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Physics-informed Neural Networks for Robot Mapping

Physics-informed AI delivering 10x faster real-time mapping and motion planning for robots.

Mapping and motion planning are essential to using robotics in real-world environments. While these two facets are inherently joined, traditional methods often require linking two distinct and computationally complex approaches. To resolve this challenge and reduce the computational expense of on-the-fly mapping and motion planning, researchers at Purdue University propose the use of Neural Time Fields (NTFields), a physics informed neural framework that actively explores unknown environments while mapping the robot's arrival time field. This technology offers benefits in control of robotics such as those in automated manufacturing or autonomous driving. This technology is related to 2023-QURE-70169: Physics-informed Neural Motion Planning.

Advantages

-Significantly reduced computation time

-Simultaneous mapping and motion planning

Applications

-Control of robotic manipulators

-Automated manufacturing

-Autonomous driving

Technology Validation:

This technology has been validated through simulated and real world testing. Compared to traditional approaches, NTFields were able to increase computation speed by 10x while maintaining high accuracy.

TRL: 4

Technology ID
2024-QURE-70611

Category
Artificial Intelligence & Machine Learning/Reinforcement & Federated Learning
Robotics & Automation/Simulation, Digital Twins, & Industrial Automation
Robotics & Automation/AI-Based Motion Planning & Navigation

Authors
Yuchen Liu
Ruiqi Ni
Ahmed Hussain Qureshi

Further information
Matt Halladay
MRHalladay@prf.org

View online

Intellectual Property:

Provisional-Patent, 2024-05-08, United States

PCT-Patent, 2025-05-08, WO

Keywords: Real-time motion planning,AI-driven robotics,Autonomous navigation systems,Intelligent pathfinding,Physics-informed AI,Robotics control systems,Automated manufacturing robotics,Neural network-based mapping,High-speed route optimization,Self-driving vehicle planning,Smart factory automation,AI for mobile robots,Adaptive robotic systems,Efficient robot navigation