

"Music Genre Recognition: Developing a Tool to Identify Genre Specific Characteristics of a Musical Piece"

Elena Fiocca (Computer Science)

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Abstract

Pattern recognition is the field of study concerned with assigning an object or an event to a category. Each category is defined by a set of features that emphasize the similarities among the objects or the events in the category. It is the occurrence of these features across different object and event samples that create the patterns identified in pattern recognition. These patterns are then classified in a procedure known as pattern classification, which assigns a label to the patterns. This thesis explores the application of pattern recognition to MIDI music files and classifies the patterns identified by assigning a genre label to the music file. The complete software development seeks to highlight the significance of pattern recognition through its application to music classification by genre, and to aid those who value a deeper and richer understanding of music analysis.



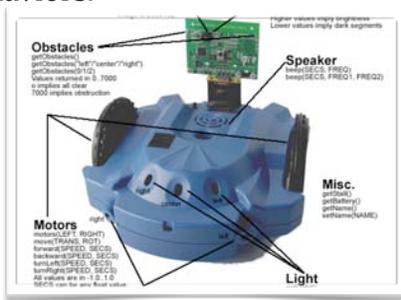
"Exploring the Capabilities of the Scribbler Robot as a Teaching Tool for Introductory CS Classes"

David Mar (Computer Science)

Advised by Sofia Visa (CS)

Abstract

This thesis focuses on assessing the advantages and disadvantages of the Scribbler robot as a teaching tool in an introductory computer science course. This is achieved by collecting data on motor and sensor behavior through repeated testing, using the robot to interpret environmental data, and implementing more advanced algorithms for maze navigation and light following behaviors.



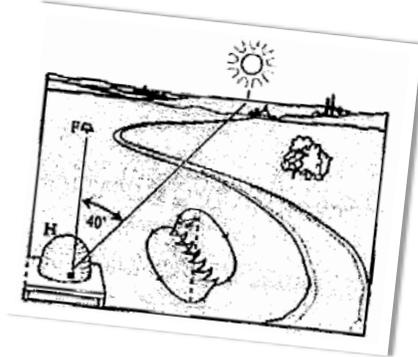
"We Didn't Start the Fire! Applying Swarm Intelligence to Unmanned Aerial Vehicles for Forest Fire Suppression"

Daniel Norris (Computer Science)

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Abstract

Swarm intelligence is a form of artificial intelligence that is inspired by behavior exhibited by social insects as well as bird flocks and wolf packs. This paper seeks to use swarm intelligence as a means of creating a model to coordinate a group of Unmanned Aerial Vehicles (UAVs) in order to suppress the spread of forest fires. A basic overview of the Particle-Swarm Optimization (PSO) and the Ant Colony Optimization (ACO) heuristics are provided as an introduction to the field. Digital pheromones are used to represent the fire in an abstract manner as well as to provide a means of communication between the UAVs. A multi-agent simulation is developed in order to test the model. Three experiments are conducted to test various parameters used in the UAV model. It is found that the swarm size and the pheromone threshold both have a strong correlation with the end time of the simulation in addition to the size of the fire. Each experiment is run with random and non-random environmental conditions to create a basis for comparison. In the worst case, the UAV swarm was able to contain the fire 72.3% of the time while the best case contained the fire 90.9% of the time.



"BitTorrent-Enhanced Distributed Internet Caching: Applying Peer-to-Peer Protocols to Enhance Performance and Scalability of Browser-Accessible Internet Resources"

Max Rafferty (Computer Science)

Advised by Sofia Visa (CS)

Abstract

This research proposes the BitTorrent-Enhanced Distributed Internet Caching (BEDIC) system, which extends the existing BitTorrent file-sharing system to access and distribute URL-accessible content such as HTML files using peer-to-peer methods. Our experiments confirm that our BEDIC implementation is able to match the network performance of current client/server and peer-to-peer file access methods while remaining fully scalable to usage and robust to changing network conditions, unlike any current URL accessible file distribution system.