Retraction

Retraction: Performance of PID Controller in Poultry House System (J. Phys.: Conf. Ser. 1916 012184)

Published 23 February 2022

This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

Retraction published: 23 February 2022
Performance of PID Controller in Poultry House System

K Vidhya¹, B Shivani²

¹ Associate Professor, ECE Department, Sri Ramakrishna Engineering College, Coimbatore, Tamil Nadu, India
² Student, ECE Department, Sri Ramakrishna Engineering College, Coimbatore, Tamil Nadu, India
vidhya.k@srec.ac.in

Abstract. Poultry house is mainly used for the purpose of enhancing the environmental conditions in which birds are grown. The temperature and humidity inside livestock building is the most influential factor on the chickens. This paper proposes new ways to control the temperature inside poultry house using an optimized Proportional Integrator Derivative controller. The primary technique focuses on the set of the output matrix via the adaptation of the Static Output Feedback control for the Multi Input Multi Output system. The single model of the poultry house process is controlled with the PID controller. Additionally, the Ant Colony Optimization algorithm is employed to derive the optimal parameters (Kp, Ki, Kd) on testing the four multi-objective indices (Integral Absolute Error, Integral Square Error, Integral Time multiplied by Absolute Error, Integral Time multiplied by Square Error). The simulation results and shows better performance of the proposed technique in tracking the required set point with the poultry house systems.

1. Introduction
The study of comfort of birds in a poultry house has observed that over an decade of poultry farmhand. In general, both physiological and psychological factors involves in birds comfort are directly related with the combination of characteristics that are intrinsic to the birds. The comprehensive investigation of studies has given the comfort to poultry birds is improved by periodic monitoring the factors such as temperature, humidity, and solar radiation in the poultry farm [1-10]. While it is good to coordinate all the above factors, economic importance have been decided the control of a factor. If the poultry farm temperature is more it can have a severe on poultry production. Production efficiency is decided before the temperature of the poultry bird. The vital sign of a bird normally lies between 39.4°C and 40°C. The neutral zone of the birds which allows adult chickens to keep up their body temperature is between 18°C and 23.9°C while for adult broilers it’s between 26°C and 27°C.

To urge the foremost efficiency in poultry generation, it is fundamental that the warm environment presents fitting consolation levels. When warm environment gets to be awkward, the body of the poultry winged creatures will start to require a few physiological alterations so as to keep up their homoeothermic conditions making them to either hold or disseminate warm. Ideal temperatures allow the poultry fowls to change over supplements into development rather than utilizing the calories for temperature control. Poultry fowls watched less nourish and change over this nourish effectively. Destitute temperature control in poultry house amid hot and muggy climate may result in over the top feathered creature mortality. There are numerous parameters like temperature, relative mugginess and...
discuss that are to be observed. This has made the need for warm environment control to rise. One in all the first common approaches utilized to control the warm environment of the poultry house within the later time is that is utilized of window ornament drops. Another strategy is bringing down the nourish admissions of the fowl so as to scale back the warmth push. In any case, window ornament ventilation requires ceaseless, 24 hour administration on the off chance that the poultry house environment is to be palatably controlled [11-15].

The standard procedure is utilized rather than being effective are dull, monotonous and require a tireless watching. Thus, the larger part of the poultry ranchers depend on better control frameworks to play down creature with feathered mortality and increase poultry production. Though proportional integral derivative controllers are by and largely used within the industry, their ampleness is regularly compelled due to destitute regulating. To bargain these holes, much exertion has been saturated into creating deliberate regulating procedures. Numerous of these procedures are incapable within the temperature monitoring framework which has non-linear, time delay and time-fluctuating qualities.

Previous inquiries about temperature control on poultry farm had been created. The creators have compiled a PID controller with better calculation than the PID controller as it is far from time to resolve and therefore a fixed status error. The remaining operating methods calculate PSO and ACO calculations and perform accurate vehicle calculation ACO calculations.

The numerical re-enactments of the control procedures have illustrated their adequacy and strength to follow the input parameter. The previous works have been increased by joining the Subterranean ACO optimization calculation in choosing driving regard limit the PID controller. The Multiple input and multiple output frameworks have been decoupled by means of yield input strategy additionally the SISO demonstrate produced is supervised with the enhanced controller so as to supervise the temperature control. The Ant colony optimization calculations have been attempted to fortify the PID controller tuning advancement, to illustrate the controller productivity in taking after the set parameters which is to supply a predominant alteration. The rests are organized as looks for after: the drawing closer zone presents briefly the logical appear of the poultry systems, and the delineations for the creepy crawly ant colony optimization procedures are talked to. At long last, a couple of cleaning off comments and comes around are given.

2. Static output feedback techniques
Figure 1 shows the Static output feedback control

We are using the command law for the static output feedback methods of form as shown in Equations (1)-(3):

\[ u(t) = K_y y(t) + K_r r(t), \]

With: \( u(t) \in \mathbb{R}^n \) and \( r(t) \in \mathbb{R}^m \)

\[ \text{Figure 1. Static output feedback control} \]
Where \( r(t) \) is command signal, \( K_r \) is pre recompense, \( y(t) \) is the output and \( K_y \) is the framework of pick up connected to degree PID controller. The structure is given in ask for switch the energetic for the framework and to finalize the conditions allowing a decoupler orchestrate.

\[
X = AX + BU + B_d d
\]

\[
X = [x_1 \ x_2]^T \quad d = [d_1 \ d_2]^T
\]

The poultry farm model has been distinguished as MIMO straight process, it has two inputs \((u_2=E_{ev}, u_3=D_{ev})\) and two outputs \((x_1=T_{int}, x_2=H_{int})\) irritated by external parameters \((d_1=T_{ext}, d_2=H_{ext})\).

In the dimension of the state output control, \( K_r \in \mathbb{R}^{2x2} \) and \( K_y \in \mathbb{R}^{2x2} \)

\[
\dot{X} = \begin{bmatrix}
-\left( R_{n} + \frac{K_x}{a} + r \frac{K_y}{b} + \frac{x_{1e}}{V_b} K_{y3} \right) & -\frac{r}{a} K_y \frac{x_{1e}}{V_b} K_{y3} \\
R_{n} \left( 0, 52 \overline{x}_{1e} - 6.46 \right) + \frac{K_{y1}}{b} & \frac{K_{y2}}{b}
\end{bmatrix} X + \begin{bmatrix}
-\frac{r}{a} K_y \frac{x_{1e}}{V_b} K_{y3} & -\frac{r}{a} K_y \frac{x_{1e}}{V_b} K_{y4} \\
\frac{K_{y1}}{b} & \frac{K_{y2}}{b}
\end{bmatrix} r + B_d d
\]

if the matrices are diagonal, the control is decoupled. The condition of decoupling are written:

\[
K_{y1} = -b_{Re} \left( 0.52 \overline{x}_{1e} - 6.46 \right) \quad K_{y2} = -a \frac{x_{1e}}{V_b A} \quad K_{y3} = 0 \quad K_{y4} = -a \frac{x_{1e}}{V_b A}
\]

In the below condition, the equation (4) could be written in the form:

\[
\dot{X} = \begin{bmatrix}
R_{n} \left( 0, 52 \overline{x}_{1e} - 6.46 \right) - K_x & -a R_{n} - \frac{x_{1e}}{V_b} K_{y3} & 0 \\
0 & 1 & 0 \\
-\frac{x_{1e}}{a} K_{y3} & 0 & \frac{K_{y2}}{a} \\
0 & 0 & 1
\end{bmatrix} X + \begin{bmatrix}
K_{y1} \\
0 \\
0
\end{bmatrix} r + \begin{bmatrix}
0 \\
1 \\
0
\end{bmatrix} d
\]

The equation (5) is changed to the transfer function like,

\[
x_1(s) = \frac{-K_y a r_1(s) + K_x a d_1(s)}{s + \frac{K_x + a R_{n} - rb R_{n} \left( 0, 52 \overline{x}_{1e} - 6.46 \right)}{a} + \frac{x_{1e}}{V_b} K_{y3}}
\]
Equations (6) and (7) can be executed with the PID controller for maintaining the temperature and also the humidity of the poultry house model.

3. PID controller
A PID controller is utilized in industrial control applications to maintain temperature, flow, pressure, speed, and other. It used an effect loop feedback mechanism to regulate process variables and are the most precise and stable controller. It could be a well-established way of driving a system towards a target position or level. It uses closed-loop control feedback to keep the output from a process as close to the target.

![Figure 2. Block diagram of poultry house model](image)

The below Kp, Ki and Kd are shown corresponding the proportion, the derivative and integral gain. The equation of PID controller is as shown in equation (8),

$$K_p + \frac{K_i}{s} + K_d s$$

From figure 2, the PID parameter is coordinated by a regulating method. PID parameters Kp, Kd, Ki are tuned with using Ant Colony Optimization.

4. Ant Colony Optimization
The ACO calculation could be a probabilistic method of tackling calculation issues which will be decreased to searching great ways through charts. Artificial Ants imply multi-agent strategies propelled by the behaviour of genuine ants. The pheromone-based communication of natural ants is ordinarily the overwhelming worldview utilized. Combinations of Artificial Ants and nearby look calculations became a strategy of choice for different optimization assignments including a few assortments of graphs.

Each ant should develop a arrangement to move through the chart. To choose the ensuing edge in its visit, an ant will consider the length of each edge accessible from its current position, as well as the comparing pheromone level. At each and every step for the calculation, each insect move from a one state x to other state y taking after a more add up to centre of the street course of action. So that, each insect k calculates a set Ak(x) of achievable improvements its show one state in each and every cycle, and goes to one of those in likelihood. The insect k, the likelihood pxy^k of going from one state x to other state y depending upon the combination of two values, the locks quality ηxy of the move, as calculated by many interesting appearing the a previous charm of that moving and the way level τxy of
the move, illustrating capable it has inside the past to consider that specific move. The way case talks to a posteriori representation of the charm of this move.

\[
p_{xy}^{k} = \frac{(\tau_{xy}^\alpha)(\eta_{xy}^\beta)}{\sum_{x \in \text{allowed}_x}(\tau_{xx}^\alpha)(\eta_{xx}^\beta)}
\]

(9)

Where \(\tau_{xy}\) is sum of parameter kept to move from one state x to y, \(\leq \alpha\) could be the factor to monitor the impact for \(\tau_{xy}\), \(\eta_{xy}\) is attractive quality for state move xy (a prior information, ordinarily 1/dxy, d is the distance) and \(\beta \geq 1\) may be a factor to coordinate a impact of \(\eta_{xy}\), \(\tau_{xz}\) and \(\eta_{xz}\) speak to the path level and allure for the inverse conceivable state transitions as shown in equation (9). Figure 3 shows the Functional scheme of ACO algorithm on poultry house model.

**Figure 3.** Functional scheme of ACO algorithm on poultry house model

### 4.1 Objective cost value

The work of the ACO need the objective work fetched esteem. The little works utilize the Necessarily of Outright Greatness of the Blunder, the Fundamentally Time duplicated by Supreme Blunder, the indispensably of the Blunder the Fundamentally increased by the Blunder to regulate the controller.
creators have utilized four criteria specified over so as to watch the yield of the demonstrate and to discover the foremost sensible basis to be connected with the ACO calculation. The ACO calculation is executed to compare the most excellent highlights for regulation the controller of the poultry cultivate framework.

5. Simulation Results
The simulation of the execution of the closed poultry cultivate for the ACO or controller is came by a model run depending on the five execution records. A beginning parameter utilized within re-enactment for the ACO calculations are considered in Table 1. Figures 4-9 shows the result.

| Table 1. Input parameters of the Ant Colony Algorithm |
|------------------------------------------------------|
| Parameters                                          | Values                                 |
| No of insect                                        | NA=30                                  |
| Fixed value                                         | $\alpha=0.8$, $\beta=0.2$             |
| Evaporation rate                                    | 0.7                                    |
| Iteration                                           | Ni=5                                   |
| Nodes                                               | N=10000                                |

Figure 4. Humidity response with ISE criterion

Figure 5. Humidity response with IAE criterion
Table 2. Optimum values measured for the controller

| Parameter | ISE   | IAE   | ITAE  | ITSE  |
|-----------|-------|-------|-------|-------|
| Kp        | 4.6550| 3.4469| 4.6558| 3.7087|
| Ki        | 8.4084| 8.0727| 8.4084| 8.4084|
| Kd        | 1.9243| 0.65542| 4.6898| 1.9632|

Table 2 appears the gauge time picked up by the advantages of the ant colony optimization regulated with reference to the four parameters. The settling parameter time and the speedy rise time is provided by the IAE and ITSE and overshoot is given as ISE. It ought to be seen that the IAE execution file is greatly important of down to earth application within the case for the poultry cultivate framework displayed.
6. Conclusion

Hence a capable and viable customise method depended on ACO - Ant Colony Optimization has made to get great exhibitions adjusting the parameters. Thus it comes about gotten of the genuine information took from the experiment measure a great complete execution of the framework and proposed technique has demonstrated its practicality through recreation result.

References

[1] Lahlouh Ilyas, Elakkary Ahmed, Sefiani Nacer PID Controller of a MIMO system using Ant Colony Algorithm and its application to a poultry house system International Conference on Optimization and Applications 2019.
[2] Aborisade D O and Stephen O, Poultry house temperature control using Fuzzy-PID controller International Journal of Engineering Trends and Technology Vol 11 2014.
[3] Oладайо B O and Titus A O PID Temperature Controller System for Poultry House System Using Fuzzy Logic International Journal of Engineering Trends and Technology 2016.
[4] Ola B O and Awodeye O O Performance Evaluation of Particle Swarm Optimization on poultry House Temperature Control System IOSR Journal of Computer Engineering. 2017.
[5] Lahlouh I A. Akkary E Sefiani N, PID/MultiLoop Control Strategy for Poultry House System Using Multi-Objective Ant Colony Optimization International Review of Automatic Control 2018.
[6] M. Suganya and H. Ananadakumar, Handover based spectrum allocation in cognitive radio networks, 2013 International Conference on Green Computing, Communication and Conservation of Energy (ICGCE), Dec. 2013.doi:10.1109/icgce.2013.6823431. doi:10.4018/978-1-5225-5246-8.ch012.
[7] Haldorai and A. Ramu, An Intelligent-Based Wavelet Classifier for Accurate Prediction of Breast Cancer, Intelligent Multidimensional Data and Image Processing, pp. 306–319.
[8] Banhazi T et al., Issues related to livestock housing under hot climatic conditions including the animals response to high temperatures International Journal of Biometeorology 2007.
[9] Animal housing in hot climates: A multidisciplinary view Research Centre Bygholm, Danish Institute of Agricultural Sciences, Schütesvej 17, 8700 Horsens, Denmark, 2006. 105p., Irenilza de Alencar Naas, 2006.
[10] Upachaban T, Khongsatit K and Radpukdee T Mathematical Model and Simulation Study of a Closed-poultry House Environment International Journal of Technology vol. 7, no. 7, p. 1246, 2016.
[11] Lahlouh I, El Akkary A and Sefiani N Mathematical Modelling of the Hygro-Thermal Regime of a Poultry Livestock Building: Simulation for Spring Climate International Review of Civil Engineering vol. 9, no. 2, p. 79, 2018.
[12] Chiha I, Liouane H and Liouane N A hybrid method based on multi-objective ant colony optimization and differential evolution to design PID DC motor speed controller International Review on Modelling and Simulation. vol. 5, no. 2, pp. 905–912, 2012.
[13] Soni Y K and Bhatt R BF-PSO optimized PID controller design using ISE, IAE, IATE and MSE error criteria *International Journal of Advanced Research in Computer Engineering and Technology* vol. 2, no. 7, pp. 2333–2336, 2013.

[14] Lahlouh I, El Akkary A, and Sefiani N Mathematical Modelling of the Hygro-Thermal Regime of a Poultry Livestock Building: Simulation for Spring Climate *International Review of Civil Engineering* vol. 9, no. 2, p. 79, 2018.

[15] Dorigo M and Stützle T, Ant colony optimization. *Cambridge, Mass.: MIT Press*, 2004.