Hybrid rubbing fault identification using machine learning

J. Elakkiya, S. Nirosha, Lakshmi and C. Jeevitha
Assistant Professor1, Final year2
Department of Information Technology,
St. Joseph College of Engineering Sriperumbudur, Chennai-602 117

Abstract

When any product or material is about for production it must fulfil the requirements of the client. To satisfy the demand or request of a client, the team manufacturing the material must be conscious of the quality. As every industry or company like how significant the production and manufacturing is equivalent to the importance of the quality. The nature of the product is given for numerous examinations and after several tests, the product is obtained at last. Then the rigour of the error during the quality inspection is also analyzed. So the analysis of the fault can help diagnose the fault and give out the products with the best quality. To serve the company to developin a good standard the fault can be identified and diagnosed in the right way to implement the good quality of product and satisfying the client requirement. Therefore we are using a voting classifier algorithm in ensemble learning that helps in characterizing the severity of the fault to bypass the mass quality less production that becomes an enormous decline for the company. Depending upon the output, the company decides to advance with the process**.**

INTRODUCTION

Before carrying out their products to the client, first, they must inspect the product quality in order to provide the customer and receive more requests from the customer. So for diagnosing the fault first we must classify the fault so that when the fault and the severity of the fault are classified. The nature of the product is given for numerous examinations and after several tests, the product is obtained at last. Then the rigour of the error during the quality inspection is also analyzed. So the analysis of the fault can help diagnose the fault and give out the products with the best quality. To serve the company to develop in a good standard the fault can be identified and diagnosed in the right way to implement the good quality of product and satisfying the client requirement. Therefore we are using a voting classifier algorithm in ensemble learning that helps in characterizing the severity of the fault to bypass the mass quality less production that becomes an enormous

decline for the company.

EXISTING SYSTEM

In the existing system, in any industries that utilise turbines for the power generation that perform several rotations to provide the power required. When the turbine moves continuously this heads to the rubbing of the turbines and it will lead to insufficient and faulty output. Thus they are attaining the detection of the fault so that they can determine the rubbing deepness and solve it to make the turbine works properly without any disturbance to the output. But the existing system disappoints to perform better as it handles only one type of fault. In this case, they missed identifying the more faults and the severity of the faults as it is not sufficient in finding out the exact solution to the arising problem. Thus the existing needs more transparency to find all faults were identifying the problem in one area is not sufficient.

PROPOSED SYSTEM

In the proposed system, the quality of the steel material that is utilised for obtaining the big jet turbines is investigated. Thus for a healthy quality of the product, we must examine the quality before beginning the mass production in order to bypass the enormous mistake in producing the mass production of the product. A sole product that before delivered into the market has to pass through several quality checks.Like advancing through the different kinds and different levels of the quality checks. By practising a voting classifier in ensemble learning can optimize the product's quality and can make further adjustments in the product. This voting classifier helps in determining the fault of the product after going through many quality checks. So when the design team when finding the fault they can decide whether to make minor changes and start the process or else the product is sent to the material management in order to mould the material and apply it for future production. Thus an efficient way of production is accomplished by the manufacturing team.

SYSTEM STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure

that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

I. Economical feasibility study

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was

achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

II. Technical feasibility study

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system

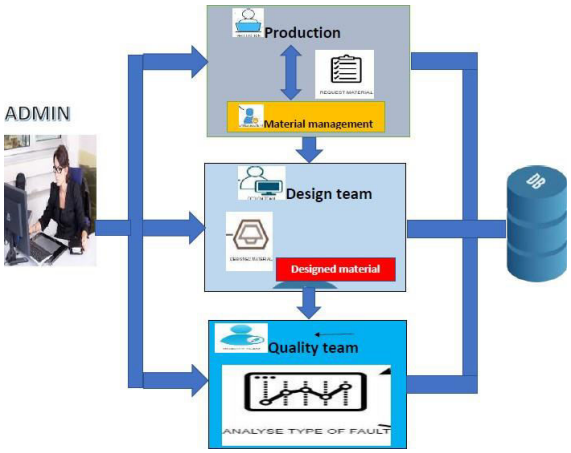
III. Social feasibility study

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system,instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it. His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

IV. ARCHITECTURE DIAGRAM

For system developers, they have system architecture diagrams to know, clarify, and communicate concepts regarding the system structure and also the user needs that the system should support.It's a basic framework may be used at the system designing section serving to partners perceive the architecture, discuss changes, and communicate intentions

clearly.



V. VOTING CLASSIFIER ALGORITHM

a voting classifier is a machine learning estimator that trains various base models or estimators and predicts on the basis of aggregating the findings of each base estimator. the aggregating criteria can be combined decision of voting for each estimator output.

VI. LIST OF MODULES

i. Production
ii. Design
iii. Quality
iv. Material Management
v. Admin

i..Production

This module gives out the registration process for the production manager to log in to their respective work page. After this admin has to give access for the production manager to log in. Then manager login with the email id and password. Here there are furthermore sub-modules under the production module where the first is to request sufficient material for the production also this gives the form to upload the material requirement in kgs. The next sub-module gives the required material with supplied and pending information. And this material management will be supplying the required material. In the initiate submodule, the production manager fixes the composition of the material for production. Then in

production submodule displays the composition details where the production process is carried out and also manager can start the different types of the production process. The technicality submodule givesthe physical properties for the producing material.

ii.Design

In this design module, the registration process is initiated for the login purpose of the design member. Once the registration process is done then the admin has to give access for the design member to log in. After the login process of the designer, the page will be redirected to the home page of the design module. It also has the sub-modules where the first submodule has the form, in that produced material is partitioned to produce different types of design such as foil, sheet, coil, and bar. Also can give the dimension for the material to be produced. In dimension, the submodule table shows the dimensiongiven for the different types of design such as kilogram, thickness, width, and diameter. The defect list sub-module gives the table of information of the tested result with fault. In that designer can find and

move the fault material either for redesign or for reuse from the production. In the redesign, thesubmodule designer can view the material allocated for redesigning.

iii .Quality

This module gives the registration page where the quality tester can register for the testing of material quality. After the registration process, the admin has to give access to the quality tester for the login process. Once the login process is done the page will be redirected to the home page quality testing. It has a submodule test queue that shows the dimension details of the material along with the testingoption. Once the tester has chosen the type and used the test option, the page will be redirected to where the tested output from different types of testing with the type of testing and value as output is displayed as a table. Also in that analyze option is given for analyzing the tested output for the material haswhether fault or not, and also if there is any fault, the specific fault is categorized. After analyzing the output will be displayed on the new page and the tester must report the output to the designer by usingthe report link. Here also the quality tester logs out by using the logout module which removes the login details from the session.

iv. material management

In this module initially, the management team is login, then it will be redirected to the home page of material management. In the requested material submodule it shows the form where the management team can choose to view the requested material from the name and the request-id. Then the page will display the requirement of the material in kgs. Then management team can supply the material.Defects submodule shows the table contains the details of the tested value along with the test name and with the type of fault. In reusing submodule shows the table also gives the tested value with test name along with the type of fault but it is for the reusing process. The reusing process will start from the intial production process. After this, the management team can log out using the logout module whichremoves the login information from the session.

v.Admin

In this admin module initially, the admin will log in to redirect to their home page. This has six sub- modules where three sub-modules are for accessing the production manager, designer, and quality tester,If the registration request from these modules is displayed, then the admin can access the respective person for authority to login. In tested sub module all the data from the quality testing will be displayedincluding material that has no fault with the type. And reuse submodule displays the table which has the
quality tested details that are to be reused. Next, the redesign gives the tested result with the type wherethese materials going to be redesigned for further process.

VII. SCOPE FOR FUTURE DEVELOPMENT

In the future, this benefits in industry or company to improve their manufacturing process more efficient and in an optimized manner. For the next time, they can take advantage of this classified data to avoid sfuture blunders. For future enhancements, we can improve the material or product quality by identifying the severity of the fault with the accurate percentage so that the team which is producing the product can utilise the severity in percentage and solve it according to the percentage and increase the quality of the product in delivering process.

VIII. CONCLUSION

the voting classifier of ensemble learning helps to categorize the initial fault and the severity of the production of the material or product according to the client need.thus we can produce the quality either by designing in another time or by reusing the same product by fashioning it and pushing it to the material management for another production.

IX. REFERENCE

[1] Y. Zhang, B. Wen, and A. Y. T. Leung, "Reliability analysis for rotor rubbing," *J. Vibrat. Acoust.*,vol. 124, no. 1, p. 58, 2002, doi: 10.1115/1. 1423635.

[2] E. Rubio and J. C. Jáuregui, *Time-Frequency Analysis for Rotor-Rubbing Diagnosis*. London, U.K.:Citeseer, 2011.

[3] J. Zhihao, J. Shangwei, J. Wen, and W. Bangchun, "Rubbing fault diagnosis of rotary machinerybased on wavelet and support vector machine," in *Proc. 1st Int. Workshop Database Technol. Appl.*, Apr. 2009, pp. 287–290, doi: 10.1109/DBTA.2009.163.

[4] Y. Lu, F. Meng, and Y. Li, "Research on rub impact fault diagnosis method of rotating machinery based on wavelet packet and support vector machine," in *Proc. Int. Conf. Measuring Technol. Mechatronics Autom.*, Apr. 2009, pp. 707–710, doi: 10.1109/ICMTMA.2009.539.

[5] S. D. Roy, S. K. Shome, and S. K. Laha, "Impact of wavelets and filter on vibration-based mechanical rub detection using neural networks," in *Proc. Annu. IEEE India Conf. (INDICON)*, Dec. 2014, pp. 1–6.

[6] P. W. Tse, W.-X. Yang, and H. Y. Tam, "Machine fault diagnosis through an effective exact wavelet analysis," *J. Sound Vibrat.*, vol. 277, nos. 4–5, pp. 1005–1024, Nov. 2004, doi: 10.1016/j.jsv.2003.09.031.

[7] N. Bessous, S. E. Zouzou, W. Bentrah, S. Sbaa, and M. Sahraoui, "Diagnosis of bearing defects in induction motors using discrete wavelet transform," *Int. J. Syst. Assurance Eng. Manage.*, vol. 9, no. 2, pp. 335–343, Apr. 2018, doi: 10.1007/s13198-016-0459-6.

[8] B. Bessam, A. Menacer, M. Boumehraz, and H. Cherif, "Wavelet transform and neural network techniques for inter-turn short circuit diagnosis and location in induction motor," *Int. J. Syst. Assurance Eng.Manage.*, vol. 8, no. S1, pp. 478–488, Jan. 2017, doi:

10.1007/s13198-015-0400-4.

[9] N. E. Huang *et al.*, "The empirical mode decomposition and the Hilbert spectrum for nonlinear and non-stationary time series analysis," *Proc.Roy. Soc. London. Ser. A, Math., Phys. Eng. Sci.*, vol. 454, no. 1971,pp. 903–995, Mar. 1998.

[10] Y. Zhao, E. Liu, J. Zhu, B. Zhang, J. Wang, and H. Tian, "Rub-impact fault diagnosis of rotating machinery based on Hilbert-huang transform,"in *Proc. IEEE Int. Conf. Mechatronics Autom. (ICMA)*, Aug. 2015,pp. 32–36, doi: 10.1109/ICMA.2015.7237452.Published by the IEEE Computer Society, Year: 2013, Volume: 46,Issue: 3 Pages: 69 – 77.