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ANALYSIS OF THE CRITICAL EVALUATION OF USING INDUSTRIAL ROBOTS

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Abstract

Introduction: An innovative technique or tool of specification is commonly achieved by the aim of the inventor to satisfy the need.

Aim of the Study: the main aim of the study is analysis on the critical evaluation of using industrial robots

Material and Method: Data analysis has been considered as one of the most important processes that help in analyzing the result of the research study.

Conclusion: It's safe to say that implementing 'Industrie 4.0' in the factory has the potential to dramatically alter the way many tasks are performed.

Keywords: Robots, Industry, Critical Evaluation.

Definition

Optimization of Robots

An innovative technique or tool of specification is commonly achieved by the aim of the inventor to satisfy the need. Movement coordinates and applied forces on the machine are the ambition of the mechanical inventor to accomplish a task. Producing parts, generating, and analyzing existing machines are done with the available resources of the CAD platform. Identification of new machines for user-defined tasks gives very little example which is attempted by the existing software. Articulated robots are invented with the support of a CAD environment of integrated theory, describing research work. In kinematic synthesis, geometric constraints of analyses and synthesis of broad knowledge are approached seeking a focus on spatial linkages. Robot capability and modern technology are also incorporated with the kinematic synthesis. Research is focused on one DOF planar device and 6 DOF spatial devices in the past decades, little attention should be carried out for devices with a broad range between these extremes.

The research work aims to develop the framework methods for design optimization of five-axis industrial robots. Stress and weight are the important parameters of optimal design. The question is raised in another way as follows,

Does the external and internal load withstand by the capacity of robot and have the possibility of the structure to lightest?

Optimization of robot is conducted by the flexibility of two different cases of reality scenarios. Pre-designed robot and design of robot from scratch are the two different methods of optimization techniques.

Optimization of Pre-Designed Robots

Reproducing and modeling of existing robot by drawing software is the main approach of this method. (Drawing and all parts assembly generation is done by Pro/E software). Solution of robot geometry is defined by the design parameters. Based on weight and stress of earlier focus, optimal design value is achieved to satisfy the objective function. Robot weight is directly related to the efficiency and energy

values. Finally Finite Element Analysis (FEA) packages are used to optimize the robot structure to achieve objective.

Design of a Robot from Scratch

Accuracy, related deflection, and productive cost etc of the system performance is influenced by the importance of optimal design of robot manipulator in design stage. In this stage, robot overall performance is improved. Reliability, usage of power, motor size, gear, cost and also the functionality of robot is directly influenced by these characteristics. Robot weight is also influenced by these variables to certain degree. Link length and thickness parameters and geometry etc in addition to solution of matrix are defined with the weight of the robot.

Literature Review

Gautam, Rahul & Gedam, Ankush (2017) The use of industrial robots is seeing a notable surge in several sectors, including food, consumer products, wood, plastics, and electronics. However, it remains mostly centred within the automobile industry. The objective of this research has been to formulate a conceptual framework for a robot with reduced weight by using lightweight materials, namely aluminium and carbon fibre, in conjunction with a recently devised prototype of a stepper motor. In addition, the wrist must be designed in a manner that allows for the passage of cabling inside. The cost associated with cable replacement necessitates the prioritisation of devising strategies aimed at minimising cable friction since this is essential for extending the maintenance interval. A concept generation was conducted using the function analysis and the defined specifications of needs. A total of twenty-four sustainable ideas, which were categorised into four distinct categories reflecting different components of the overall concept, were assessed throughout the process of concept creation.

He, Wei & Li, Zhijun (2017) Intelligent methodologies facilitate the widespread distribution of recent findings and innovative technology, hence enhancing the capacity of robots to provide assistance and support to human beings. This study centres its attention on recent accomplishments and provides a comprehensive overview of the current body of literature about human-centred robotics. In addition, we provide an extensive examination of the latest advancements in human-centred intelligent robotics and analyse the pertinent concerns and challenges that exist within this domain.

Ivanov, Stanislav (2017) While several individuals acknowledge the advantages that artificial intelligence and robots will provide to civilizations, others see a more pessimistic outcome. The widespread integration of robots and the adoption of a robotics framework in the economic system will result in significant job displacement, the emergence of new employment opportunities, the downsizing and relocation of production facilities, and a substantial transformation in the factors that contribute to the competitive advantages of individuals, companies, and nations. The developments will have significant consequences for several aspects of society, including the nature of employment, income distribution, recreational activities, political dynamics, global commerce and diplomacy, property rights, and more. Consequently, these changes will give rise to substantial social, economic, and political complexities and conflicts. In response to these issues, societies will be compelled to seek alternative solutions such as birthright patents, the implementation of universal basic income, the establishment of a continuous and adaptable life-long education system for the population, the adoption of a tax system based on robotics, and the reevaluation of human rights. This study aims to provide a comprehensive analysis of the economic concepts behind robotics. It will examine the advantages and disadvantages associated with this emerging field, and provide potential strategies to address the issues it presents.

Meng, M. & Zhou, C. & Feng (2016) The future of the manufacturing sector will inevitably include digitization and intelligent manufacturing. In this context, industrial robots will play a crucial role as a major component of intelligent plants, presenting new potential for their growth. This study provides an overview of the progress made by the United States, Japan, Europe, and China in the domain of

industrial robots. Additionally, it discusses the present research status of key components like high-precision RV reducers, high-precision servo systems, and robot control systems.

Coupeté, Eva & Weistroffer, Vincent (2016) This study focuses its attention on two distinct difficulties that must be addressed to facilitate effective cooperation between humans and robots inside factory settings. When comparing actual and virtual environments, it is important to consider concepts linked to acceptability, which may be effectively assessed via the use of virtual reality technology. This will enable us to assess prospective collaboration situations before their implementation inside supply chains. The decision was made to investigate gesture recognition to facilitate seamless cooperation. By using this approach, the robot is expected to possess the capability to comprehend its surroundings, adjust its velocity, and achieve synchronisation with the operator. Two use cases were used to conduct testing on our frameworks, to evaluate their performance and identify potential areas for improvement.

Methodology

Data Analysis

Data analysis has been considered as one of the most important processes that help in analyzing the result of the research study. The collected data is analyzed to obtain results and clarify the objective of the research study. Data analysis tools are used according to the type of data collected. Qualitative data analysis uses the interpretations of humans with the application of thematic analysis and content analysis techniques for interpreting the data by survey process through the conduction of interviews. On the other hand, quantitative data has been analyzed by using statistical tools because the information or data of quantitative research has been collected in the form of numerical values and have to be represented in the form of graphs and charts for better understanding among the readers. Also, some software-based tools such as SPSS, MS excel, graph pads, etch have been used for analyzing the quantitative data and evaluating the results.

Results

ANOVA analysis for SWOT of robotics in medicine

ANOVA Analysis for SWOT scores between the different age groups was done and summarized in table 4.1

Result of ANOVA: p value of 0.061 which was higher than 0.05.

Conclusion: No significant mean difference in SWOT scores between age groups.

Pearson Correlation Coefficient between different Variables

In order to test the correlation between the different variables, a Pearson correlation coefficient was applied by using SPSS. The variable calculations are shown in table 4.1.

Table 4.1 Pearson Coefficient Calculator for Various Variables

Correlations				
		Study the system & Application of Industrial robots	Analyzing the application of Industrial robots	Strength, Weakness, Opportunity & Threats (SWOT) analysis of Industrial robots
Study the system &	Pearson Correlation	1	.597**	.663**

Application of Industrial robots	Sig. (2-tailed)	0		0
	N	60	60	60
Analyzing the application of Industrial robots	Pearson coefficient	.597**	1	.779**
	Sig. (2-tailed)	0	0	
	N	60	60	60
Strength, Weakness, Opportunity & Threats (SWOT) analysis of Industrial robots	Pearson coefficient	.663**	.779**	1
	Sig. (2-tailed)	0	0	
	N	60	60	60

Result of Analysis: The p value was found to be 0.000 which was less than 0.05

Conclusion: There was a significant and positive correlation between the application of robotics, analyzing the application of robotics and SWOT scores.

Regression Analysis and Hypothesis Testing

Hypothesis 1: There is a significant association of system and application of Industrial robots and SWOT analysis
In order to test hypothesis 1 a regression analysis was performed using SPSS. The analysis result is shown in Table 4.2.

Table 4.2: Regression analysis for hypothesis 1

Coefficient sa						
	Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.642	0.303		5.423	0
	Study the system & Application of Industrial robots	0.543	0.081	0.663	6.742	0

Result of Regression Analysis: p value of 0.621 which was more than 0.05.

Conclusion: There is no significant association of system and application of Industrial robots and SWOT analysis.

Hypothesis 1: There is a significant association between application of Industrial robots and SWOT analysis.

In order to test hypothesis 1 a regression analysis was performed using SPSS. The analysis result is shown in Table 4.3.

Table 4.3 Regression analysis for Hypothesis 1

Coefficient sa						
Model		Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
		B	Std. Error			
1	(Constant)	0.704	0.315		2.235	0.029
	Analyzing the application of Industrial robots	0.789	0.083	0.779	9.449	0
a. Dependent Variable: Strength, Weakness, Opportunity & Threats (SWOT) analysis of robotics in Medicine						

Result of Regression Analysis: p value is 0.135 which is more than 0.05.

Conclusion: There is no significant association between the application of industrial robots and SWOT analysis.

Conclusion

It's safe to say that implementing 'Industrie 4.0' in the factory has the potential to dramatically alter the way many tasks are performed. Human operators will need to adjust to several environmental, psychological, and social shifts in the workplace and the task itself. The success of technical advancements and productivity hinges on considering and managing all of these shifts so that human aspects and ethics are suitably addressed in favour of both. In this paper, we examine the potential ethical concerns raised by the widespread role changes that human-robot collaboration may bring about for many workers in the global manufacturing sector.

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