

*Université 20 Août 1955 Skikda*

ISSN: 2992-054X  
EISSN: 2992-1341

# International Journal of Automation and Safety



*Editor-in-chief*  
*Pr. Youcef ZENNIR*

*Co-editors*  
*Pr. Fares INNAL*  
*Pr. El-hadi GUECHI*  
*Pr. Cherif TOLBA*

*Université 20 août 1955 Skikda-Algérie*  
*BP 26 route El-hadeaik, 21000 Skikda, Algérie*

*Tel. : 00213664735277/ Fax. : 0021338723128*  
*Email. : [ijas@univ-skikda.dz](mailto:ijas@univ-skikda.dz)*

**Volume:02, Issue: 01**

June -2024

***International Journal of Automation and Safety (IJAS)***

Is an international peer-reviewed open-access journal  
specialized in automation and Safety System.

Issued by the University of Skikda

Honorary President of the magazine:

Professor Pr. Toufik BOUFENDI

President of the University of Skikda

Editor-in-Chief: Professor Pr. Youcef ZENNIR - Institute of  
Sciences and Techniques Applied- ISTA- University of Skikda

Vol. 2. Issue: 01

# *International Journal of Automation and Safety (IJAS)*

## **OBJECTIVES AND SCOPE OF JOURNAL**

The International Journal of Automation and Safety IJAS is a comprehensive platform dedicated to advancing knowledge in the fields of automation science and safety science. Our aim is to provide a valuable resource for researchers, professionals, and students interested in the latest developments, theories, and applications in these areas.

This journal covers a wide range of topics related to automation and safety, including but not limited to industrial automation, robotics, artificial intelligence, control systems, risk and dependability assessment, hazard analysis, and safety management. By publishing high-quality research articles, reviews, and case studies, we aim to foster innovation, promote best practices, and contribute to the overall improvement of automation and safety practices. Multidisciplinary research that bridges the gap between automation and safety/reliability is particularly welcome.

Our editorial board comprises experts and scholars from academia, industry, and research institutions, ensuring the publication of cutting-edge and impactful research.

Whether you are an engineer, scientist, or professional working in automation or safety-related fields, the IJAS provides a platform to share and explore the latest advancements, emerging trends, and practical solutions. Join us in shaping the future of automation science and safety science.

IJAS is an international peer-reviewed open-access journal, disseminating the quality research in the following fields:

- Automation, systems and control,
- Autonomous systems,
- Multiagent systems,
- Decision-making and decision support,
- Robotics,
- Mechatronics,
- Data sciences,
- New computing paradigms,
- Principles and theory of risk assessment and management
- Risk assessment policy, standards and regulations
- Risk-based decision making and risk management
- Decision making and decision support systems for risk and disaster management on regional and global scales
- Risk perception and communications
- Risk assessment and control
- Risk characterisation
- Dynamic risk assessment

- Integration of risk models and quantifications
- Advanced concepts and information technologies in risk assessment and management
- Integrated risk assessment and safety management
- Integrated risk assessment in developing and rapidly developing countries, etc. Topics covered include.
- Diagnosis of continuous and discrete event systems (DES)
- Control of continuous, Discrete Event Systems and hybrid systems
- Fault-tolerant control
- Integrated modelling, simulation and analysis approaches for dependability assessment
- Dynamic reliability
- Process safety and environmental engineering
- Public health and medical services
- Process engineering and environmental protection
- Computer science and safety
- Health and safety at work
- Environmental and ecological systems
- Biology and human behavioral science

**Editor in chief:**

Pr. Youcef ZENNIR

**Co-editors :**

Pr. Fares INNAL

Pr. El-hadi GUECHI

Pr. Cherif TOLBA

**Secretariat :** Wahiba BOUCHARB

## Scientific Committee:

Pr. Denis Pomorski (France)	Pr. Hamid Bentarzi (Algeria)	Dr. Amina Benaissa (Algeria)
Pr. Hichem Arioui (France)	Pr. Hacene Bouzakri (Algeria)	Pr. Abdelaziz Bouhadiba (Algeria)
Pr. Bernard Kamsu Fogoum (France)	Dr. Ghania Harzallah (Algeria)	Dr. Mohamed Rahim (Algeria)
Pr. Belkacem Old Boumama (France)	Pr. Abdelmajid Reciou (Algeria)	Pr. Youcef Soufi (Algeria)
Pr. Abdelouhab Aitouche (France)	Pr. Imad Ahriche (Algeria)	Dr. Yassine Bensafia (Algeria)
Dr. Paul Reaidy (France)	Pr. Lilia Zighed (Algeria)	Dr. Marsa Zoubida (Algeria)
Pr. Manuel Rodriguez (Spain)	Dr. Rochdi Bouchebbat (Algeria)	Dr. Bilal Zerouali (Algeria)
Pr. Saad Mekhilef (Malaysia)	Pr. Fayçal Arbaoui (Algeria)	Dr. Salima Lekhchine (Algeria)
Dr. Ammar Belatreche (UK)	Pr. Nabil Messikh (Algeria)	Pr. Khettab khatir (Algeria)
Dr. Olivier Pages (France)	Dr. Lamine Mehennaoui (Algeria)	Dr. Abdelhamid Djari (Algeria)
Pr. Horst Schulte (Germany)	Dr. Kamel Menighed (Algeria)	Pr. Mohamed Nemissi (Algeria)
Pr. Yiliu Liu (Norway)	Dr. Salima Ziani (Algeria)	Dr. Mohyiddine Hamaidia (Algeria)
Pr. Ahmed Rubaai (USA)	Dr. Salima Ait Ali (Algeria)	Dr. Zeroual Abdelhafid (Algeria)
Pr. Mary Ann Lundteigen (Norway)	Dr. Riad Bendib (Algeria)	Dr. Omeiri Hanane (Algeria)
Pr. Rochdi Merzouki (France)	Dr. El-Arkam Mechhoud (Algeria)	Dr. Bensaci chaima (Algeria)
Dr. Jesús Fernández Lozano, (Spain)	Pr. Smaïne Mazouzi (Algeria)	Dr. Berghout Belkacem (Algeria)
Pr. Maan El Badaoui El Najjar (France)	Dr. Hichem Bounezour (Algeria)	Pr. Ridha Kelaiaia (Algeria)
Pr. Manuel Fernando dos Santos Silva (Portugal)	Pr. Nabil Bougdah (Algeria)	Pr. Azzedine Bouzaouit (Algeria)

Pr. Sebti Foufou (UAE)	Dr. Amira Otmani (Algeria)	Dr. Mohamed Boudiaf (Algeria)
Pr. Adam Belloum (Netherlands)	Pr. Salah Messast (Algeria)	Pr. Mohamed Salah Medjram (Algeria)
Pr. Vincent Cocquempot (France)	Pr. Samir Ladaci (Algeria)	Pr. Mounira Rouainia (Algeria)
Pr. Saso Blazic (Slovenia)	Pr. Fayçal Djazi (Algeria)	Dr. Nassira Ferroudj (Algeria)
Pr. Ahmed Chemori (France)	Pr. Ahcene Goutas (Algeria)	Pr. Mohamed Belkheiri (Algeria)
Pr. Ilhami Colak (Turkey)	Pr. Aissa Belmeguenai (Algeria)	Pr. Emna Zouaoui (Algeria)
Pr. Şeref Sağıroğlu (Turkey)	Dr. Karim Baiche (Algeria)	Dr. Nesrine Ammouchi (Algeria)
Dr. Adel Merabet (Canada)	Dr. Saadia Saadi (Algeria)	Dr. HadeF Hefaidh (Algeria)
Dr. Samia Maza (France)	Dr. Belkhir Negrou (Algeria)	Dr. Fatiha Djemili (Algeria)
Dr. Jesus Enrique Sierra Garcia (Spain)	Pr. Abderrazak lachouri (Algeria)	Pr. Zahir Ahmida (Algeria)
Dr. Maher Kharrat (Tunisia)	Dr. Salah Bouhayene (Algeria)	Pr. Lotfi Messikh (Algeria)
Pr. Mohamed Chaabane (Tunisia)	Pr. Nadir Derouiche (Algeria)	Dr. Abderahmane Ganouche (Algeria)
Dr. Karim Chabir (Tunisia)	Dr. Khaoula Lassoued (Tunisia)	Dr. Nouara Ouazraoui (Algeria)
Dr. Fouzi Boulkenafet (Algeria)	Dr. Ibtissam Boussouf (Algeria)	Dr. Nadhir Abderrahmane (Algeria)
Dr. Bilel Ayachi (Algeria)	Pr. Hamid Boubertakh (Algeria)	Pr. Salim labiod (Algeria)
Pr. Noureddine Bessous (Algeria)	Dr. Faouzi Bouchareb (Algeria)	Dr. Nourreddine Nafir (Algeria)

## *Table of contents*

<b>Article Title</b>	<b>authors</b>	<b>pages</b>
<b>Autonomous Obstacle Avoidance for a Hexapod Robot Using Proximity Sensors</b>	Ahmed Benyoucef, Ali Amrane, Youcef Zennir , Ammar Belatreche	01
<b>Enhancing Mobility for Individuals with Disabilities: A Computer Vision-Based Approach to Electric Wheelchair Control</b>	Ali Amrane, Ahmed Benyoucef, Youcef Zennir	07
<b>Numerical investigation of melting and energy storage of phase change material within a square enclosure</b>	Fatiha Chebli, Farid Mechighel	11
<b>Improving safety and risk management in high-risk industries: Focus on Safety Instrumented Systems (SIS) in the oil and gas sector</b>	Mohamed Elamine Hammadi , Mounira Rouainia,	15
<b>Developing an Image Encryption Algorithm Utilizing Chaotic Systems</b>	Djamel Herbadji , Abderahmane Herbadji, Hichem Kahia, Ismail Haddad, Aïssa Belmeguenäi, Amine Herbadji,	19
<b>Implementing FMEA for Multi-Stage Centrifugal Compressor in ASU “AQS”</b>	Khalid Larit, Youcef Zennir, Manuel Rodriguez	24
<b>Interaction Analysis and Decoupling of Axial-Torsional Vibrations in Rotary Drilling Systems</b>	Sabrina Meddah, S.A. Tadjer, M. Kidouche, M.Z. Doghmane, A. Idir	33
<b>Evaluation of the Performance of a Safety Instrumented System by the “Fault Tree” Method Using GRIF Software</b>	Fateh Berrah, Fares Innal	40
<b>Analyzing Storage Tank Incidents: Utilizing Fishbone Diagram and Fault Tree Methods</b>	Sami Slimani, Youcef Zennir	47
<b>Functional identification of an internal intervention plan using the FAST approach</b>	MESLOUB Khouloud, INNAL Fares, DUCQ Yves	57