

Interactive comment on “USAR simulation system: presenting spatial strategies in agents’ task allocation under uncertainties” by Navid Hooshangi et al.

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This paper proposes an agent-based simulation model to investigate uncertainty in tasks allocations in urban search and rescue (USAR) operation. The paper has an interesting and relevant topic to this journal. Although, the paper provides a clear image of the performed research and has a sound experimental work, my concern lays in its profession English writing even by a large effort that went into this study. It is believed by this reviewer that the manuscript deserves publication once the following minor comments are observed.

Response: Thank you for your in-depth analysis. Although the manuscript has been

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edited by “Academic Proofreading Services Ltd” for any spelling and grammatical errors before submitting the article. After applying the corrections intended by the reviewers, it was sent to “Text check - English Consultants” again for English editing, so two natives reviewed and corrected the article. Certification is sent in attachment.

1- The innovation of the article should be explicitly stated in the abstract, as well as in the introduction, the volume of the article can be reduced by deleting the general and repetitive sentences.

Response: This insightful comment is highly appreciated. In order to express the research innovation, the following sentence added to the abstract and introduction section. The article was reviewed and repetitive and general sentences were removed to reduce the volume of the article. The changes are marked by the track and change tool in Word. In Abstract: “Applying allocation strategies is the main innovation of the method.” In Section 1. Introduction: “The main innovation of the study is the establishment of an approach to improve conditions during reallocations or future allocations when initial allocations encounter problems due either to availability uncertainties or the addition of a new task.”

2- In the abstract, the numerical results should be expressed as percentages to make them more understandable.

Response: The authors completely agree with the reviewer’s comment and have revised the sentences as follows to make the results understandable. In Abstract: “Interval uncertainty analysis and comparison of the proposed strategies showed that increased uncertainty led to increased rescue time for the CNP and strategies 1 to 4. The time increase was less with the uniform distribution strategy (strategy 4) than with the other strategies.”

3- Authors are requested to elaborate on how their proposed method can be used in the real disaster environment? Do rescuers need to use mobile phones and tablets as an assistant agent?

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Response: The implemented method can be used for cooperation between different agents. In crisis environments, rescue teams use assistant agents. These agents can be as software on a mobile phone or tablet. Thank you for pointing out this concern to us. In Section 6. Conclusion: “The implemented method can be used for cooperation among agents. In an earthquake-stricken environment, rescuers can use assistant agents (devices such as mobile phones and tablets) to implement this methodology.”

4- In the text, either uses the word reallocation or replanning.

Response: The term “reallocation” was changed to “replanning”.

5- State the references used for the following sentence or argue on its reasons. “Methods such as simulated annealing (SA) and the ant colony optimization algorithm cannot find a global optimization of the problem and provide local solutions instead.”

Response: The reference of the stated sentence was added. In Section 2.3. Reallocation and reassigning methods section: “Methods such as simulated annealing (SA) and the ant colony optimization algorithm cannot find a global optimization of the problem and provide local solutions instead [12].”

5- In the implemented method, express what happened if a task is not executed, are the new values definitely considered or re-entered into the cycle with uncertainty?

Response: The following sentences were added to the text to clarify the subject. In Section 4.3.5. Implementation and observation of real values in the environment section: “If the agent observes a large difference between the auction information and the real environment, the agent abandons that task. In this instance, the agent updates the task’s values and uncertainties and returns the work to the central agent. The new uncertainty interval will be 80% smaller than the original interval.”

6- State the units used in Equation 1 for distance, etc.

Response: The following sentence was added to state the units used in Equation 1. In Section 4.3.3. Holding an auction section: “In Equation 1, the distance (in meters),

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severity of the victims' injuries, and task priority are based on values declared by the central agent.”

7- More explanation of Figure 3 is needed.

Response: We generally agree with the reviewer's point to add more explanation in Figure 3. The following sentence was added to the text. In Section 4.3.4. Applying allocation strategies section: “In Figure 3, a rescue agent located centrally has a strategic position and will try to maintain this position. Although the total movement may increase, if there are problems in performing other tasks, this agent can help all other groups.”

8- How did you create the real numbers in step 5 of the proposed method?

Response: Due to the fact that in the real world it was not possible to evaluate the model, simulated values were used. Random numbers in $[X - 30\%X, X + 30\%X]$ interval was used to create the values of the simulation environment. In Section 4.3.5. Implementation and observation of real values in the environment section: “In this study, a random number in the $[X - 30\%X, X + 30\%X]$ interval was chosen to model the real environment.”

9- Correct Equations numbering.! Equation 1 exists in two parts.

Response: Thanks to this statement, the equation numbering was corrected.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2020-277>, 2020.

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