The Application of Information Assay Algorithm in Quality Control, Case Study Research: The Body Making Hall of Peugeot 207

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Abstract

This research inspected the requested of information assay algorithm in quality rein, situation research investigation: Peugeot 207 body entrance. Nowadays, human capability for manufacture and group of dataset have been developing swiftly. Most of facture frolic significant figure in this procedure; namely, prevalent utilization of computer capabilities in various body of knowledge, in expansion tools for set information, study and consistent knowledge systems, integrated banking systems, and electronic commerce. The explosive expansion in stored datum has given rise to new technologies and automated tools to transform the vast amount of datum into facts and knowledge, hence information assay is a solution for the obstacle. Information assay is prophesied to utilize of information assay tools in order to realize the templates and reliable interaction which has undisclosed so far. The willing research is requested to announce information assay in a manufacture company of Iran Automotive firm; that the original purpose is to demonstrate the reliable evaluation and some of dependability and precision controllers in the body construction company. In the recent researches, scholar efforts to provide this precision by cent and utilizing CLEMENTINE schedule, and attempts to show that when the researcher warrants a body, to what extent it can be possible to need to be re-diagnosed by the editors' instant response system. In the current research, the primary data of the quality information systems that have been accessed are used to perform calculations by the CLEMENTINE program. The findings of the study showed that the prediction is reliable in 85% of the opportunities. By using data analysis in the process of quality control and predicting the accuracy of people's performance in the bodybuilding salon and preventing the discovery of problems and defects in the reactivity department.

Keywords: information assay, process of quality control

1. Introduction

Based on many scientific articles, algorithm in programming is an instruction for the detailed description of all steps and execution steps in computer programs that are used to solve the program and achieve its main goal. For example, in the real and everyday world, a recipe for a meal includes the required ingredients and a set of steps to prepare the desired meal. In the world of programming, the algorithm does exactly the same thing. In programming languages, the word used instead of recipe is "Procedure" and food also plays the role of (Input).

To carry out its process, the computer program performs the steps by the algorithm procedure and then using the inputs, produces results which are called (Output). In general, the algorithm in programming explains how the programs should be executed, and the computer will perform the same process of the algorithm every time the program is executed. Algorithms must be translated into a language that can be understood by computers. However, it is important to note that algorithms are not computer code programming. Algorithms are written in natural language. For example, the algorithms are in Persian or English.

Algorithm in programming does not have many leaves and generally includes beginning, middle and end sections. In fact, the first step of it can be named "Start" and the last step "End". These steps depend on the content that the app is going to contain. All the steps of the algorithm in programming and the tasks to be done are very clear and unambiguous, and anyone can understand the functional instructions of the program by reading it. The use of algorithm in programming always leads to a solution and as much as possible it is tried to provide the most efficient solution for the program.

Sometimes numbering the steps of doing the work in the algorithm is a good way, but there is no obligation for this. Some people use indentation and (Pseudocode) instead of numbering algorithm steps in programming. Pseudocode is a semi-programming language that is used to describe the steps of an algorithm. Also, some people use flowcharts to design their algorithm (Khalilelahi, M., 2022).

According to many scientific studies quality control given that the number of product manufacturers or service providers has increased today, customers are looking for the best product or service that has the highest quality. Therefore, there is a competition between these economic enterprises in order to maintain quality and obtain customer satisfaction. The scientific tool for controlling and maintaining the quality of goods or services is (Statistical Quality Control), which is sometimes called SPC as abbreviated. In this statistical method, charts and indicators are used in order to identify the factors of departure of goods or services from the desired quality. As a result, (Quality Control Process) is a permanent and repetitive process that is carried out during the production stages and even after that.

Quality Control is measuring and evaluating the quality of products during and after the production process is the responsibility of the quality control department. This department is responsible for determining the evaluation criteria for the raw materials to the manufactured product. Controlling the production process and identifying the causes of poor quality products is one of the main duties of this department. As a result, the dispersion in the quantitative and qualitative characteristics of the manufactured product must be identified and corrected.

Since dispersion analysis is one of the statistical techniques, statistical theories are also used in order to maintain and improve the quality of products during and after the production process. (Control Chart) is one of the most famous statistical tools in quality control (Ribad , A., 2022).

Many studies illustrate that industrial machinery is a collection of moving, moving and fixed parts together, which with the help of each other perform the tasks of various production systems with various types of chemical, mechanical, electrical, nuclear, etc. energies. In general, it should be said that industrial machines reduce the labor force and increase the quality of manufactured products, as well as increase the level of production, which use robotic and automatic machines for mass production (Hesarki, E., 2021).

There are some researches:

Due to inherent uncertainties and the complex and competitive nature of the industry, automobiles require special tools for decision-making. A machine with a higher capability in pattern recognition and prediction in a problem where the relationship between input and output is complex and does not follow a specific model, and can create a serious transformation in decision-making models. The current research examines common machine algorithms and the limitations of each one. Also, with a review of the articles, it examines the application of these algorithms in issues related to the construction industry and provides guidance for choosing an algorithm that fits the characteristics and purpose (Babei, N., 2020).

Due to the ever-increasing volume of electronic text information that is significantly accessible through the Internet and other sources, text classification is considered very important for managing and processing a large amount of electronic information, text and queries. In this field, there are methods for text classification that can be suggested to increase the accuracy and efficiency of classification. In this article, text classification methods based on SVM vector machines and LSA latent semantic analysis are reviewed. And then IHS-SVM and HS-SVM text classification algorithms that use these methods will be reviewed and compared (Choorli, F., & Ramoozi, 2021).

In a research that is proposed for the first time in the field of controlling the quality of car body color using digital images, an attempt has been made to use similar works done on steel and tile surfaces in a smart way to check the appearance of car defects. Let's get there. In this research, three cases of the car's appearance defects, which are more frequent than other defects, have been identified. These three defects are the orange skin condition of the body, the scratches on the body and the deformation of the body. In this research, a method based on support vector machine is presented to diagnose the mentioned problems and in the next step, it is improved with the help of PCA algorithm. The main process of the proposed method includes pre-processing, feature extraction, analysis and defect detection. The steps are as follows: after the pre-processing stage, the texture features of the car body are first extracted using the Gabor filter and the linear filter, and at the end, the intelligent detection of the defects in the images determined by the experts in the support vector machine. SVM) has been discussed. The presented algorithm was evaluated using images taken from one of the car manufacturing companies and the results indicate an accuracy of 92% in diagnosing the mentioned problems (Faghirh Abdollahi, M., 2017).

In a research, the resistance-spot welding process of galvanized steel sheets used in the automobile industry, with two different materials, has been modeled and optimized. In general, in the spot welding process, the quality of the joints is highly dependent on the values of the adjustment parameters. Among the most important regulatory parameters in the spot welding method are current intensity, electrode pressure, welding time and maintenance time, which have been investigated in this research. The most important characteristic of weld quality in this method is tensile-shear strength, which has been studied as a criterion for evaluating weld quality in this research. In order to establish a precise relationship between the input parameters and the response variable (tensile-shear strength), mathematical models based on mediation methods and neural networks have been extracted. The modeling of the process is based on experimental data that have been developed using the design of experiments approach and with two complete factorial designs and a combined pivot design. All the tests have been done in the industrial environment and body production line of Iran Khodro company. The presented regression models include first-order, second-order and logarithmic functions for both experimental designs. Next, a neural network model is developed based on all the data. After modeling, based on analysis of variance (ANOVA) and 95% confidence level and absolute error percentage of the models, their compatibility with the real process was checked and the best model was selected. Also, the validity of the proposed model has been validated and confirmed with the help of statistical hypothesis testing. The second part of the research includes the optimization of welding parameters in order to achieve the desired quality of joints. This has been done by using the genetic algorithm in order to determine the levels of optimal parameters to achieve the best tensile-shear strength. The calculation results obtained from the optimization were compared with the experimental data, which showed a good agreement in all cases. Due to the fact that the tests were carried out in Iran Khodro and Sapco in a completely industrial environment, the results of this study will be very effective in standardizing spot resistance welding procedures by predicting the effect of parameters on the quality of sheet welding. In this way, the optimal levels of regulatory parameters can be determined to obtain the desired welding quality (Hamidinezhad, H., 2008).

Along with the expansion of science day by day, the science of car making is progressing and developing, but among these, people like and use a car that is of better quality. Therefore, the competition between car manufacturing factories around the world, especially in the first world countries, is very tight. This is not an exception in our country. Quality control is of particular importance in the process of car assembly and production. In this thesis, how to control the quality of automobile managers' products has been discussed, the quality indicators for the control of manufactured products in each specific control station, the methods of evaluating the quality of manufactured products and comparing them with the goals have been investigated, the results and trends have been identified and the degree of effectiveness and impact of final product quality control methods is considered to improve and achieve the overall goals of the organization (Roodbarinasab, A, 2018).

Nowadays, reducing the weight of cars is considered as a solution to improve fuel consumption and reduce emissions. Simplified models are a suitable tool for structural optimization of the car in the early stages of design. In this direction, to optimize the dimensions of the cross-section of the beams that make up the car body structure in order to reduce the weight of the car and also increase the static stiffness, including the bending and torsional stiffness. In this article, a simplified model of the body of a sedan car is presented, in which beam-like members are replaced with one-dimensional high-beam elements, in order to validate the static accuracy of the simplified model, torsional and bending stiffness for the complete finite element model of the car and the simplified model are calculated. The results show the high accuracy of the simplified model in predicting the torsional and bending stiffness of the car body. In this analysis, the cross-sectional dimensions and thickness of the beams constituting A_pillar, Roof rail, B_pillar and several other beams as well as the car roof beams are considered as design variables, as well as torsional stiffness, bending stiffness and weight simultaneously as objective functions (Behnia Asl, H , 2018).

Algorithm is information science and knowledge and discovering hidden patterns from a very large and complex database. Manufacturing is one of the important topics in industries to raise the quality level of products and reduce costs. Control is one of the quality control tools, but this chart usually cannot show the actual change in the chart. There is always a lot of data from various processes about which, by exploring this data using statistical analysis techniques, it is possible to improve quality and increase profitability. In various process control plans, due to the occurrence of natural fluctuations in production, correct and quick detection of abnormal patterns and significant deviations in a short period of time is a challenge. Process control plans are logical. The researcher proposes a model to identify basic and simultaneous patterns (Kazemnezhad Vaghefi, SH, 2021).

To detect the sudden deviations of the car, it is necessary to detect the car. An important point in car diagnosis is the use of stable techniques against changes. In this article, in order to distinguish cars, the feature of symmetry is used, which is stable against changes in light. It is also an effective way to deal with the problem of overlapping cars. To find the line of symmetry of cars, the method of quick detection of the line of symmetry is used. This method obtains the line of symmetry of each object with the help of Hough transformation and the use of edge pixels. Also, the algorithm to improve the method of quick detection of the line of symmetry is proposed in this article. This algorithm is presented in order to solve the errors caused by the depth of the image, which the fast symmetry line detection algorithm was not able to solve. In order to track the cars, the Kalman filter has been used. Experiments have shown that the proposed method is able to track a large number of vehicles on a road with 95.52% accuracy (Kocheshmaki, N., Zarif Loloei, A., & Fathi, M, 2011).

2. Methodology

The current research is considered to be an application-based research, and the datum set is a documentary study. In order to get knowledge about part of the quality control, the written information of the base commissions is used. The basis type in this research is scalar (continuous) and onomastic (discrete). In recent research, the CRISP_DM standard model has been used, which was a modular method for measuring information and was appointed in late 1996 by the Big Three, DAimeler Kelimer, S.P.S.S.One.C.R.N. (Chapman, P., Clinton, J., Kerber, R., Khabaza, T., Reinartz, T., Shearer, C., & Wirth, R. 2000).

This procedure insets a proceeding model for information assay; which is a passing of the life stream of any information measure. The life flow of an information measurement plan thus includes six levels: realizing the business difficulty, understanding the basis, the model, evaluating the conclusions, and using the model. The use of CRISP_DM, as noted, is a global advantage for research process governance. The applied research structure is shown in accordance with the module program.

2.1 Perception of Business Difficulty

The current phase is focusing on the purpose and contents of the project from a commercial point of view, the main objective of the automotive business is to provide quality production. Then, this knowledge is transformed into the description of data analysis and the design of a schedule to achieve the goals. The purpose of data analysis in the current research is predictive classification.

Data perception: The current phase begins with data collection. And then explained and determined the quality of the base. In the present study, in order to differentiate the data evaluation, it was necessary to analyze the data sources carefully available in the company's quality control alliance. First, the quality and availability of available data were carefully analyzed before collecting and selecting data to initiate practical pre-processing.

Data preparation: The current phase includes all the operations that are required from the initial raw data to structure the final data collection (the data that is prepared for the model). The better the quality of the preparation, the better the model. Allocation of base preparation is done in several steps and there is no subsequent pre-determination. This migration includes selecting tables, records, attributes, as well as transforming and modifying data for the model.

2.1.1 Model

Currently, all kinds of models were selected and requested. In general, there are different methods for data analysis, which is the problem. Some methods require a special format. Therefore, it is necessary to refer frequently to the preliminary stage. In the present study, CLEMENTINE 12 program was used to manage methods. In order to model the data, each algorithm was classified separately. And the most accurate algorithm was determined as the knowledge model and function. Its purpose is to extract knowledge according to the selected data and algorithm.

2.1.2 Evaluation of Results

At this stage of the research, a model was made that has high quality in terms of data analysis. Before requesting a model, it should be fully evaluated and the requested steps checked to match the purpose of the transaction.

2.1.3 Application of the Model

At this stage, the model does not mean the end of the research. Even if the purpose of the base model is to disseminate knowledge, the resulting knowledge needs to be recreated. It should be presented in a way that stalkers can use it. Depending on business needs, the application step can be as simple as preparing a report or as complex as using an iterative data analysis process.

3. Results and Findings of the Research

The sequence of the research was divided into five parts: preparing data sources, explaining data, analyzing the model, evaluating the model, and applying the model results. The details of the sequences are given below.

3.1 Making Data Sources

In the first sequence, the format of the information stored in the last month in the quality control unit was carefully analyzed and written in this data source with the appropriate database design, in order to evaluate the performance of the sequences. Information related to body building and with information fields such as number of bodies, number of operations, production time, defect or lack of defect, type of defect, evaluation status, etc., thousands of information files have been registered in the last month. It is registered. So the data was collected and stored in a data source and then the data was understood and modified.

3.2 Description of Data (Summarization and Making Image of Data)

In the current sequence, information was calculated based on body number, time and work shift, controller final code and individual quality control unit code, defect code and defect image, observation plan and image. The perceived level of the statistical population of the research includes data related to about 3500 Peugeot 207 body cases, which was produced and carefully analyzed and controlled in the eleven months of 2013. Due to the fact that the data of the statistical population was carefully examined according to their quality and was as pure as possible, therefore, the research models for the final sample were made from only 1100 Peugeots. 207 data items that were stored in a data source in the Excel program. The deleted records were related to bodies that were not available in the responsive Excel file according to structured body information or had faulty information.

3.3 Description of the Model

In this section, data crystallization and required analysis were presented. In the first step, in order to increase the accuracy and quality of information, some irrational cases and such cases are removed from the data collection process by examining and determining according to the explanation of the comprehensive rules. The requested algorithm in this research is C5 target tree. And the model flow in CLEMENTINE 12 is as follows. Reactivity system unit information with store body unit was deleted. In the data analysis, two levels of information and three C5 intention tree models, logistic analysis, Chaid analysis and C&R tree analysis were used, which are located in the indicators.

The precision of the algorithm matching, to the correct classification of data and according to the amount of repetition of the test is presented in Table 1. As presented in Table 1, for instruction data out of a total of 1100 records, 709 (90.9%) data were correctly classified. And 71 records (9.1%) were misclassified. Regarding the tested data, out of a total of 329 records, 303 recors (92.1%) were correctly classified and 26 records (7.9%) were classified incorrectly.

Table 1. The amount of accuracy of algorithm

partition	education		experiment	
Correct categorization sample	709	90.9	303	92.1
Incorrect categorization sample	71	9.1	26	7.9
Total samples	780		329	

3.4 Assessment of Validity

While the reliability of the introduced method should be determined in each study, sample analysis was used in two educational and experimental datasets to determine the validity and accuracy of the method. The validity adjustment is carefully checked based on the results of the data, and the experimental data enters the algorithm as a spectator, evaluating the effects of the fine adjustment. In the current research, 90% of the data were selected from educational data and 10% from experimental data. Setting the validity and accuracy of the model depends on the classification or demodulation accuracy of the experimental data. In order to evaluate the applicability of

the proposed C5 decision tree model, the accuracy of the model result was compared with other classification algorithms such as neural network, C&R decision tree, and logistic regression. The table below shows the results.

Table 2. The accuracy of result of the model

C&R	Logistic	C5	Algorithm
99.1	99.8	99.8	Accuracy

As the table above shows, the C5 decision tree and logistic regression have the same and higher accuracy (99.8) than the C&R method. In terms of number of leaves and size, this tree is more than other trees, so the best algorithm was selected.

3.5 Application of Results

The obtained information was provided to the quality control unit and was used as a source for the development of quality documentation for the body department in order to carefully check and identify the right person in order to fix defects in the reaction unit and reduce dissatisfaction. From the users of the attached table, it is noticeable that the data was divided into two parts, acquisition and test, and the results were the same.

4. Conclusion and Suggestions

Today, companies and industrial organizations are faced with numerous data and information that were continuously collected from routine activities for purposes such as controlling and guaranteeing production quality, planning and controlling the performance of production lines. Today, there are vast sources of information in these organizations. From responsive information with a constructive and supportive process that discovers patterns and hidden knowledge from data, it can give industry decision makers peace of mind to complement the quality and productivity of their productions while the C5 decision tree is more accurate compared to other data analysis classification algorithms, therefore the knowledge used by this tree is the most faithful knowledge of the data that was carefully examined in the present study and it can be a source for exploiting data analysis rules. In the present research, an example for the application of data analysis technique regarding the quality control process and predicting the accuracy of the quality performance of people in the body part and preventing the repetition of defects of this unit in the reactivity part was investigated. The results of the research showed that in 85% of cases, the predictive factors are reliable. Naturally, if the records in different production units were recorded more accurately and more comprehensive information could be obtained, the quality of Iranian products could be used and predicted to reduce dissatisfaction also, there is a lot of information content in many production units and other departments of this company, which is not used. For further research, it seems interesting to collect data from different assembly units and on a larger scale.

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