

ABSTRACT

Evaluating Alternative Metaheuristic Algorithms for Procedural Content Generation in Game Design

Sana Alyaseri

Procedural Content Generation (PCG) has emerged as a powerful approach for automating game content creation, offering significant benefits in terms of cost reduction and time efficiency compared to traditional game design and development processes (Zhang, Zhang, & Huang, 2022). While Genetic Algorithms (GAs) have been widely used in PCG, alternative metaheuristic algorithms such as Particle Swarm Optimization (PSO) and Artificial Bee Colony (ABC) have demonstrated their effectiveness in delivering high-quality solutions and efficient optimization capabilities across different problem domains (Amato, 2017). However, their application in PCG remains limited. I aim to evaluate the performance of PSO and ABC in map layout generation, challenging the conventional use of GAs. By comparing three metaheuristic algorithms (GA, ABC, and PSO) I seek to assess the effectiveness of these approaches in generating game levels and identify any obvious differences in their performance characteristics. Comprehensive experiments are conducted, applying GA, ABC, and PSO to a map layout generation. Metrics like convergence speed and content quality are used to evaluate the generated game content. My findings reveal that both ABC and PSO demonstrate advantages over traditional GA implementations when generating game levels, indicating their potential for enhancing PCG. In this presentation, I will share the results of comparing three metaheuristic algorithms (GA, PSO, and ABC) in map layout generation for game levels, emphasizing the potential benefits of leveraging diverse algorithmic approaches to create more captivating and immersive game worlds. Also, I will conclude with a call for further research in this area to expose new possibilities in content generation. By considering varied metaheuristic approaches, game developers can improve content generation techniques and create more captivating and interactive player experiences.

References

- Amato, A. (2017). Procedural content generation in the game industry. In O. Korn & N. Lee (Eds.), *Game Dynamics: Best Practices in Procedural and Dynamic Game Content Generation* (pp. 15-25). Springer.
- Zhang, Y., Zhang, G., & Huang, X. (2022). *A survey of procedural content generation for games* [Paper presentation]. 2022 International Conference on Culture-Oriented Science and Technology (CoST), Lanzhou, China.
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