Available online at [www. scholarsresearchlibrary.com](http://www.scholarsresearchlibrary.com)

Scholars Research Library

Der Pharmacia Lettre, 2023, 15(7): 35-37
(http: //scholarsresearchlibrary. com/archive. html)

ISSN 0975-5071
USA CODEN: DPLEB4

Thoracic Operation Control Using Flexible PID

Chittaranjan Shariatullah*

Department of pharmaceutical chemistry, Jahangirnagar University, Savar Union, Bangladesh

***Corresponding author:** Chittaranjan Shariatullah, Department of pharmaceutical chemistry, Jahangirnagar University, Savar Union, Bangladesh;E-mail: chittarajansharitullah@gmail.com*

***Received:** 29-Jun-2023, Manuscript No. DPL-23-76470; **Editor assigned:** 03-Jul-2023, PreQC No. DPL-23-76470 (PQ); **Reviewed:** 17-Jul-2023, QC No.DPL-23-76470; **Revised:** 24-Jul -2023, Manuscript No. DPL-23-76470 (R); **Published:** 31-Jul-2023, DOI:10.37532/ 0975-5071.2023.15.35.*

INTRODUCTION

The use of a Fuzzy Proportional Integral Derivative (FPID) control architecture to monitor the pressure in the airways during mechanical ventilation. A blower hose patient system and a single compartmental lung system with nonlinear lung compliance are combined to model the respiratory system. The traditional PID controller is also created and simulated on the same system for comparison's sake. When there are unknown characteristics of the patient's hose leak and patient breathing effort, the ventilator will supply airway flow that keeps the peak pressure below critical limits, according to the specified control strategy. The findings demonstrate that FPID is a superior controller in terms of a faster reaction, less overshoot, and less tracking error. This offers insightful information for using the suggested controller.

Since the COVID-19 disease outbreak was initially discovered in Wuhan, China, the entire globe has been in disbelief. Three months later, the World Health Organization (WHO) declared it to be a global pandemic. As of this writing, the disease has infected more than 174 million people globally, with about 4 million fatalities. According to the data, Acute Respiratory Failure (ARF) is the main cause of death, and a study indicated that 40% of COVID-19 patients who were critically ill developed Acute Respiratory Distress Syndrome (ARDS), which calls for intrusive incubation and ventilation. A mechanical

Citation: *Shariatullah C. 2023. Thoracic Operation Control Using Flexible PID. Der Pharma Lett.15:35-37.*

DESCRIPTION

Mechanical ventilators were utilised to help with ventilation, but the first closed loop system for mechanical ventilation was not created until much later. To cycle gas into the lungs, a mechanical ventilator used mechanical bellows and valves, while a straightforward Proportional (P) or Proportional Integral (PI) controller was used. These controllers were later implemented using microprocessors, and several closed loop control suggestions have been made since then. Depending on how often the system interacts with patients, closed loop control in mechanical ventilators can be divided into different categories. While there is no backward communication between the patient and the device in a class 1 control loop, this is conceivable in a class 2 control loop. Control signals are measured inside the device in both classes. Because a class 3 control loop uses the physiological parameter as its control variable rather than the physical one, it is known as a physiological compensatory control loop. The control goal of the pressure based ventilation controller presented in this study, which falls under the class 2 category, is to monitor a set point target airway pressure. In addition to this, other methods were employed to enhance the performance of the PID controller in the mechanical ventilation system. These methods included repetitive control, Pressure Evaluate Correction Module (PECM), and Particle Swarm Optimization (PSO), which automatically adjusted the PID gains. A fuzzy PID (FPID) controller for mechanical ventilation airway pressure set point tracking. Through the measured set-point error and the rate of change of error, fuzzy reasoning is used to assess changes in the system's dynamic, which in turn updates the PID tuning parameters depending on the rules set. The tuning parameters are updated online during the procedure. The suggested controller is then tested using a respiratory system model made up of two models: a single compartmental lung model and a blower hose patient system model that was taken from the works of hunnekens and bates, respectively. Fuzzy logic-based controllers have been used in numerous applications, such as induction motor control, conveyor system speed regulation, tissue differentiation process simulation, and longitudinal autopilot of Unmanned Aerial Vehicles (UAVs). This proposed controller's main goal is to improve the PID controller's performance on a respiratory system where certain of its mechanical parameters are variable, notably lung compliance, which might change depending on lung capacity. The remainder of this essay is structured as follows: In addition to providing a brief description of lung compliance, Section 2 offers the specifics of the mathematical model for the blower hose patient system and single lung compartmental model. The specifics of the suggested controller design, while the simulation results, analysis, and comparison of PID and FPID.

The blower hose patient system model with a single compartmental lung model is the foundation for the respiratory system model employed in this study. The respiratory module, the hose connecting it to the patient and the patient's lung make up the system's three primary parts. The blower compresses ambient air to the required pressure. A pressure sensor is positioned inside the module to measure the airway pressure. Following the target set point with the measured pressure is the control goal. Consequently, the following is a description of the error equation. Keeping track of the pressure set point is more challenging since lung compliance varies with lung capacity. In this situation, as opposed to when the PID controller is simulated in the model with constant lung compliance value, the controller exhibits greater oscillation and overshoot. Then, a simulation of a fuzzy PID controller employing the same parameters and PID controller outcomes is performed. Here, we can see that FPID responds more quickly and has less overshoot. Based on the estimated ITAE, where FPID scored 7.467 and PID scored 8.293, FPID controller is also superior at tracking the set point.

Citation: *Shariatullah C. 2023. Thoracic Operation Control Using Flexible PID. Der Pharma Lett.15:35-37.*

CONCLUSION

The simulation results of using FPID control design in a pressure based mechanical ventilation system have been described in this work. The blower hose patient system and a single compartmental lung system with nonlinear lung compliance were combined to represent the respiratory system. The simulation results have demonstrated that utilizing fuzzy reasoning to automatically adjust the PID parameters online can improve the PID controller's subpar performance in tracking the airway pressure of the modeled system. The response time was faster, the overshoot was lower, and the tracking error was smaller (ITAE). There is, however, still opportunity for development. The performance could be further improved by more research into the number and kind of membership functions employed in the FIS.