Dear Editor,

We would like to thank you for the editorial job on our article

" **Can greedy-like heuristics be useful for solving the Weighted Orthogonal Art Gallery Problem under regular grid discretization?**"

which we submitted for possible publication in *IJEEC journal.*

We also thank the Referee for his valuable comments. We accepted them in the revised version of the paper that is enclosed in the attachment.

We answered to the Referee comments in a separated letter enclosed below.

Sincerely yours,

Authors

" **Can greedy-like heuristics be useful for solving the Weighted Orthogonal Art Gallery Problem under regular grid discretization?**""

**Answers to Reviewer 1.**

We are grateful to the Referee for his valuable comments and suggestions which have helped us to improve the paper. We now give detailed answers to all the comments.

This paper proposes the use of greedy-like heuristics for the Weighted Orthogonal Art Gallery Problem under regular grid discretization.

While I believe the problem may have interesting applications and the paper is well written, I believe it currently has important issues that need to be addressed and, in my view, it doesn't present enough novelty for publication at this moment. Similar problems and variants of the Art Gallery Problem were considered in recent papers with very successful results in practice. It's not clear to me that these algorithms couldn't be applied with little modification to solve the discretized WOAGP or even its continuous (and more challenging) version where the objective is to cover the whole polygon. The problem itself, after discretization, seems to be almost the same as solving the Weighted Set Cover Problem. That said, it would be more significant to solve the problem without discretization, aiming at the full coverage of the polygon. I also believe that the experiments are not enough and they need to be more detailed and performed on larger data sets.

**Answer**

We thank to Reviewer for his valuable comments.

We completely understand the Reviewer's remark and we would like to explain the motivation of our approach.

The aim of our paper was not to propose any new state-of-the-art method for solving discrete AGP, but the investigate whether "an easy to implement" greedy like heuristics could be applied on the weighted variant of the problem. In that sense, we consider that it would be very hard to expect that our relatively simple greedy-like methods could outperform or even be comparable to the well known sophisticated state-of-the-art methods. On the other hand, our paper proposes a fast and simple greedy approach which could be used in practical situations when regular grid discretization can be applied, for example to help engineers in their tasks related to the problem, such as determining location of cameras in order to minimize the installation costs. We believe that the novelty of our approach lays in the construction of the greedy approach based on balancing the trade off between the total sum of guards' costs and the total number of not yet covered points from the discretization, also considering different types of weights for benchmarks, based on an approximation of the costs in real situations.

Still, we consider that Reviewer's comments very valuable and we tried to improve the paper according to the suggestions.

**Reviewer’s comments**

Page 1:

**Remark1**

+ Couto et al. algorithm appears in different papers on the topic, with the last and more robust version being able to solve general polygons with up to 2500 vertices (including orthogonal instances).

[1] Couto, M.C., de Rezende, P.J., de Souza, C.C.: An exact algorithm for minimizing vertex guards on art galleries. Int. Trans. Oper. Res. 18, 425–448 (2011)

How this new algorithm compares with Couto et al. work (same weight for all guards)? Is it possible to easily adapt Couto et al. work to solve this version of the problem? If yes, would be important to compare with it.

Answer

As we mentioned above, we believe that the adaptation of the Couto's algorithm, as well as the algorithms presented in a survey paper written by Rezende et al. will outperform our simple greedy like algorithm (and its hybridizations as well), so we did not include such a comparison.

**Remark2**

+ I believe it's important to add as reference the following survey on Algorithms for the AGP, which presents a comparison of different state-of-the-art algorithms for optimally solving the AGP with vertex guards. It shows a big improvement (speed up) over Couto et al. approach when using C+BS-2013 algorithm, which can solve instances with 5000 vertices in minutes. This is important to mention and to consider if comparing with Couto et al. work.

[2] Pedro J de Rezende, Cid C de Souza, Stephan Friedrichs, Michael Hemmer, Alexander Kröller, Davi C Tozoni: Engineering art galleries. Algorithm Engineering, 379-417 (2016)

+ Missing references for other recent works proposing practical solutions for AGP problems. Some of them include also greedy algorithms.

- [3] Amit, Y., Mitchell, J.S.B., Packer, E.: Locating guards for visibility coverage of polygons. Int. J. Comput. Geom. Appl. 20(5), 601–630 (2010)

- [4] Fekete, S.P., Friedrichs, S., Kröller, A., Schmidt, C.: Facets for art gallery problems. Algorithmica 73(2), 411–440 (2014)

- [5] Bottino, A., Laurentini, A.: A nearly optimal algorithm for covering the interior of an art gallery. Pattern Recogn. 44(5), 1048–1056 (2011).

**Answer**

We appriciate to Referee for this remark. We included the suggested references in out paper. In the new version of the paper, the following text is added:

TEXT

**Page 2:**

**Remark3**

+ Is there any previous work on (continuous or discrete) WOAGP?

**Answer**

While reviewing the literature, we could not find any relevant work concerning the weighted version of the AGP. In our paper, we only noticed that WOAGP (discrete variant) is related to the Minimum Weighted Set Cover Problem (MWSCP).

**Remark4**

+ "An anytime algorithm to compute..."?

**Answer**

We improved the sentence. In new version it looks like

An anytime algorithm which computes successively better approximations of the optimum for Minimum Vertex Guard is proposed in [8].

**Remark5**

+ Why using the regular grid discretization? It seems to not be a good choice even for the experimented data (minArea polygons). Other discretizations are discussed in previous papers that seem to obtain good results, as the one in Couto et al. [1] last work using Shadow AVPs and the one called Chwa Points in Tozoni et al.. I suggest including reference to

[6] Chwa, K., Jo, B., Knauer, C., Moet, E., van Oostrum, R., Shin, C.: Guarding art galleries by guarding witnesses. Int. J. Comput. Geom. Appl. 16(2–3), 205–226 (2006).

**Answer**

We can agree with the Reviewer that the chosen discretization is not ideal and in some cases it fails to provide the full optimal covering of the whole polygon.

In future, we are planning to extend our research in that direction, which we also noticed in Conclusion section (in the Future work paragraph).

**Remark6**

+ It is confusing sometimes if WOAGP refers to the discrete or continuous version of the problem. Please, use different names for the two versions of the problem.

**Answer**

The Referee is right. We adapted the text in the sense that the discrete version is called discrete WOAGP. We corrected the text where it is needed.

Page 3:

**Remark7**

+ "Solution component of the problem is a guard"?

**Answer**

**Nisam popravio**

**Remark8**

+ Meaning of "S" symbol in equations is confusing. In first line of the page (C contained in {S\_1,...,S\_i}) seems to refer to points that can be guards. Later on, it seems to refer to sets of points in D(P) that are visible from vertices.

**Answer**

**Nisam popravio i tu sam stao**