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EHDA closed loop control system based on real time non-visual spray mode classification

(Center, Bold, Times New Roman 14, maximum 15 words in english)

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Abstract

Electrohydrodynamic Atomization (EHDA) also known as Electrospray (ES), is a technology that uses a strong electric field (kV/cm) to manipulate liquid breakup into droplets. This technique allows the generation of droplets smaller than the nozzle diameter with a controlled droplet size, which means it can be used to produce uniformly sized particles in the micro/nanoscale range. This liquid spraying technique can generate different modes when both the liquid flow rate and the voltage vary with a narrow size dispersion. The most known mode is the cone-jet mode, because it can produce droplets in the micro and nanometric range with a narrow size dispersion. The article presents a novel closed-loop control system for electrohydraulic actuators (EHDA) that utilizes real-time, non-visual spray mode classification to improve performance and efficiency. The system utilizes current data from the experiment to classify the spray mode dynamics in real-time and adjust the EHDA parameters, such as pump flowrate and power supply voltage, to reach the desired spray mode and stabilize it. The proposed control algorithm is able to achieve improved accuracy and reduced waste compared to previous methods. The results of the system are discussed and its potential applications in industrial settings are highlighted. consists of objectives, methods, findings, and research contributions in 150 to 250 words which contains the main conclusions and provides important information and is accompanied by **5 keywords**. Furthermore, the determination of keywords needs to pay attention to important words contained in the title and abstract, separated by a semicolon. **The novelty** in this paper briefly explains why no one else has adequately researched the question. Then **the results** are made a list of the empirical findings and write the discussion in one or two sentences.

Keywords: *Keyword 1; keyword 2; keyword 3; keyword 4; keyword 5*

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1. Introduction (10pt, bold)

The introduction is about 400-600 words and provides background information, previous references related to the main topic, reason, purpose of the research, and the novelty of the research. Content should be relatively non-technical, but clear enough for a knowledgeable reader to understand the manuscript's contribution. Explain what the purpose of the research is and why the research was conducted the main body of the article should begin with an introduction, which provides further details on the purpose of the paper, motivation, research methods, and findings. For citations use numbering which must be used for reference titles, for example, citations for journals consisting of 1 article [1] or two articles [2], [3], while for writing citations of more than two articles [4] - [7].

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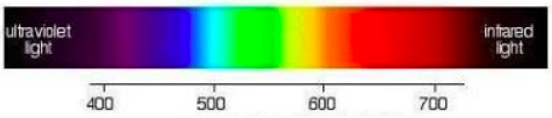
2. Methods (10pt, bold)

The methods section describes the steps followed in the execution of the study and also provides a brief justification for the research methods used. A chronological explanation of the research, including research design, research procedures (in the form of algorithms, codes, or others), how the procedures are to obtain and test data [8] - [23]. The description of the research has been supported by references, so that the implementation can be accepted scientifically [6]. Figure are presented in the center, as shown below and are cited in the manuscript. An example of a membership function graph can be seen in Figure 1.



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	2020	59	23.9%
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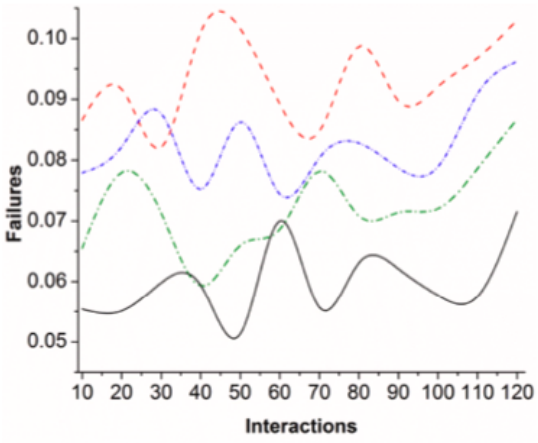

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Mathematical equations must be numbered sequentially and starting with (1) until the end of the paper including the appendix. This numbering must begin and end with an opening and closing parenthesis and right align. Add one blank space above and below the Eq. 1.

$$\chi(L(\Gamma);\lambda) = (\lambda+2)^{m-n}\chi(\Gamma;\lambda+2-k) \tag{1}$$

For example, from Eq. 2 it is derived again the next mathematical equation

$$\chi(L(\Gamma);\lambda) = \det(\lambda I_m - A_L) \tag{2}$$

Or there is the next mathematical Eq. 3 as below

$$\det(D_0 D_0^t) = \sum_{|U|=n-1} \det(D_U)\det(D_U^t) \tag{3}$$

3.2. Therema (10pt, bold)

The schema for writing definitions, theorems, lemmas, and proofs conforms to and follows the template below.

Theorem 1 *Theorem is a statement about mathematics that still requires proof and the statement can be shown to have a truth value or is also true.*

3.2.1. Lemma (10pt, bold)

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5. Acknowledgement (if any)

Contains an acknowledgment of thanks to an agency if this research was funded or supported by that agency, or if there were parties who significantly assisted directly in the research or writing of this article. If the party is already listed as the author, then there is no need to mention it again in this Acknowledgment

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