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Review Study on Lathe Machines

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ABSTRACT –

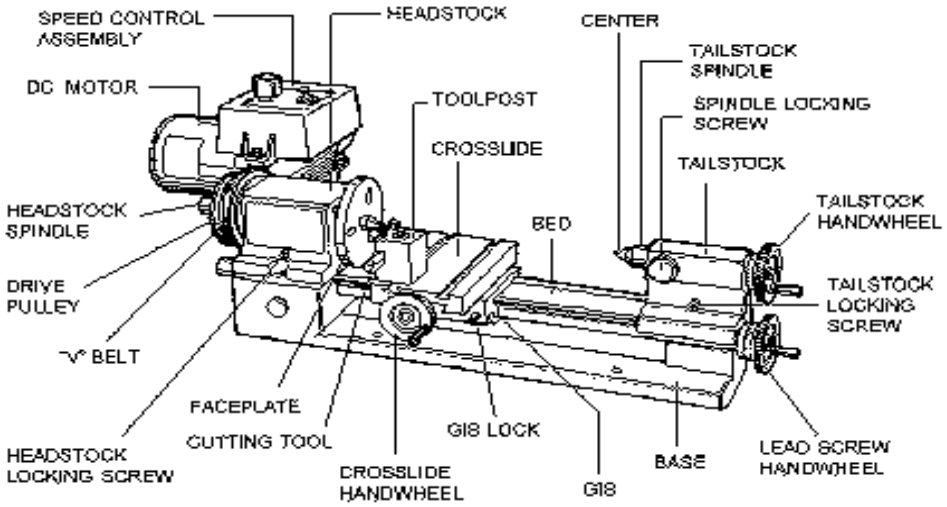
In this segment, we discuss systematic review, which is a study design used to summarize the results of several primary research studies performed on lathe machines to deeply understand their mechanisms for further studies and development.

Keywords: Research design, systematic review

1. Introduction

1.1 What is a lathe machine?

The lathe machine is an ancient tool used in production machines and is often referred to as the "mother of all machines." Its purpose is to eliminate unwanted material from a rotating workpiece, producing chips with the aid of a tool that moves across and into the work. This machine is highly versatile and is used extensively across the globe as a machine tool.



1.2 List of papers

In this study we referred to the following conferences and journals.

- *Research on Remote Intelligent Fault-diagnosis of CNC Lathe Based on Bayesian Networks*. The intelligent model based on BN was proven to be reliable and advantageous in a case study that involved compensating for the self-detection of machine tool faults in both hardware and programming

- *Design of the detection system of CNC Lathe thread machining*. This is aimed at addressing various issues that arise during screw-cutting, such as accurately counting pulses, differentiating between directions, ensuring precise control, maintaining synchronization, and minimizing interference.
- *Design of A High Force Electromechanical Actuator for Electrically Driven Lathe Machine.* The article presents a proposal for the design and driving mechanism of an electromechanical actuator system that integrates a single drive motor, intended for use in computer numerical control (CNC) lathe machines.
- *Feed rate compensation for constant cutting force turning.* What makes this approach unique is that it involves using an offline computer simulation to determine the control system gains, which enable stable operation across a broad range of spindle speeds.
- *Roundness Error Compensation in Lathe Turning Through 2-D ARMAX Model Based FCC.* The article outlines the process of designing, simulating, and implementing a compensatory control (FCC) system for a lathe turning machine, using a two-dimensional (2-D) exogenous autoregressive moving average (ARMAX) model-based forecasting approach.
- *Machining Simulation of the three-axes CNC lathe of the drilling.* The article presents an algorithm for generating a three-axis CNC lathe processing program tool path, building upon traditional CNC lathe processing programs. Machining simulation is conducted using the CAXA platform. The algorithm includes end face G01 drilling and radial G01 drilling.
- *Mechatronic modeling and control of the lathe machine equipped with a MR damper for chatter suppression.* The article introduces a new technique for suppressing chatter vibration in machining, using tunable magnetorheological (MR) dampers and a semi-active intelligent control approach.
- *Design of an automated vibration monitoring system for condition based maintenance of a lathe machine.* The objective of this study was to develop a vibration monitoring system for a lathe machine, utilizing an electronic circuit in the system and incorporating a liquid crystal display for improved user interface. The system also incorporates vibration sensors to accurately measure the machine's vibration levels.
- *A new reconfigurable logic for CNC lathe controllers.* This paper developed a new resampling algorithm for the synchronized movement in threading and a reconfigurable logic in a CNC lathe.
- *Cutting force monitoring and control system for CNC lathe machines.* This study details the process of designing and constructing a cutting force sensor, and integrating it with a fuzzy logic controller to create a comprehensive system for monitoring and controlling cutting forces during rough turning operations.
- *A stiffener structural design method for worktable of heavy duty vertical lathe combining topology optimization and size optimization.* The article presents a method for designing worktable stiffeners that combines topology optimization and size optimization. This approach is intended to enhance the static and dynamic performance of the stiffeners.
- *On-machine measurements and a evaluation for the turned wheel profile of rail vehicle.* This article examines the on-machine measurement and evaluation method for the out-of-roundness (OOR) of wheel profiles, using an underfloor wheelset lathe as a basis. The objective of this method is to enable high-precision online machining and measurement of wheel profiles.
- *A hybrid method based on macro-micro modeling and infrared imaging for tool temperature* The article introduces a hybrid method that takes into account both the macroscale tool heat transfer and microscale machining mechanics. This approach is used to reconstruct the three-dimensional (3-D) tool temperature field from non-obstructed infrared (IR) images.

1.3 Review Table

S.No	TITLE	JOURNAL/CONFERENCE	PUBLISHER /LIBRARY	YEAR OF PUBLICATION
1	Machining Simulation of the Three-axes CNC Lathe of the Drilling	2015 IEEE 10th Conference on Industrial Electronics and Applications (ICIEA)	IEEE INTERNATIONAL	2015
2	Mechatronic Modeling and Control of a lahte machine equipped with	2010 8th IEEE International conference on control	IEEE INTERNATIONAL	2010

	a MR Damper for Chatter Suppression	and Automation		
3	Design of an Automated Vibration Monitoring System for Condition based Maintenance of a Lathe Machine	2016 International Conference on System Reliability and Science	IEEE INTERNATIONAL	2016
4	A New Reconfigurable Logic for CNC Lathe controllers	2009 IEEE International Conference on Mechatronics and Automation	IEEE INTERNATIONAL	2009
5	Cutting Force Monitoring and Control system for CNC Lathe Machines	IEEE International Conference on Advanced Intelligent Mechatronic	IEEE INTERNATIONAL	2016
6	A Stiffener Structural Design Method for Worktable of Heavy-duty Vertical Lathe Combining Topology Optimization and size optimization	6th International Conference on Mechanical, Automotive and Materials Engineering	IEEE INTERNATIONAL	2018
7	Research on Remote Intelligent Fault-diagnosis of CNC LATHE Based on Bayesian Networks	2010 International Conference on Mechanic Automation and control engineering	IEEE INTERNATIONAL	2010
8	Design of a high force electromechanical actuator for electrically driven lathe machine	IEEE Transactions on Industrial Electronics	IEEE INTERNATIONAL	2020
9	On Machine Measurement and evaluat- ion for the turned wheel profile of raid vehicle	IEEE Transactions on Industrial Electronics	IEEE INTERNATIONAL	2021
10	A hybrid method based on macro-micro modeling and infrared imaging for tool temperature reconstruction in dry turning	IEEE/ASME Transactions on Mechatronics	IEEE INTERNATIONAL	2018
11	Feedrate compensation for constant cutting force turning	IEEE Control Systems Magazine	IEEE INTERNATIONAL	1993
13	Roundness error compensation in lathe turning through 2-D ARMAX model based FCC	IEEE Transaction on Control Systems Technology	IEEE INTERNATIONAL	2002

1.4 References

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