



# MDESops

TECHNOLOGY NUMBER: 2022-351

## OVERVIEW

Software tool for analyzing and controlling discrete event systems using automata

- Automates and simplifies DES analysis, diagnosis, and controller synthesis algorithms
- Automated manufacturing, fault diagnosis, cybersecurity, and transportation systems

## BACKGROUND

Discrete Event Systems (DES) are mathematical models used to describe systems where state transitions occur at discrete points in time, such as manufacturing processes, automated warehouses, communication networks, and more. Traditionally, analysis and control of such systems have relied on the theory and manual implementation of finite-state automata, requiring a deep theoretical background and extensive labor to perform safety, liveness, and diagnostic analyses. Often, these analyses are limited by manual calculation errors, scalability concerns, and the complexity of integrating advanced algorithms. Historically, there has been a lack of comprehensive and user-friendly tools that implement the latest algorithms from DES and control theory, making it difficult for both practitioners and researchers to efficiently analyze and synthesize controllers for complex systems. As these systems grow more complex and integral to modern technology, there is a clear need for accessible, automated tools that reliably facilitate their design and analysis.

## INNOVATION

MDESops addresses these needs by integrating state-of-the-art algorithms from discrete-event system and control theory into a robust software platform. By implementing advanced methods for checking safety, liveness, diagnosability, and security properties, MDESops automates analyses that were previously time-consuming and error-prone. Additionally, it provides tools for synthesizing supervisory controllers under various real-world constraints, supporting both researchers and engineers in their design and verification tasks. The tool draws on current theoretical advances found in leading textbooks and technical publications, ensuring its methods are up-to-date with the latest scholarship. MDESops' ability to manage complex automata-based models streamlines the analysis of systems in industrial automation, fault diagnosis, transportation, and security, enhancing productivity and reducing the potential for critical errors in deployed systems.

## ADDITIONAL INFORMATION

### Technology ID

2022-351

### Category

Software

MOSS - Michigan Open Source

Software

### Inventor

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### View online page



PROJECT LINKS:

- [MDESops Github](#)

DEPARTMENT/LAB:

- [Stéphane Lafortune, Electrical Engineering and Computer Science \(EECS\)](#)

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