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Jury Member Report – Doctor of Philosophy thesis.

Name of Candidate: Aleksei Postnikov

PhD Program: Computational and Data Science and Engineering

Title of Thesis: Towards seamless autonomous navigation in dense urban environments

Supervisor: Associate Professor Gonzalo Ferrer

Name of the Reviewer: Konstantin Yakovlev

I confirm the absence of any conflict of interest (Alternatively, Reviewer can formulate a possible conflict)	**Date: 26-August-2024**

The purpose of this report is to obtain an independent review from the members of PhD defense Jury before the thesis defense. The members of PhD defense Jury are asked to submit signed copy of the report at least 30 days prior the thesis defense. The Reviewers are asked to bring a copy of the completed report to the thesis defense and to discuss the contents of each report with each other before the thesis defense.

If the reviewers have any queries about the thesis which they wish to raise in advance, please contact the Chair of the Jury.

Reviewer's Report

Reviewers report should contain the following items:

- Brief evaluation of the thesis quality and overall structure of the dissertation.
- The relevance of the topic of dissertation work to its actual content
- The relevance of the methods used in the dissertation
- The scientific significance of the results obtained and their compliance with the international level and current state of the art
- The relevance of the obtained results to applications (if applicable)
- The quality of publications

The summary of issues to be addressed before/during the thesis defense

Brief evaluation of the thesis quality and overall structure of the dissertation: The dissertation is nicely structured and is generally easy to follow. However, some small paragraphs and sections can be merged for better flow. In general, the quality of the dissertation meets the bar as it presents a comprehensive investigation of the challenging problems and original methods to solve them.

The relevance of the topic of dissertation work to its actual content: The thesis's content aligns with the topic.

The relevance of the methods used in the dissertation: The methods used are various machine learning techniques and optimization algorithms. These are relevant to the field of autonomous robotics.

The scientific significance of the results obtained and their compliance with the international level and current state of the art: Two main contributions: uncertainty-aware motion prediction and trajectory optimization. These have a significant scientific value and are in line with international standards and state of the art related works.

The relevance of the obtained results to applications: The findings presented in this thesis have clear applications in autonomous vehicles, social robotics, and other domains requiring safe and efficient navigation in complex environments.

The quality of publications: From what I can see, several papers were published in peer-reviewed venues that cover certain chapters of the Thesis. On the one hand, the quality of the publications is high, and it is worth mentioning that the publications' venues include the top-ranked robotic conferences such as ICRA, IROS. On the other hand, some publications are available only as (non peer-reviewed) pre-prints. Moreover, in some publications the candidate is not the first author which raises the question on his contribution. I wish a statement on such personal contribution has been explicitly made in text (I was not able to locate it, maybe, I have just missed it).

The summary of issues to be addressed before/during the thesis defense:

All the following issues are not critical and do not require major revision.

1. Several chapters are dedicated to the same problem, i.e. trajectory prediction. However, the clear formal problem statement, which I presume should be same for all chapters, is missing. I wish that such a formal statement was presented.
2. Some notions are repeatedly introduced in Thesis, moreover slightly varying notation is used. For example, such performance indicators as ADE or FDE are introduced in Chapter 4 (4.21, 4.22), Chapter 5 (pages 56, 57, formulas not numbered), Chapter 6 (6.9, 6.10) always using (slightly) different notation.
3. I did not quite understand the contribution delivered by Chapter 7. The explicit formulation of such contribution in Section 1.2 is missing. It is also not quite clear why the author instead of previously used measures ADE and FDE switches to minADE and minFDE in this Chapter. For me it seems quite ad-hoc.
4. It is not quite clear whether any kind of trajectory prediction is used when solving trajectory optimization problem described in Chapter 8. Seems that the static

environment is considered. Thus, the Chapter looks somewhat 'disconnected' from the previous ones.

5. In Section 1.2. several contributions are mentioned that are not then covered in the text of the Thesis, i.e. Social Robot Navigation through Constrained Optimization and Coinbot: Intelligent Robotic Coin Bag Manipulation.

Provisional Recommendation

☐ ***I recommend that the candidate should defend the thesis by means of a formal thesis defense***

☐ ~~*I recommend that the candidate should defend the thesis by means of a formal thesis defense only after appropriate changes would be introduced in candidate's thesis according to the recommendations of the present report*~~

☐ ~~*The thesis is not acceptable and I recommend that the candidate be exempt from the formal thesis defense*~~