

## **Numerical simulations of agent navigation via half-sweep modified two-parameter over-relaxation (HSMTOR)**

### **ABSTRACT**

The research on the efficiency of route navigation has been continuously developing. Especially, the capability of the generated route to provide a collision-free route for an agent to move in a particular environment. Thus, this study attempts to solve the route navigational problem iteratively via a numerical method. A new method called Half-Sweep Modified Two-Parameter Over-Relaxation (HSMTOR) is used to solve the navigational problems. For numerical simulation purposes, HSMTOR is used to obtain Laplace's equation solutions called harmonic functions. A gradient descent search algorithm then utilizes the harmonic functions to provide a smooth and collision-free route for an agent to commute inside the environment. In addition, the formulation of the HSMTOR iterative method is presented. Several numerical experiments and simulations are conducted in order to verify the efficiency of the proposed method. The result shows that the proposed method performed better than the existing methods such as full-, half-sweep for Modified Successive Over-Relaxation, Modified Accelerated Over-Relaxation and Modified Two-Parameter Over-Relaxation respectively (FSMSOR, HSMSOR, FSMAOR, HSMAOR and FSMTOR) .