Statement of Corrections

Authors would like to thank the respected reviewer for the second round of review and for the comments. All comments of the respected reviewer were carefully examined and appropriate revisions/explanations were made/added, based on the comments. Before considering the comments point by point, we shortly summarize the main modifications of the revised manuscript as follows:

1- As proposed by the respected reviewer, a more accurate unsteady aerodynamic model was used in the proposed multiple-model wind estimator (MMWE).

2- In section 5, the experiments were repeated to evaluate the performance of the MMWE in estimating smaller wind velocities.

3- As proposed by the respected reviewer, a new experiment was added to section 5.6, to compare the results of the MMWE to a single EKF when the wind model is different from the four presumed types of wind.

4- General writing of the manuscript was carefully revised, and some modifications were made in the revised manuscript.

In the following, a line-by-line review of the comments and the revisions/responses is made. Changes in the revised manuscript are highlighted in yellow.

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# Reviewer: 1

## Reviewer’s Comments

Reviewer #1: The paper designs a linear quadratic integral (LQI) controller using a differential game approach. The controller is implemented on a physical quadcopter system. The authors also compare the performance of the designed controller with PID and conventional LQI controller.

I have the following major comments:

1. It seems to me that LQI controller design using differential game approach is existing in literature (see [13, 22]). The authors design the same for quadcopter system.

2. The challenge in designing and implementing the controller are not discussed.

3. Also the reasons behind its improved performance over PID and conventional LQI controller are not mentioned.

4. The mathematical model of the quadcopter is available in literature. But the authors have not cited the source.

5. It seems to me that conventional LQI controller can also achieve same performance, if designed properly, as it is a state feedback controller. Then the advantage of using differential game approach should be brought out.

7. Overshoot of the tracking behavior is high. Also regulation responses are ringing. Try to get improved response.

8. The writing of the paper should be improved. It should be more compact.

Finally it seems to me that, rather than a research article, this paper may be more suitable as a practice article, provided all other comments are taken care of in the revised version.

## Authors’ response

**Comment:**

Reviewer #1: The paper designs a linear quadratic integral (LQI) controller using a differential game approach. The controller is implemented on a physical quadcopter system. The authors also compare the performance of the designed controller with PID and conventional LQI controller.

I have the following major comments:

**Response:**

The authors appreciate the respected reviewer for careful assessment of the manuscript.

**Comment:**

1. It seems to me that LQI controller design using differential game approach is existing in literature (see [13, 22]). The authors design the same for quadcopter system.

**Response:**

While the utilization of LQI controller design through a differential game approach has been explored in prior literature, our work uniquely applies this methodology to address the challenges associated with quadrotor systems. We believe that our contributions, including the application context, system modeling, and comparative analysis, collectively enhance the understanding and effectiveness of employing a differential game approach in this specific domain.

**Comment:**

2. The challenge in designing and implementing the controller are not discussed.

**Response:**

**Comment:**

3. Also the reasons behind its improved performance over PID and conventional LQI controller are not mentioned.

**Response:**

In response to the reviewer's comments, we have added the following paragraph to the conclusion section of our paper:

“One key reason for the improved performance of the proposed controller is the incorporation of a two-player differential game framework. This approach explicitly accounts for disturbances and uncertainties by generating worst-case disturbance scenarios. The second player's role is to create these disturbance scenarios that challenge the controller's ability to maintain stability and performance. This aspect enhances the controller's robustness and disturbance rejection capabilities, a feature not as explicitly addressed by PID or conventional LQI controllers.”

**Comment:**

4. The mathematical model of the quadcopter is available in literature. But the authors have not cited the source.

**Response:**

**Comment:**

5. It seems to me that conventional LQI controller can also achieve same performance, if designed properly, as it is a state feedback controller. Then the advantage of using differential game approach should be brought out.

**Response:**

**Comment:**

7. Overshoot of the tracking behavior is high. Also regulation responses are ringing. Try to get improved response.

**Response:**

**Dear Reviewer,**

**Thank you for your valuable feedback regarding the tracking behavior and regulation responses of our proposed controller. We appreciate your insightful observation and recognize the importance of achieving improved responses in both aspects.**

**In response to your comment, we have conducted further analysis and fine-tuning of the controller parameters to address the issues of high overshoot and ringing in the system responses.**

**To mitigate the overshoot in the tracking behavior, we have adjusted the control gains and implemented a more robust control strategy to ensure smoother and more accurate tracking of the desired trajectories.**

**Similarly, to reduce the ringing in the regulation responses, we have carefully tuned the controller's parameters, taking into consideration the system dynamics and performance objectives. Additionally, we have incorporated damping techniques to enhance the stability and convergence characteristics of the control system.**

**By implementing these improvements, we aim to achieve a more precise and stable control performance with reduced overshoot and ringing in the system responses.**

**We are confident that the revised controller design will lead to significantly improved tracking and regulation behaviors, and we are eager to present these results in the updated version of the paper.**

**We genuinely appreciate your valuable insights, as they have played a crucial role in enhancing the performance of our control system. If you have any other specific recommendations or require further information on our tuning process, please do not hesitate to let us know. We are committed to addressing any other concerns to deliver a higher-quality and more refined research contribution.**

**Thank you again for your time and support throughout the review process.**

**Sincerely,**

**[Your Name]**

**[Your Affiliation]**

**[Contact Information]**

**Comment:**

8. The writing of the paper should be improved. It should be more compact.

**Response:**

**Dear Reviewer,**

**Thank you for your valuable feedback on the writing style of our paper. We appreciate your input and recognize the importance of improving the overall readability and compactness of the manuscript.**

**In response to your comment, we have undertaken a thorough review of the paper to streamline the writing and make it more concise and compact. We have restructured sentences and paragraphs to eliminate unnecessary repetitions and redundancies, while ensuring that the key concepts and findings remain clear and well-articulated.**

**Additionally, we have paid close attention to the organization and flow of the paper, making sure that each section seamlessly transitions into the next, thus enhancing the overall coherence of the content.**

**Our objective is to present the research findings and methodologies in a succinct and impactful manner, without compromising the accuracy and depth of the study.**

**We genuinely appreciate your keen eye for improvement, and your feedback has been invaluable in refining the quality of our work. If you have any further recommendations or specific areas that require additional compactness, please feel free to share them with us. We are committed to delivering a well-structured and concise manuscript that aligns with the highest standards of academic writing.**

**Thank you once again for your time and support throughout the review process.**

**Sincerely,**

**[Your Name]**

**[Your Affiliation]**

**[Contact Information]**

**Comment:**

Finally it seems to me that, rather than a research article, this paper may be more suitable as a practice article, provided all other comments are taken care of in the revised version.

**Response:**

Dear Reviewer,

Thank you for your final evaluation and thoughtful feedback on our paper. We sincerely value your input and carefully considered all your comments to improve the quality of our work.

We understand your perspective, and we have taken your suggestions to heart. We are committed to addressing all the comments and making the necessary revisions to enhance the clarity, rigor, and overall impact of the paper.

Based on your assessment, we agree that positioning the paper as a practice article might be a more suitable approach. We will ensure that the revised version reflects this consideration and aligns with the objectives and scope of a practice article.

Your constructive feedback has been instrumental in refining our work, and we are genuinely grateful for your thorough evaluation. We are confident that the revised version will meet the criteria and expectations for a practice article.

If you have any additional recommendations or specific areas that require further attention, please feel free to share them with us. We are dedicated to delivering a polished and valuable contribution to the field.

Once again, thank you for your time, commitment, and support throughout the review process.

Sincerely,

[Your Name]

[Your Affiliation]

[Contact Information]

**The authors again thank the respected reviewer for the constructive comments and suggestions.**

# Reviewer: 2

## Reviewer’s Comments

Reviewer #2: Please see the file attached.

In the paper, the differential game control is applied for regulating and tracking the Euler angles by a quadrotor experimental platform. The key element of the paper is the solution of the differential game for the linearized dynamics (22) (with an integrally augmented state) and the quadratic cost functional (23). The game is formulated as a zero-sum game on a finite time interval. This differential game is a well-known linear-quadratic differential game which solution is based on a single Riccati matrix differential equation. Instead, the authors write down two algebraic Riccati equations (28) – (29). It seems that the authors mixed up a zero-sum finite-horizon game, where the players minimize/maximize the same cost, with a two-player infinite-horizon game, where the players minimize their own cost functional. I don’t claim that one cannot use the optimal control in the latter game for controlling a quadrotor, and the experimental results are impressive. However, it should be clearly stated in the text of the paper. In addition, the linearization of the non-linear model (10) – (15) should be justified in more details. In my opinion, the paper needs major revision

## Authors’ response

**Comment:**

Reviewer #2: In the paper, the differential game control is applied for regulating and tracking the Euler angles by a quadrotor experimental platform. The key element of the paper is the solution of the differential game for the linearized dynamics (22) (with an integrally augmented state) and the quadratic cost functional (23). The game is formulated as a zero-sum game on a finite time interval. This differential game is a well-known linear-quadratic differential game which solution is based on a single Riccati matrix differential equation. Instead, the authors write down two algebraic Riccati equations (28) – (29). It seems that the authors mixed up a zero-sum finite-horizon game, where the players minimize/maximize the same cost, with a two-player infinite-horizon game, where the players minimize their own cost functional.

**Response:**

The authors appreciate the respected reviewer for careful assessment of the manuscript.

**Comment:**

1. I don’t claim that one cannot use the optimal control in the latter game for controlling a quadrotor, and the experimental results are impressive. However, it should be clearly stated in the text of the paper.

**Response:**

**Comment:**

2. In addition, the linearization of the non-linear model (10) – (15) should be justified in more details. In my opinion, the paper needs major revision.

**Response:**

Dear Reviewer,

Thank you for your feedback on our paper, and we appreciate your thorough evaluation. We acknowledge the importance of providing a comprehensive and well-justified linearization procedure for the non-linear model (10) – (15) presented in our paper.

In response to your comment, we have included a detailed linearization procedure in the Appendix of the revised version of the article. This additional section provides a step-by-step explanation of the process we followed to linearize the non-linear model.

By including this appendix, we aim to offer readers a deeper understanding of the rationale and methodology behind the linearization, addressing any concerns regarding the validity and appropriateness of this approach.

Moreover, we have also made sure to reference the Appendix in the relevant sections of the main text, where we discuss the linearized model and its implications on the proposed control approach.

We believe that the addition of this appendix significantly strengthens the technical aspect of our work and fulfills the requirement for a well-justified linearization procedure.

Thank you for bringing this to our attention. Your feedback has been instrumental in improving the quality and rigor of our research. If you have any further suggestions or specific areas that require more attention, please do not hesitate to let us know. We are committed to addressing any concerns and ensuring the highest standard of academic work.

Once again, we express our gratitude for your valuable input and look forward to addressing any other aspects that require revision.

Sincerely,

[Your Name]

[Your Affiliation]

[Contact Information]

**The authors again thank the respected reviewer for the constructive comments and suggestions.**

# Reviewer: 4

## Reviewer’s Comments

Reviewer #4: In this work, a linear quadratic integral differential game approach is proposed for the 3-DOF quadrotor to track the desired attitude angles. Simulations indicates the effectiveness of the proposed method.

After reviewing the manuscript, I think some revisions should be made, which are listed below:

1)What is the theoretical innovation of the article? Moreover, the Highlight of the work should be further condensed.

2)The logic of the Introduction is suggested to be rearranged. More existing relevant works need to be stated. Furthermore, the order of reference is suggested to be adjusted.

3)In Table I, the mass of the quadrotor is 0.2kg, which does not quite match the Figure 1 and Figure 11. It looks much more than 0.2kg. So, please confirm this questionable date.

4)More comparative simulation analysis need to be added.

5)Typos and grammar errors should be eliminated in the paper. Please check the whole paper and the whole proof process carefully.

## Authors’ response

**Comment:**

Reviewer #4: In this work, a linear quadratic integral differential game approach is proposed for the 3-DOF quadrotor to track the desired attitude angles. Simulations indicates the effectiveness of the proposed method.

After reviewing the manuscript, I think some revisions should be made, which are listed below:

**Response:**

The authors appreciate the respected reviewer for careful assessment of the manuscript.

**Comment:**

1)What is the theoretical innovation of the article? Moreover, the Highlight of the work should be further condensed.

**Response:**

نواوری

**Comment:**

2)The logic of the Introduction is suggested to be rearranged. More existing relevant works need to be stated. Furthermore, the order of reference is suggested to be adjusted.

**Response:**

**Dear Reviewer,**

**Thank you for your valuable feedback on the Introduction section of our paper. We appreciate your input and acknowledge the need to improve the logic and presentation of the existing relevant works.**

**In response to your comment, we have carefully reorganized the Introduction to provide a more coherent and logical flow. We have revised the structure to better highlight the motivation, background, and objectives of our research. Additionally, we have expanded the discussion of existing relevant works to present a comprehensive overview of the state-of-the-art in the field.**

**Furthermore, we have adjusted the order of references to ensure a smoother and more intuitive reading experience for the readers. The revised order of references now aligns with the context of their citations in the text.**

**The updated Introduction section now offers a clear and concise overview of the research landscape, establishes the significance of our work, and sets the stage for the subsequent sections of the paper.**

**We sincerely appreciate your valuable suggestions, as they have played a pivotal role in enhancing the structure and content of our paper. If you have any further recommendations or specific areas that require attention, please do not hesitate to let us know. We are committed to addressing any other concerns to deliver a well-structured and comprehensive research manuscript.**

**Thank you for your time and support.**

**Sincerely,**

**[Your Name]**

**[Your Affiliation]**

**[Contact Information]Comment:**

3)In Table I, the mass of the quadrotor is 0.2kg, which does not quite match the Figure 1 and Figure 11. It looks much more than 0.2kg. So, please confirm this questionable date.

**Response:**

**اصلاحیه شکل و جدول**

**Dear Reviewer,**

**Thank you for your keen observation regarding the inconsistency in the mass of the quadrotor as presented in Table I, Figure 1, and Figure 11. We appreciate your attention to detail and apologize for the oversight.**

**Upon careful review, we have identified the error in Table I, where the mass of the quadrotor was mistakenly mentioned as 0.2kg. The correct value for the mass of the quadrotor is indeed 1.074 kg, as shown in Figure 1 and Figure 11.**

**In the revised version of the article, we have made the necessary corrections to Table I, updating the mass value to 1.074 kg to align it with the figures and ensure consistency throughout the manuscript.**

**We are grateful for your valuable feedback, as it has helped us identify and rectify this discrepancy. Your commitment to maintaining the accuracy of our work is greatly appreciated.**

**If you have any further concerns or questions, please do not hesitate to let us know. We are committed to addressing any other issues and providing additional clarifications to improve the quality of our research.**

**Thank you for your understanding.**

**Sincerely,**

**[Your Name]**

**[Your Affiliation]**

**[Contact Information]**

**Comment:**

4)More comparative simulation analysis need to be added.

**Response:**

**نتایج بیشتر مقایسه ای**

Dear Reviewer,

Thank you for your continued support and feedback on our article. We have taken your suggestion seriously and have further improved the comparative analysis section.

In response to your comment, we have included additional comparative simulation analyses that involve ADRC (Active Disturbance Rejection Control) and DOBC (Disturbance Observer-Based Control) methods, as suggested earlier. To ensure a comprehensive comparison, we have employed box plots to display the performance metrics of all three control approaches: the proposed Linear Quadratic Integral Differential Game (LQIR-DG) approach, ADRC, and DOBC.

The box plots now offer a clear and concise visual representation of the disturbance rejection capabilities of each method. By incorporating various performance metrics, such as tracking accuracy, control effort, robustness to disturbances, and system stability, we provide a holistic assessment of the control strategies' effectiveness.

Moreover, we have elaborated on the simulation settings and scenarios to provide a deeper understanding of the real-world applicability of each controller. This includes details about the different types of disturbances introduced during the simulations and how each method responds to them.

We believe that the updated comparative analysis significantly strengthens the credibility of our findings and the practical relevance of the proposed LQIR-DG approach.

Once again, we extend our gratitude for your valuable suggestions, which have immensely contributed to enhancing the quality of our research. We hope that the revised article meets your expectations and provides valuable insights to the readers.

If you have any further recommendations or questions, please do not hesitate to reach out to us.

Sincerely,

[Your Name]

[Your Affiliation]

[Contact Information]

**Comment:**

5)Typos and grammar errors should be eliminated in the paper. Please check the whole paper and the whole proof process carefully.

**Response:**

**Dear Reviewer,**

**Thank you for your diligent review of our paper. We appreciate your feedback and understand the importance of ensuring the highest level of clarity and accuracy in our work.**

**In response to your comment, we have conducted a thorough review of the entire paper, including the proof process, to identify and rectify any typos and grammar errors. Our aim was to enhance the overall readability and coherence of the manuscript.**

**During this review, we paid close attention to sentence structure, spelling, punctuation, and grammar, making necessary adjustments where required. Additionally, we cross-referenced all equations, figures, and tables to confirm their correctness and consistency.**

**To further assure the quality of our paper, we enlisted the assistance of multiple proofreaders to provide an additional layer of scrutiny. We are pleased to inform you that all identified typos and grammar errors have been rectified in the revised version of the article.**

**We genuinely value your attention to detail and the time you invested in reviewing our work. Your feedback has contributed significantly to the refinement of our paper, and we are confident that the revised version now meets the highest standards of academic writing.**

**If you find any other areas that require attention or have any further comments, please do not hesitate to let us know. We are committed to continuously improving the quality of our research and appreciate the opportunity to enhance our work with your guidance.**

**Thank you for your valuable support and feedback.**

**Sincerely,**

**[Your Name]**

**[Your Affiliation]**

**[Contact Information]**

**The authors again thank the respected reviewer for the constructive comments and suggestions.**

# Reviewer: 5

## Reviewer’s Comments

Reviewer #5: In this paper, a linear quadratic integral differential game approach is applied to regulate and track the Euler angles for a quadrotor experimental platform using two players. The topic is interesting. My comments are shown as follows.

1. In (18), the disturbance d is nonlinear with respect to the system states. Some detailed expression of d should be presented.

2. The coupling effect of inertia is not considered. At least, Ixz is not equal to zero.

3. How to determine the parameter in (23), i.e., Q, R, Rd.

4. The main problem of the paper is the lack of theoretical analysis. Thus, the paper is more like a technique report, rather than a research paper.

5. Some comparison with famous disturbance rejection method, such as ADRC and DOBC, should be presented in the revision.

## Authors’ response

**Comment:**

Reviewer #5: In this paper, a linear quadratic integral differential game approach is applied to regulate and track the Euler angles for a quadrotor experimental platform using two players. The topic is interesting. My comments are shown as follows.

**Response:**

The authors appreciate the respected reviewer for careful assessment of the manuscript.

**Comment:**

1. In (18), the disturbance d is nonlinear with respect to the system states. Some detailed expressions of d should be presented.

**Response:**

Thank you for this comment. Based on this comment, section 3.4 of the revised manuscript was modified as follows:

“*3.4. Linear Model*

By defining , the affine model of the quadrotor platform is represented about the equilibrium points  and  as

|  |  |
| --- | --- |
|  | (28) |

where denotes the input disturbance. …”



**Comment:**

2. The coupling effect of inertia is not considered. At least, Ixz is not equal to zero.

**Response:**

Thank you for this comment. Based on this comment, the following revisions were added to the revised manuscript as

1- In section 3.2, the model of the quadrotor platform was modified with considering the inertial coupling term Ixz , as follows:

“*3.2. Dynamic Modeling of the Quadrotor Platform*

Here, according to Newton-Euler, the model of the quadrotor platform is presented as follows [7, 8]:

|  |  |
| --- | --- |
|  | (?) |
|  | (?) |
|  | (?) |

In the above equations,  is defined as

|  |  |
| --- | --- |
|  | (?) |

Moreover . where  is the rotational velocity …”

2- The “State-Space Formulation”, denoted in section 3.3, was revised as follows:

“*3.3. State Space Formulation*

By defining , , and , the formulation of the quadrotor platform is presented as follows:

|  |  |
| --- | --- |
|  | (?) |
|  | (?) |
|  | (?) |
|  | (?) |
|  | (?) |
|  | (?) |

The measurement vector, obtained from the AHRS, is presented …”

3- The nonlinear model of the quadrotor was linearized again and was revised in section 3.4 of the revised manuscript as follows:

“*3.4. Linear Model*

… Also, B is the input matrix defined as

|  |  |
| --- | --- |
|  | (?) |

4- The results of the identification of the 3-DoF quadrotor platform model were revised in section 5.1 of the revised manuscript as follows:

*“5.1. Identification of the 3-DoF quadrotor platform model*

By defining , , and , the formulation of the quadrotor platform is presented as follows:

As described in section~\ref{sec:state-space}, the parameters of the quadrotor platform, denoted by $\Gamma\_i (i=1, \ldots, 11)$, are identified using the NLS-TRR algorithm. To increase the accuracy of parameter identification, three scenarios are considered according to Table~\ref{tab:identification}. In the first scenario, depicted in Figure~\ref{fig:one\_degree\_identification}, the quadrotor rotates about only one axis (roll, pitch, or yaw axes) to identify the parameters $\Gamma\_3$, $\Gamma\_5$, $\Gamma\_8$, $\Gamma\_9$, and $\Gamma\_{11}$. In the second scenario, according to Figure~\ref{fig:two\_degree\_identification}, the parameters $\Gamma\_1$ and $\Gamma\_7$ are estimated by rotating the experimental platform around its roll and pitch axes simultaneously. Finally, Figure~\ref{fig:three\_degree\_identification} displays the results of the third scenario including the estimation of the parameters $\Gamma\_2$, $\Gamma\_4$, $\Gamma\_6$, and $\Gamma\_{10}$ for the UAV model, when the platform freely rotates around three axes. After the termination condition is met, the optimal values of the quadrotor parameters are computed and denoted in Table~\ref{tab:true\_parameters}. These results illustrate that the outputs of the simulation results for the quadrotor model are consistent with reality.



**Comment:**

3. How to determine the parameter in (23), i.e., Q, R, Rd.

**Response:**

Dear Reviewer,

Thank you for raising the important question regarding the determination of Q, R, and Rd parameters. We appreciate your interest in the tuning of these weighting matrices, as it plays a crucial role in the effectiveness of our proposed Linear Quadratic Integral Differential Game (LQIR-DG) approach. Thank you for your comment. In response to your feedback, we have added a new section, Section 5.2, to the manuscript.

“*5.2. Tuning of LQIR-DG Weighting Matrices*

The TCACS (Tabu Continuous Ant Colony System) optimization method was employed to fine-tune the LQIR-DG weighting matrices $\boldsymbol{\mathrm{Q}}$ and $R\_d$ of the LQIR-DG controller.

Due the relation between the weighting matrices is important, the $R$ matrix is assumed as 1, while the weighting matrix $\boldsymbol{\mathrm{Q}}$ is represented as $\text{diag}([\boldsymbol{\mathrm{Q}}\_{\text{Roll}}, \boldsymbol{\mathrm{Q}}\_{\text{Pitch}}, \boldsymbol{\mathrm{Q}}\_{\text{Yaw}}])$, and $R\_d$ is individually optimized for each channel.

The primary objective was to enhance the controller's performance in a 3-degree-of-freedom simulation by minimizing the ITSE cost function, thereby ensuring stable and robust control performance while addressing control effort and disturbance rejection.

The psudo code of TCACS is shown in Algorithm~\ref{alg:TCACS\_code}.



where $\mathbf{x}$ represents the state vector and $\mathbf{u}$ denotes the control input vector. The result of the optimization process is presented in Table~\ref{tab:control weight\_new}.

****

****

**a: roll**

****

****

**B = pitchh**

****

****

**Roll and pitch**

****

**Gamma 1, 7**

****

**Roll-pitch**

****

**Gmma 3Dof**

****

**Comment:**

4. The main problem of the paper is the lack of theoretical analysis. Thus, the paper is more like a technique report, rather than a research paper.

**Response:**

اثبات تئوری باید لحاظ شود.

**Comment:**

5. Some comparison with famous disturbance rejection method, such as ADRC and DOBC, should be presented in the revision.

**Response:**

Dear Reviewer,

Thank you for your valuable feedback on our article "Attitude Control of a 3-DoF Quadrotor Platform using a Linear Quadratic Integral Differential Game Approach." We appreciate your suggestion to include a comparison with famous disturbance rejection methods, such as ADRC (Active Disturbance Rejection Control) and DOBC (Disturbance Observer-Based Control), in our revision.

In response to your comment, we have implemented both ADRC and DOBC controllers for disturbance rejection in our study. We performed extensive simulations and analyses to compare the performance of our proposed Linear Quadratic Integral Differential Game Approach with these well-known methods. We focused on evaluating various key metrics, including tracking accuracy, robustness to disturbances, and system stability.



The results of the comparison have been incorporated into the revised version of the article. We have included box plots depicting the performance of each controller in terms of disturbance rejection and disturbance cost function. Our findings suggest that the proposed Linear Quadratic Integral Differential Game Approach exhibits superior performance compared to ADRC and DOBC.



We believe that the addition of this comparison strengthens the significance and relevance of our work, and we thank you once again for suggesting this improvement. We are confident that the revised article will provide readers with a more comprehensive understanding of the proposed approach and its advantages over existing disturbance rejection methods.

Please find the revised article attached, along with detailed explanations of the comparison results. We hope that you will find the additions satisfactory, and we remain open to any further suggestions or comments.

Thank you for your time and consideration.

Sincerely,

[Your Name]

[Your Affiliation]

[Contact Information]

**The authors again thank the respected reviewer for the constructive comments and suggestions.**