and this can only be done efficiently by an experienced operator. The scans can be combined with photographic imagery to produce realistic 3D models.

Figure 12 (Scanner, scanning a bridge)

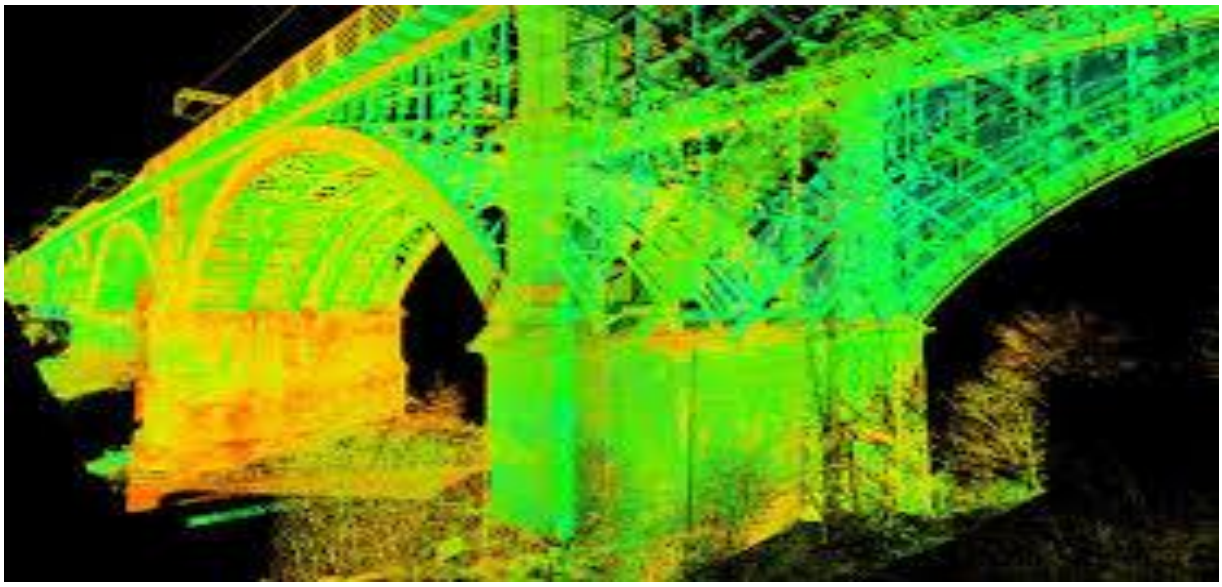

Figure 13 (Scanned image)

SURVEY PROGRAMMES

Survey programmes are the programmes used by surveyors to calculate, reduce data and produce the final plans, diagrams and general plans depending on the purpose of the survey. These programmes have improved over the years and now are able to accommodate data from different sources.

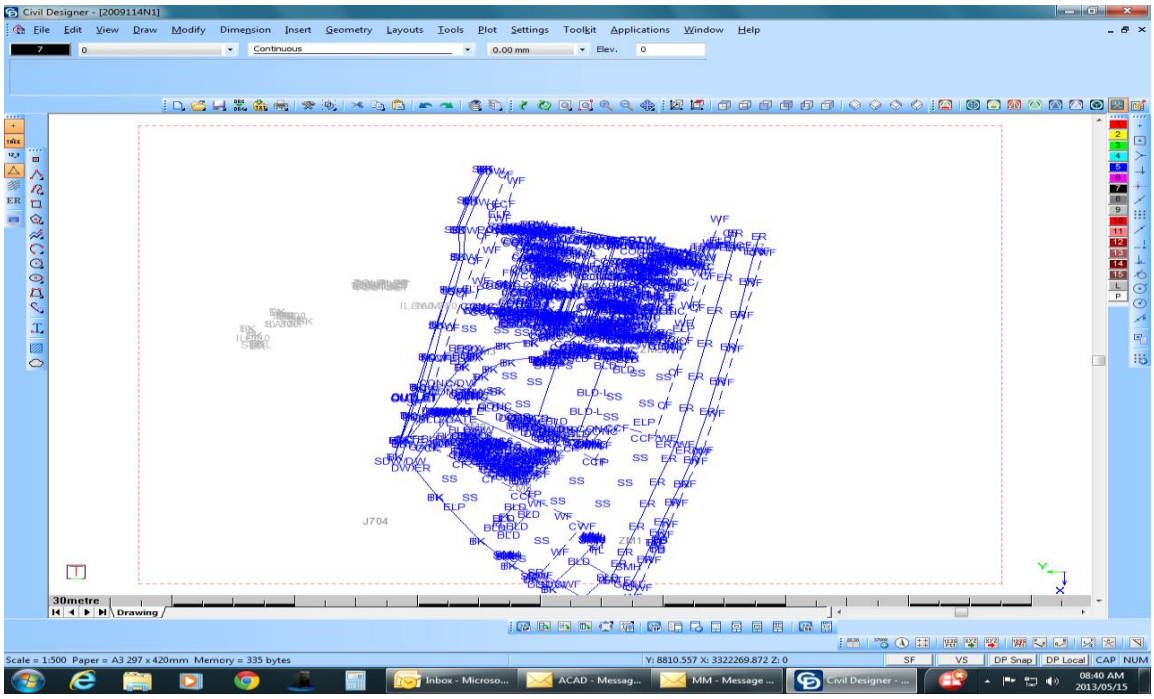

Figure 14 (Civil Designer)

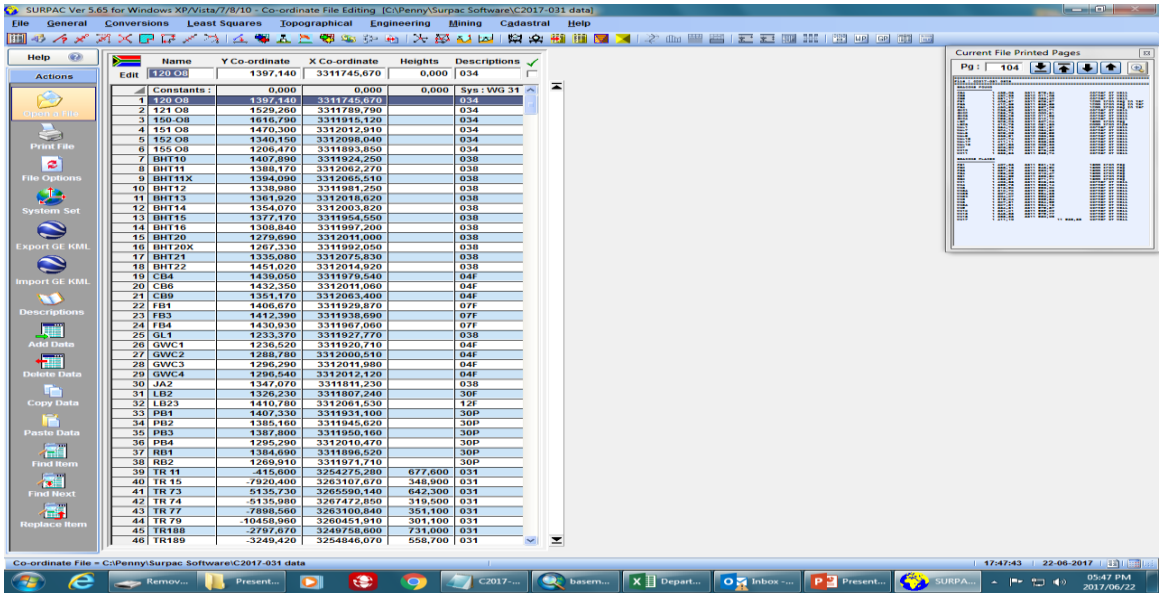

Figure 15 (Surpac)

CONCLUSION

Technology has changed the way that the surveys are done. Surveyors now require less man power and you can do more work in less time which is more productive for the organisation or the company. There are cost implications with the new technology such as when you have to upgrade the software and sometimes go for training, but in the long run it does pay off. Technology keeps on improving and we have to keep up with times. It is important to note that although changing technology has a huge influence on the way Surveyors undertake their work, the basic principles of survey still apply and must always be considered to ensure that surveys are both accurate and complete.

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