MULTIPLEX NETWORK SCIENCE AND MULTISCALE SYSTEM DYNAMICS

Tech ID: 33511 / UC Case 2024-110-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20250265376	08/21/2025	2024-110

BRIEF DESCRIPTION

UC Berkeley researchers have developed a sophisticated hybrid modeling framework that integrates Multiplex Network Science (MNS) with Multiscale System Dynamics (MSD). The MNS component maps physical infrastructure as a network of layers to identify external dependencies, while the MSD component models the installation's internal nested subsystems and resource flows. By linking these through defined mathematical boundary conditions, the hybrid model can simulate how an alteration in the external environment—such as a power grid failure or supply chain disruption—propagates through the system. This allows for high-fidelity forecasting of cascading effects, enabling operators to identify vulnerabilities and optimize resilience strategies for critical installations.

SUGGESTED USES

»

Critical Infrastructure Protection: Simulating the impact of regional power or water outages on hospital systems or military installations.

»

Urban Planning: Modeling how changes in public transportation networks affect the resource flows and economic activity of nested city districts.

»

Industrial Site Management: Assessing the resilience of large-scale manufacturing plants to disruptions in external utility or logistics networks.

»

Disaster Response Simulation: Forecasting how damage to physical infrastructure (roads, bridges) propagates to affect the delivery of essential services.

»

Strategic Investment Analysis: Evaluating the long-term benefits of infrastructure upgrades by modeling their impact on internal system stability.

ADVANTAGES

Holistic Visibility: Bridges the gap between external network dependencies and internal operational dynamics.

Cascading Effect Modeling: Precisely identifies how a single external failure can trigger a chain reaction across multiple internal subsystems.

Multiscale Accuracy: Captures interactions at different levels, from micro-scale resource flows to macro-scale infrastructure links.

Dynamic Simulation: Allows for "what-if" scenario testing to validate contingency plans before an actual disruption occurs.

CONTACT

Michael Cohen
mcohen@berkeley.edu
tel: 510-643-4218.

INVENTORS

» Gonzalez Valderrama, Marta C.

OTHER INFORMATION

CATEGORIZED AS

» **Computer**

» Software

» **Engineering**

» Engineering

» **Research Tools**

» Bioinformatics

RELATED CASES

2024-110-0

Optimized Resource Allocation: Helps prioritize infrastructure hardening by identifying the boundary conditions most critical to system survival.

RELATED MATERIALS

University of California, Berkeley Office of Technology Licensing
2150 Shattuck Avenue, Suite 510, Berkeley,CA 94704
Tel: 510.643.7201 | Fax: 510.642.4566
https://ipira.berkeley.edu/ | otl-feedback@lists.berkeley.edu