

Dear Anonymous Reviewer,

We highly appreciate your time to review our manuscript and the helpful comments. Please see our response below.

Response to the Anonymous Reviewer's Comments

C1: (Effectiveness of MOPSO) Particle Swarm Optimization (PSO) is often used for optimization with continuous variables. Even though authors apply a simple and traditional way (just rounding up and down) to change continuous values to discretized values, there is no specific reason why PSO works better than other algorithms, for example Genetic Algorithm (Pratap et al. 2002) or Nested Partitions algorithm (Shi and Olafsson 2000). Especially, this problem includes categorical type variables (i.e., two adjacent solutions may not have any functional relationship) and thus I am still wondering why authors have tried to adjust PSO to solve this problem and how their algorithm outperforms the existing algorithm.

A1: Thank you for your suggestion. The original MOPSO was proposed by Coello et al. in 2004. They developed MOPSO algorithm and compared it against three state-of-art multi-objective evolutionary algorithms of Nondominated Sorting Genetic Algorithm II (NSGA-II), Pareto Archived Evolution Strategy (PAES) and Microgenetic Algorithm for Multi-objective Optimization (MicroGA) using 5 different test functions. Experiment results show that MOPSO has a highly competitive performance and can be considered a viable alternative to solve multi-objective optimization problems and it can cover the full Pareto frontier of all the potential solutions with low computational time.

We also developed an enumeration search method to verify whether our modified MOPSO can get a full Pareto frontier or not. Results show that both the modified MOPSO and enumeration search method can get a same Pareto frontier. There is also a comparison between our algorithm and the GA used by Telci (on line 2 page 9 in our paper). The second highest pollution detection probability in our paper is 91.7% while the second highest pollution detection probability in Telci's paper is only 83%.

Based on the literature review and our practical testing and analysis, we think it is reasonable to adjust MOPSO to solve this optimization problem.

According to your suggestion and question, we will add a comparison of simulation results between the modified MOPSO and the enumeration research method as well as some discussion on why we use MOPSO to design an optimal network for water quality monitoring in the revised version.

C2: (Problem Formulation) Unless authors assume that each monitoring device should be discriminated, they should exclude repetition of solutions (e.g., (2,3,1) is the same as (1,2,3)). Without repetition, total number of potential deployment is $\binom{m}{n}$ not equation (1) in page 5. Also, authors mentioned that they will deploy 20 monitoring devices within 100 potential locations, readers cannot see any such example in the paper.

A2: Thank you very much for finding this mistake for us. We carefully checked equation (1) in our paper and found our equation missed out a divider of $(\prod_{i=1}^n i)$. The actual equation should be $T = (\prod_{i=1}^n (m - i + 1)) / (\prod_{i=1}^n i)$, which also can be simplified as $T = C_m^n$. We have updated the equation in the revised paper.

In our paper, the purpose of using an example of deploying 20 monitoring devices out of 100 potential locations is to demonstrate that it is almost impossible to search all the combinations

of deployment solutions using a traditional enumeration search method. For the simplicity of demonstration and the comparison to the literature, we only consider a situation of selecting 3 monitoring locations out of 12 locations.

C3: (Test Problem) In order to test the performance of their algorithm, they consider a hypothetical river with only 12 nodes (possible locations for monitoring stations). When selecting three locations out of 12 possible locations, there are only $\binom{12}{3} = 220$ potential cases. Thus, no optimization algorithm is needed to solve the problem (i.e., we can evaluate all possible cases easily). Unless authors apply their algorithm to a larger and more realistic case, such as Altamaha River case in Telci. et al. (2009), I believe it is hard to show the effectiveness of the algorithm in a practical point of view.

A3: The main purpose for us to use a relative simple demonstration of selecting 3 monitoring locations out of 12 locations is that: 1) for comparative analysis, we need to list all the optimal solutions and show all optimal deployment solutions on the Pareto frontier. 2) a simple demonstration is easy for us to use an enumeration search method to verify the correctness of our algorithm. However, our algorithm can support more larger cases by changing 2 parameters of Maxvar (maximal number of potential monitoring locations) and nVar (number of monitoring locations). In fact, we also tested our algorithm using $\binom{12}{4}$, $\binom{12}{5}$ and $\binom{12}{6}$ respectively and compared the optimal deployment solutions to the enumeration search method.

To apply our algorithm to a realistic case, we are planning to cooperate with Suzhou water monitoring office, a local government department to carry out research on the Wangyu River, which is between Yangzi River and Tai Lake, and obtain river parameters such as river width and depth at each segment, the regulation of water flow directions and catchment slopes.

We are also developing a prototype of wireless sensor based water quality monitoring system to collect other water quality data such as water flow speed and direction, PH, temperature, chlorophyll, blue-green algae, DO, turbidity, conductivity and NH.

It is estimated that we will spend 1 year to accomplish the prototype development and collect all the water quality data we need before we can apply our algorithm to the Wangyu River. We think that our current research achievements are worth to share with other researchers, which will give us an opportunity to discuss with external researchers and get suggestions and advices to further improve before we apply it to a realistic case.