World Academy of Science, Engineering and Technology
International Journal of Computer and Systems Engineering
Vol:17, No:01, 2023

Solving a Micromouse Maze Using an Ant-Inspired Algorithm

Authors : Rolando Barradas, Salviano Soares, António Valente, José Alberto Lencastre, Paulo Oliveira

Abstract : This article reviews the Ant Colony Optimization, a nature-inspired algorithm, and its implementation in the Scratch/m-Block programming environment. The Ant Colony Optimization is a part of Swarm Intelligence-based algorithms and is a subset of biological-inspired algorithms. Starting with a problem in which one has a maze and needs to find its path to the center and return to the starting position. This is similar to an ant looking for a path to a food source and returning to its nest. Starting with the implementation of a simple wall follower simulator, the proposed solution uses a dynamic graphical interface that allows young students to observe the ants' movement while the algorithm optimizes the routes to the maze's center. Things like interface usability, Data structures, and the conversion of algorithmic language to Scratch syntax were some of the details addressed during this implementation. This gives young students an easier way to understand the computational concepts of sequences, loops, parallelism, data, events, and conditionals, as they are used through all the implemented algorithms. Future work includes the simulation results with real contest mazes and two different pheromone update methods and the comparison with the optimized results of the winners of each one of the editions of the contest. It will also include the creation of a Digital Twin relating the virtual simulator with a real micromouse in a full-size maze. The first test results show that the algorithm found the same optimized solutions that were found by the winners of each one of the editions of the Micromouse contest making this a good solution for maze pathfinding.

Keywords : nature inspired algorithms, scratch, micromouse, problem-solving, computational thinking
Conference Title : ICRI 2023 : International Conference on Robot Intelligence
Conference Location : Rome, Italy
Conference Dates : January 16-17, 2023