National Institute of Technology Rourkela

Synopsis Seminar

Seminar Title	: Analysis and Implementation of AI-Approaches towards Terrain Exploration and Control of Humanoid Locomotion.
Speaker	: Vikas (Rollno : 519me1019)
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Venue	: ME Seminar Hall (ME-001)
Date and Time	: 04 Nov 2024 (9:35 am)
Abstract	: Exploring an optimal path for Humanoid locomotion is a challenging idea which also demands for a smooth and collision-free path. In the current work, various path-planning algorithms are introduced to achieve the objectives. The classical-based Linear regression model, memory-less Gravitational Search Algorithm (GSA) models, and memory-based Harris-Hawk optimization (HHO), Archerfish Hunting Optimization (AHO), and Slime Mould (SM) models are introduced for effective path planning of the NAO robots. The modifications to the standard approaches, hybridization of the different standalone models, and tuning of the different standalone models using the classical approach are performed to evaluate the effectiveness of the different models. The path exploration is performed in both environments with static-only obstacles and with static and dynamic environments. In path planning, in an environment with dynamic obstacles, the Petri-Net model is introduced with the other approaches to ensure a collision-free path when multiple NAO robots participate in the path planning. Also, the camera-vision approach is introduced to perform path planning in an environment with uneven floor conditions. To further evaluate the performance, the different models are compared with the existing approaches developed by the researchers using different approaches on other complex environments. Improvements of more than 5% were recorded using the different controllers. The different modified and hybrid models showed optimal performance compared to the existing research. Further, the improved models showed an efficient path exploration compared to the standard models in various complex terrains. To reduce the error in simulation and real-time environment, the number of runs was increased.

Keywords: Path planning, NAO robots, GSA, HHO, AHO, SM, LR.