

ABSTRACT

Much of the surveyor's task involves the acquisition and analysis of survey measurements. Such measurements are subject to random, systematic and gross errors. In practice, redundant measurements are made to provide quality control and check for errors. In qualitative analysis and statistical evaluation, it is generally assumed that the measurements contain only random errors and are regarded as random variables. In reality, the measurements may contain gross and/or systematic errors. The effects of such errors are distributed over the residuals, after an adjustment and lead to questionable results and interpretation.

For high precision applications, gross and systematic errors need to be detected prior to the analysis. These errors should be tackled before an adjustment and evaluation by means of screening. These few remaining gross and systematic errors in the measurements can be detected after an adjustment. These adjustment methods assume the presence of only one gross or systematic error.

One of the most effective methods that can be used in detecting multiple gross and systematic errors is the method of statistical quality control. Statistical quality control is a technique to monitor a procedure with a goal of making it more efficient and ensures precise results.

Statistical control charts are used to provide an operational definition of a special cause for a given set of data. It is possible to construct multiples of sigma control limits. When all the points on a control chart are within a multiple of sigma control limits and there are no gross or systematic patterns in the data, the process of measurements is said to be in a

state of statistical control. Otherwise, the data indicate the presence of non-random gross or systematic errors.

Different methods of statistical quality control were used in this research. The main conclusion reached out, using statistical quality control, is that this method can be used successfully in detecting multiple gross and systematic errors.

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غالبية المهام التي يقوم بها مهندس المساحة تتطلب الحصول على القياسات المساحية وتحليلها. تلك القياسات قابلة للأخطاء الجسيمة، المنتظمة والعشوائية. عملياً، عادةً ما يكون هناك أرصادات زائدة عن الحاجة من أجل الوصول الى ضبط ذات قيمة والمساعدة في اكتشاف الأخطاء. في التحليل النوعي والتقييم الإحصائي، عادةً ما يفترض أن القياسات تحتوي على أخطاء عشوائية فقط واعتبارها متغيرات عشوائية. في الحقيقة، تلك القياسات يمكن أن تحتوي على أخطاء جسيمة و/أو أخطاء منتظمة. تأثير هذه الأخطاء يتم توزيعها على الأخطاء المتبقية بعد إجراء عملية الضبط وتؤدي بدورها الى إثارة الاسئلة حول نتائجها وتفسيرها.

التطبيقات ذات الدقة العالية، تتطلب كشف الأخطاء الجسيمة والمنتظمة قبل إجراء التحليل. وهذه الأخطاء يجب معالجتها قبل إجراء عمليتي الضبط والتقدير عن طريق مسح البيانات. الأخطاء الجسيمة والمنتظمة البسيطة المتبقية في نتائج القياسات يمكن كشفها بعد عملية الضبط. الطرائق المختلفة التي تستخدم عادة ما تفترض وجود خطأ، جسيم أو منتظم، واحد فقط.

واحدة من الطرائق ذات الفاعلية والتي يمكن استخدامها في كشف الأخطاء المزدوجة، الجسيمة منها والمنتظمة، هي طريقة ضبط الجودة الإحصائي. ضبط الجودة الإحصائي هي تقنية لمتابعة اجراء ما به هدف جعلها إجراءً فعالاً ولضمان نتائج ذات دقة عالية.

تستخدم الرسومات البيانية الإحصائية لتوفير التعرف العملي للمسببات الخاصة لمرصومة بيانات محددة. ومن الممكن إنشاء حدود بعيدتها كمضروببات للانحراف المعياري. عندما تقع كل النقاط في الحدود المحددة ولا توجد أخطاء جسيمة او نمط واضح للبيانات، يقال ان عملية القياس في وضع الضبط الإحصائي. والا فإن البيانات تحتوي على أخطاء غير عشوائية أو أخطاء منتظمة.

أستخدم في هذا البحث طرقاً مختلفة لضبط الجودة الإحصائي. الخلاصة الرئيسية من هذا البحث ان ضبط الجودة الإحصائي يمكن إستخدامه بنجاح في كشف الأخطاء الجسيمة المزدوجة والأخطاء المنتظمة.

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LIST OF ABBREVIATIONS

QC	Quality Control
OQC	Operation Quality Control
FQC	Foreman Quality Control
IQC	Inspection Quality Control
SQC	Statistical Quality Control
TQC	Total Quality Control
CL	Center Line
UCL	Upper Control Limit
LCL	Lower Control Limit
SCCs	Statistical Control Charts
OCAP	Out of Control Action Plan
VCCs	Variables Control Charts
ACCs	Attribute Control Charts
LAN	Local Area Network
USL	Upper Specification Limit
LSL	Lower Specification Limit

Pr	Probability
E	Expectation
ARL	Average Run Length
PCR	Process Capability Ratio
LSE	Least Squares Estimation
GLR	Generalized Likelihood Ratio