NOISE CONTROL OF MUFFLER USED IN MOTORS BY USING MULTILAYER NEURAL NETWORK

Amit Kumar Gupta[1]

[1]Department of Mechanical Engineering, Institute of Engineering & Technology, DAVV, Indore

Email: [1]akgupta@ietdavv.edu.in

By developing adaptive motor control systems in DC motor muffler plays a vital role for noise reduction, the problem of nonlinear structures can be solved. A traditional PI controller's working performance cannot be relied upon to control the speed of DC motors. The theoretical and experimental values of the acoustic transmission loss for straight pipes and for curved pipes were compared with no significant difference. To control the curved multi-mode exhaust system, a differential gap controller and a neural network controller were designed and simulated for control tests. The study findings reveal that the use of the proposed model for noise control achieves a noise reduction of 40–50% over systems with no noise control, proving that this exhaust system is effective in noise control. The feasibility of the noise-controllable multi-mode exhaust system was investigated using both a differential gap controller and a neural network controller.

Keywords:*Muffler,Vehicle noise, vehicle vibrations, vehicle engineering*

INTRODUCTION

A deep learning system uses layers of neural networks in order to accomplish its task. Deep learning adopts a conceptual approach similar to the way the human brain processes data in order to identify speech, translate languages, recognize objects, detecting objects and for making the decisions. In order to simulate human intelligence, Deep Learning uses NN. Neurons are arranged in three layers of a neural network: the Input Layer, the Hidden Layer, and the Output Layer. A feedforward NN is a network where there is no cycle in the connections between nodes. Here nodes are nothing but neurons. In this network, the information moves in one direction i.e from the input nodes, through the hidden nodes and to the output nodes [1]. The weights applied to the inputs are then applied to an activation function, along with the bias, of the signals that are transmitted between neurons. The delta ruleis Backpropagation algorithm.

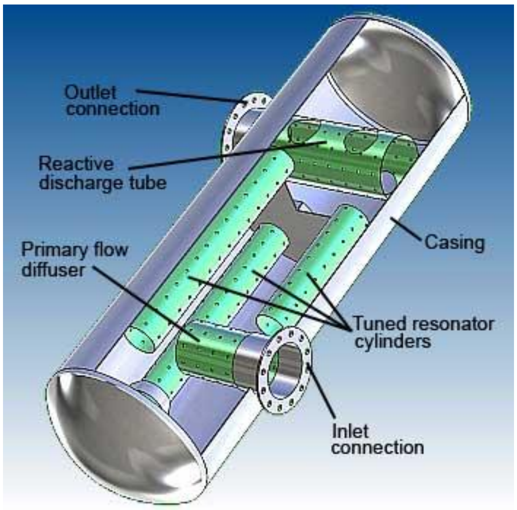

Figure1. Various Parts of Muffler

Conventional direct current electric machines and alternating current induction and synchronous electric machines have traditionally been the three cornerstones serving daily electric motors needs from small household appliances to large industrial plants. Recent technological advances in computing power and motor drive systems have allowed an even further increase in application demands on electric motors. Through the years, even AC power system clearly winning out over DC system, DC motors still continued to be significant fraction in machinery purchased each year [2]. There are two types of DC motors: brushed and brushless motor.

RESEARCH PROBLEM

Tuning pid controllers for dc motor by usingmicrocomputer. This paper presents a review study of tuning of PID controller for speed control of DC motor. PID parameters like kp ,ki ,kd are tuned using the different methods. Here in this paper, Tuning is done by the Ziegler-Nichols method using MATLAB programming as well as python programming technique. Raspberry pi is one of the microcomputers, was taken into consideration as it supports Linux based operating system and it is programmed using python. As part of the conventional closed loop control system, the User Interface Unit, Feedback Circuit, Error Detector, PID controller circuit, and the control signal generator are integrated into the hardware circuits. Here, all these hardware functions are integrated using a single Raspberry Pi. The logic for the PID controller can be implemented on Raspberry Pi by using Python. When Python programming was compared to other techniques, the results showed that the former had better parameters for performance.Artificial neural network for adaptive pid controller. (Frantisekkudlacak)ieee conference 2018.

IMPORTANCE OF MUFFLER NOISE REDUCTION

The paper explains the design of adaptive PID controller and back propagation. Here PID controller is tuned by perceptron neural network and back propagation is done. As the simplest neural network, the perceptron represents a representation of a single neuron. Each perceptron connection is weighted by calculating the weight. It is generally used an online approach to learn, where weights on artificial neural networks are updated after each sample, causing them to adapt over time It is possible to use gradient descent for differentiable error functions Single-layer neural network tuners are only capable of approximating linear functions, and not solving non-linear problems.Performance comparison of fuzzy logic and pid controller for speed control of dcmotor.

The performance of fuzzy logic and PID controllers is compared in this paper for separate excited DC motor speed control implementation in MATLAB/Simulink. It demonstrates how to adjust the fuzzy logic controller and PID controller by setting the steps accordingly. A fuzzy logic controller is developed to keep shaft speeds constant in varying loads by employing the IF-THEN rule and the speed errors are lowered to acceptable amounts as a result. Similarly, the PID controller's gains are adapted according to the ZN method. A comparison is made between the performance of FLC and PID based on their settling times and overshoot rates at the end of this paperSpeed control of dc motor by optimization techniques. (Santosh kumar suman) ieee conference 2016. A DC motor speed controller is illustrated in this paper by using a GA decision. It is a stochastic global search technique that mimics the natural evolution. Because of its high learning speed, efficiency, and simplicity, feed-forward neural networks are used in this application for the control system of DC motors. The reference tuning method is used to train neural networks. The NNPT can correct the steady-state error of PI controller after successful training.

THE TEST PROGRAM ARRANGEMENTS

Varied exhaust muffler internal construction characteristics result in different exhaust noise mufflers. Utilizing an orthogonal experiment, [9] examined the intubation diameter and insertion depth of intake and exhaust perforated pipes. two measures of the exhaust port's noise level and fuel consumption rate atdrawn to the exhaust aperture of the perforated tube and the inner diameter of the inner cannulawithin a specific range, the inner cannula has little impact on sound quality, the better the smaller the muffling effectthe perforated tubemuffler's depth and intake aperture findings. Text [10] BPnetwork to conduct additional research on the interface meter's exhaust flow from perforated pipes,length of the intubation, the bulkhead.

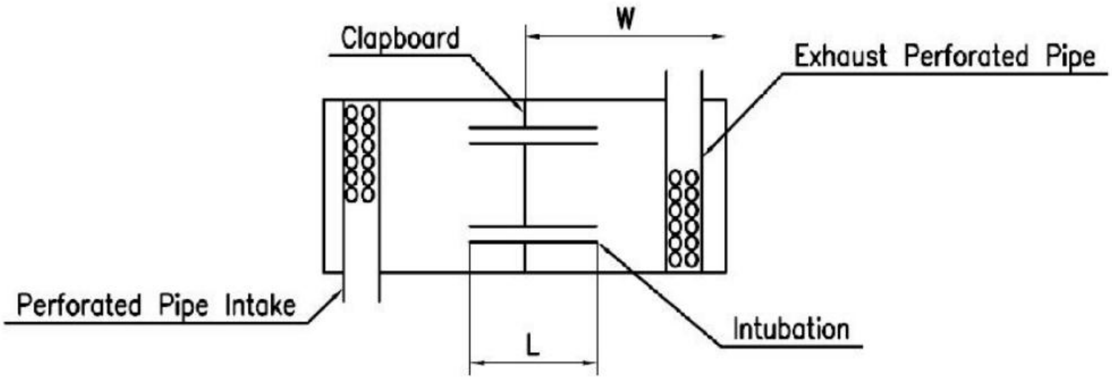

Figure 2. Structural diagram of the muffler

RESULTS AND DISCUSSION

Following the execution of the programme, the values for the muffler structure parameters are as follows: intake perforated pipe perforation rows is 10.584, length of intubation is 57.600 cm, and the clapboardwhen exhaust perforated pipe perforation row number is 13.870 and position (from the exhaust port) is 112.120 cm, the noise value is the lowest and is 76.00 dB, and fuel396.321 g/kwh is the consumption rate. The noise level is also 1.5 dB lower than what was measured in theduring the test, the fuel consumption rate was more than the lowest noise level of 77.50 dB.To pass the test, the initial 398.90 g/kwh was also reduced. formally establishedthat it is feasible to optimise systems together using genetic algorithms and neural networksin the optimization of muffler structural parameters. applications in engineering practise.

CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH

The foundational technology underlying 21st-century computational intelligence techniques include genetic algorithms and neural networks. The neural network is a massively parallel processor interconnection that can solve optimization problems by highly interconnected neural elements, and it complements and reinforces the genetic algorithm's self-adaptation, global optimization, and implicit parallelism, reflecting a strong ability to solve problems. Together, these two technologies can solve problems more effectively than either alone.

1. 178F diesel exhaust muffler-built GA-BP network and learning sample were directed through test to complete the network's training using Matlab neural network tools. The capability of the GA-BP network function model is specified by tested, training network on the structural parameters of the muffler's ability to forecast the internal structure parameters of exhaust mufflers.
2. For the fundamental genetic algorithm, several restrictions on genetic operators and the encoding technique have been examined, and an adaptive genetic algorithm has been developed to retain population diversity while also ensuring better convergence of the genetic algorithm. 3. Use the Matlab-trained neural network to simulate the muffler internal parameters and noise value of the digital modelling process to enable genetic algorithm optimization. This is done in the VC++ environment by calling the Matlab engine function. Genetic algorithm fitness function value is not always when the waist has proven digital function model for other similar engineering issues a routes, but rather when using trained GA-BP network output value as the value of the fitness function of genetic algorithm.

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