Study of Automation and Robotics in Construction: Opportunities and Challenges

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ABSTRACT

The production of automatic industries suffered from fault analysis and risk of fault process. For the proper selection and minimization of fault in robot based manufacturing industries applied some intelligence system for selection of faults such as fuzzy logic, decision tree analysis and path flower process. For the proper selection of fault path, we used ant colony optimization process for fault tree analysis. In this dissertation we modified the process of fault tree analysis in automatic manufacturing industries. The automatic production system fulfils the high rate of customer demand and supply. The working of high speed robot occurred some fault and error problem in production process. These fault and error process effect the rate of production and deceases the reliability factor of industries. For the improvement of reliability and diagnoses of fault various model and methods are used such as fault analysis tree, fault analysis and management and Markova model process of production. Failure of the robot results in production line down-time and, in some cases, damage to the product that is being processed.

Keywords: - Automatic production, robotics, FTA, Fault, Decision

INTRODUCTION

A system consisting of a set of interconnected stations for material processing that is capable of automatically processing a wide variety of types of pieces simultaneously and controlled by computers. Competition among manufacturing companies together with the availability of adequate computing and communication technology has caused dramatic changes in the manufacturing environment. The primary pressures to which manufacturing will be subject are detailed. These are encapsulated in the concept of customer-driven manufacturing business systems. In these systems the customer increasingly becomes an integrated part of both the business systems and the engineering systems of the enterprise. Key product and process technological advances, environmental, and market place developments are described. Probably most significant are the changes in the, value chain now emerging which transform manufacturing business systems and overturn both conventional manufacturing strategy and existing manufacturing metrics. The institutionalization of the Extended Enterprise is one of the most tangible and has far reaching outcomes. [1]. In the rest part of this research paper, in the section we described previous work, in this section III discussed the problem statement, in the section IV discussed about the robot fault analysis with its model and finally discussed the conclusion of the our research.

II. PREVIOUS WORK

Xujun Lyua, LongDi, Se Young Yoon, ZongliLin and YefaHu Et al. [1] They discussed in this paper to emulate the operation of such flywheels on a rotor-AMB test rig. They recently constructed. Specifically, the two AMBs located at the two ends of the rotor are used as sup-porting bearings, while the other two located at the rotor mid span and quarter span are used to emulate the generator negative stiffness and gyroscopic effects on the rotor dynamics caused by the flywheel disk. Simulation and experimental results are presented to show the effectiveness of the discussed emulation method.

JG Detoni Et al. [2] the literature on electrodynamic passive magnetic bearings to analyze the evolution of this technology toward completely passive, stable, rotor levitation, and to compare the EDBs performance with other common magnetic bearing technologies. Radial and axial EDB technologies are reviewed attempting to create an organized connection

between the works and to discuss some critical issues that still preclude the use of EDBs in industrial applications.

Jing-na Liu, Zheng-yi Ren, Shan-wei Wu and Yin-long Tang Et al. [3] This paper shows a theoretical vibration analysis regarding the controller's parameters and the gyroscopic effect, based on a simplified rotor-dynamic model. Combined with 600 Wh energy storage flywheel rotor system mathematical model, the Campbell diagram of the rotor system was obtained by the calculation of the whirl frequency under different parameters of the controller in MATLAB to analyze the effect of the controller parameter on the whirl frequency and to limit the operating speed and acceleration or deceleration of the rotor.

Chun'e Wang and Jiqiang Tang Et al. [4] A novel reluctance force-type hybrid magnetic bearing (RFHMB) is presented based on analysis of demerits of Lorentz force-type magnetic bearing and common RFHMB. It features that radial and axial magnetic bearing units are integrated into a compact assembly with four separate biased permanent magnets and two conical stators; four radial poles with shoes and rotor made of iron-based amorphousness can reduce eddy loss. Equivalent magnetic circuits of permanent magnets and their control currents are presented.

A. Noshadi, J. Shi, W. S. Lee, P. Shi and A. Kalam Et al. [5] The main focus of this paper is on system identification of an active magnetic bearing system (AMB) using genetic algorithm (GA) for optimal controller design purpose. In the first step, an analytical model of the system is derived using principle of physics and taking into account both the rigid body and bending body modes of the system.

Shuyun Jiang, Hongchang Wang and Shaobo Wen Et al. [6] The first critical speed is 1,800 rpm, and the second one is 51,000 rpm. The vibration amplitude de-creases rapidly when the flywheel passes through the first critical speed and then remains at approximately 0.02-0.025 mm until the maximum operating speed is reached. The spin-down test of the flywheel energy storage system shows that friction loss is limited to an acceptable level. Al-though the energy conversion efficiency of the discussed de-sign is slightly smaller than that of the flywheels made with AMB or SMB, the discussed system does not require sophisticated active control to remain at a stable operating state. Therefore, the cost of the discussed system is much lower and maintenance is much easier than that of other systems.

Mohamed S. Kandil, Maxime R. Dubois, João P. Trovão and Loicq S. Bakay Et al. [7] Magnetic bearings could be a good solution to improve the storability of FESS. However, they themselves could be a source for power loss. Thus, hybrid magnetic bearings (HMB) are optimal solution for long-term FESS. To compensate the non-linear behavior of HMB, a sliding mode controller is discussed for stabilizing a rotor-HMB systems. Simulation results and a comparison to the decentralized PID controller with respect to the attenuation of rotor unbalance vibrations are presented.

Jiancheng Fang, Xiangbo Xu and Jinjin Xie Et al. [8] Results indicate that the GPM can precisely compensate the errors and variations of the power amplifier as well as control the rotation axis according to various requirements of the AVC strategy. The discussed strategy is very suitable for space applications of magnetically suspended moment exchange devices (CMGs and flywheels), and it can be extended to many industrial AMB applications such as compressors, turbines, pumps and generators, since it can modulate and handle various vibration sources.

Lili Dong and Silu You Et al. [9] Our control goal is to regulate the deviation of the magnetic bearing from its equilibrium position in the presence of an external disturbance and system uncertainties. Two types of ABC methods are developed on the AMB system. One is based on full state feedback, for which displacement, velocity, and current states are assumed available. An observer is designed for AOBC to estimate velocity and current states of AMB. Lyapunov approach proves the stabilities of both regular ABC and AOBC. Simulation results demonstrate the effectiveness and robustness of two controllers.

T.M.I. Mahlia, T.J. Saktisahdan, A. Jannifar, M.H. Hasan and H.S.C. Matseelar Et al. [10] Free carbon emission and the potentiality to be integrated with renewable energy would improve the penetration of the technology in the market. How-ever, a further study and more research are necessary as there is no one energy storage technology that has all of the ideal characteristics required for optimal grid integration. By knowing the pros and the cons of each system, the technology most likely will become the best solution for replacing the need of fossil fuel on the electricity network and transportation sector without disregard the other sector.

Yuan Ren, Dan Su and Jiancheng Fang Et al. [11] The stability equivalence of the systems before and after variable reconstruction has been proven. Based on this, the inherent relationships between the distribution

of the closed-loop poles of the complex coefficient SISO system and the whirling modes stability are revealed, and the Nyquist stability criterion is further extended by applying the argument principle. All of these lay the foundation for the whirling modes stability theorem, and then, their stability criterion is further developed. Simulation and experimental results prove the effectiveness and correctness of the presented criterion.

Wenlong Li, K.T.Chau, T.W.Ching, Yubin Wang and Mu Chen Et al. [12] The discussed machine adopts a homopolar con-figuration: the rotor only consists of iron lamination with eight salient iron poles and the 12-slot stator accommodates all three groups of windings: the high temperature superconducting (HTS) field winding; the armature winding; and the suspension winding. With the HTS field winding, eight iron poles in the rotor are magnetized as 4-pole-pair electromagnets.

Behnam Zakeri and Sanna Syri Et al. [13] The examined energy storage technologies include pumped hydropower storage, compressed air energy storage (CAES), flywheel, electrochemical batteries, flow batteries (e.g. vanadium-redox), superconducting magnetic energy storage, supercapacitors, and hydrogen energy storage (power to gas technologies). The results illustrate the economy of different storage systems for three main applications: bulk energy storage, T&D support services, and frequency regulation.

Vedant Chittlangia, Lijesh K.P., Kumar Akash and Harish Hirani Et al. [14] A procedure to design eight-pole electromagnetic bearing has been described. Necessary force and constraints equations have been detailed. Geometric limitations have been considered. Constraints are applied on losses occurring in the electromagnet. The magnetic force has been maximized using geometric programming method, which is easier to understand, easy to implement and provides the optimum value.

III ROBOT FAULT ANALYSIS

For correct modeling of performance for robot, the tool FBD has been used in primitive haze to show the system inputs, treated process and outputs of system clearly and briefly. In the neat phase, the fault tree analysis (FTA) has been engaged, that we by FTA as a logical model of up to down, to detect the error routes from an undesirable position. These detected routes are starting of a top event. The top event has been obtained by analyzing treated processes and in the primitive step. After detecting the error routes, the top event is as a potential fault and its reasons are recognized and then are investigated to analyses destructions (faults) in the tables FMEA. Finally, the preventive acts are suggested to control occurrence of destructions. Thus, reducing the fault in the result of preventive acts, the reliability R (t) will be improved. Determining the potential modes of destruction is required to know and analyses the system perfectly. Here, there is the system of cannibalization having four free- degree that has been designed in order to move spares in the weight of maximum 500 gr [3]. In this robot have been used strong steel arms and seven serves of dc motor with the moment about 30 kg and many other electronic hardware's [4]. The plan FBD for the robot is according to figure. With a complete plan FBD, the potential fault modes are determined by studying treated processes. We find that disablement in the whole process, not moving the joints or clamps, not sending message from sensor or not sending the orders from CPU, can be undesirable modes in present processes that may influence the output of process. By knowing such modes, we start to study the reasons.

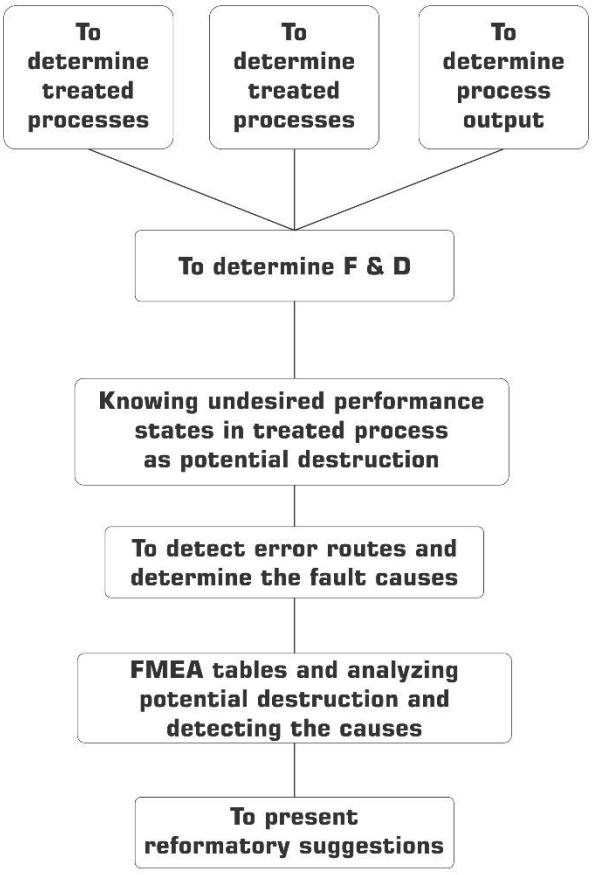

Figure 1: A Diagram of fault analysis

IV CONCLUSIONS & SUGGESTIONS FOR FUTURE WORK

In this dissertation we applied ant colony optimization analysis in the pre-processing of data used in the fault diagnostics of industrial robots. The output of FTA was then used as the input of an Ant Colony System classifier whose output predicts the state of the industrial robot. As states we considered the normal operation and 5 faulty conditions which are: brake drag (high &medium), collision (hard & soft) with external obstruction and incorrect motor commutation (phase angle). Verification of the proposed algorithm was performed off-line using experimental data obtained from an industrial robot used in the semiconductor manufacturing industry. The FTA was excellent for data reduction and capturing the required features of the signal needed for the Ant Colony System training.
Now in current scenario growth of automatic manufacturing industries is increase. The high-speed production for customer demand supply and reliability of manufacturing need a fast process of fault analysis for starting a process of production.

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