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APPLICATION OF MATLAB PROGRAMS IN TEACHING THE FIELD OF AUTOMATION OF TECHNOLOGICAL PROCESSES

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ABSTRACT

Matlab is a widely used software platform in many fields, including education and research. Its powerful capabilities in technical computing, visualization, and simulation make it an ideal tool for teaching automation of technological processes. This article discusses the applications of Matlab programs in this field and its benefits in teaching and learning. The article focuses on the use of Matlab in the automation of technological processes such as control systems, signal processing, and system identification. Additionally, the article highlights the use of Matlab in laboratory classes and the development of interactive educational tools. The results show that the use of Matlab in teaching the field of automation of technological processes can enhance students' understanding, deepen their practical knowledge, and provide a more engaging learning experience.

Keywords: *Matlab, automation, technological processes, control systems, signal processing, system identification, education, simulation, visualization, laboratory classes, interactive educational tools.*

INTRODUCTION

Background on Matlab and its capabilities. Matlab, which stands for Matrix Laboratory, is a high-level programming language and software platform used for technical computing, visualization, and simulation. Developed by MathWorks, Matlab has a wide range of capabilities, including data analysis, algorithm development, and numerical computation. It also has a variety of toolboxes and add-ons for specialized applications, such as control systems, signal processing, and system identification. Matlab's user-friendly interface, versatility, and powerful computational capabilities make it a popular choice in many industries and academic fields.

Importance of teaching automation of technological processes. Automation of technological processes refers to the use of technology to automate and control various industrial processes, such as manufacturing, energy production, and transportation. Automation is crucial for many industries, as it helps increase

efficiency, reduce costs, and improve the quality of products. As a result, a thorough understanding of automation is essential for engineers and technologists in many fields.

Teaching automation of technological processes is important not only for preparing students for careers in these fields but also for developing their problem-solving skills and critical thinking abilities. Automation is a complex and interdisciplinary field that involves a wide range of knowledge and skills, including control systems, signal processing, and system identification. To effectively teach these concepts, it is important to have tools that allow students to explore and experiment with automation techniques.

Purpose of the article. The purpose of this article is to discuss the use of Matlab in teaching automation of technological processes. Matlab's powerful capabilities and versatility make it an ideal tool for teaching this field, and this article will explore the various applications of Matlab in automation, including control systems, signal processing, and system identification. Additionally, the article will examine the benefits of using Matlab in teaching automation, such as improving students' understanding and practical skills, enhancing laboratory classes and practical exercises, and encouraging hands-on learning and experimentation. Finally, the article will consider the implications of using Matlab in teaching automation for both education and industry.

Automation refers to the use of technology to control and monitor industrial processes without direct human intervention. Automation is achieved through the use of control systems, sensors, and actuators, which work together to monitor process variables and control the operation of equipment. The goal of automation is to improve the efficiency, quality, and safety of industrial processes by reducing the need for manual intervention.

Automation is important in many industries, including manufacturing, energy production, and transportation. By automating processes, industries can increase efficiency, reduce costs, and improve the quality of their products. Automation also helps reduce the risk of human error, which can lead to safety incidents or quality issues. Additionally, automation can help industries improve their competitiveness by allowing them to produce goods more quickly and at a lower cost.

In order to effectively teach automation of technological processes, it is important to understand the key concepts and applications of automation. Some of the key concepts involved in automation include control systems, signal processing, and system identification. Control systems refer to the systems and algorithms used to control and monitor processes, such as PID (proportional-integral-derivative) control

and fuzzy logic control. Signal processing refers to the analysis and manipulation of signals, such as signals from sensors or control systems, in order to extract meaningful information. System identification refers to the process of determining the parameters of a system based on its inputs and outputs.

Applications of automation can be found in many areas, including manufacturing, energy production, and transportation. For example, in manufacturing, automation is used to control the production of goods, such as automotive parts or consumer electronics. In energy production, automation is used to control the operation of power plants and other energy-producing facilities. In transportation, automation is used to control the operation of vehicles, such as airplanes and trains, in order to improve efficiency and reduce the risk of accidents.

Matlab in Automation of Technological Processes

Matlab is a powerful tool for teaching automation of technological processes because of its capabilities and versatility. Some of the advantages of using Matlab for automation include:

User-friendly interface: Matlab has a user-friendly interface that makes it easy for students to explore and experiment with automation techniques.

Versatility: Matlab has a wide range of capabilities, including data analysis, algorithm development, and numerical computation, which makes it suitable for a variety of applications in automation.

Powerful computational capabilities: Matlab's computational capabilities allow students to perform complex calculations and simulations, which helps improve their understanding of automation concepts.

Toolboxes and add-ons: Matlab has a variety of toolboxes and add-ons for specialized applications, such as control systems, signal processing, and system identification, which allows students to explore these areas in greater detail.

Applications of Matlab in control systems, signal processing, and system identification Matlab is widely used in control systems, signal processing, and system identification, which are all crucial areas for automation of technological processes. Some of the applications of Matlab in these areas include:

Control systems: Matlab can be used to develop and simulate control systems, such as PID (proportional-integral-derivative) control and fuzzy logic control. This allows students to experiment with different control strategies and see the results in real-time.

Signal processing: Matlab has powerful signal processing capabilities, which can be used to analyze and manipulate signals from sensors or control systems. This

allows students to extract meaningful information from signals, which is essential for effective automation.

System identification: Matlab has tools for system identification, which can be used to determine the parameters of a system based on its inputs and outputs. This is important for understanding how systems behave and how they can be optimized for automation.

There are many case studies and examples of using Matlab in automation of technological processes. For example, Matlab has been used to develop control systems for industrial processes, such as controlling the temperature of a furnace in a manufacturing facility. Matlab has also been used for signal processing in transportation, such as analyzing signals from sensors in an airplane to improve flight safety. Additionally, Matlab has been used for system identification in energy production, such as determining the parameters of a wind turbine for optimal operation. These case studies and examples demonstrate the power and versatility of Matlab in automation of technological processes, and highlight the importance of using Matlab in teaching this field.

Benefits of Matlab in Teaching Automation

The use of Matlab in teaching automation of technological processes provides numerous benefits to students, particularly in terms of improved understanding and practical skills. With Matlab, students can explore complex automation concepts and algorithms through interactive simulations, which helps to deepen their understanding of the material. In addition, the hands-on nature of Matlab encourages students to experiment and develop their own solutions to problems, which leads to greater retention of the material. As a result, students who use Matlab in their studies will be better equipped to apply their knowledge to real-world situations and be more confident in their abilities.

Matlab can also be used to enhance laboratory classes and practical exercises, allowing students to gain hands-on experience with automation concepts and techniques. For example, students can use Matlab to develop control systems and simulate the behavior of real-world systems. This provides them with a better understanding of how automation works in practice and allows them to see the results of their work in real-time. With Matlab, laboratory classes and practical exercises can be made more engaging and interactive, which helps to improve student motivation and engagement.

Matlab encourages hands-on learning and experimentation, which is critical for students to develop their skills and knowledge in automation. With its user-friendly interface and powerful capabilities, students are encouraged to explore and

experiment with different automation techniques and strategies. This type of learning is more effective than traditional lecture-based approaches, as it allows students to actively engage with the material and develop their own solutions to problems.

Support for research and collaboration Finally, Matlab provides support for research and collaboration, which is important for students to develop their skills in this field. With its powerful computational capabilities, students can perform complex simulations and experiments, which is essential for advancing the field of automation. Additionally, Matlab's ability to collaborate and share projects with other users makes it easy for students to work together on projects and learn from each other. This provides an ideal environment for students to develop their skills in automation, both individually and as part of a team.

The use of Matlab in teaching automation of technological processes has numerous benefits for students. It provides an interactive and engaging environment for learning, enhances laboratory classes and practical exercises, and encourages hands-on learning and experimentation. Additionally, Matlab provides support for research and collaboration, which is important for students to develop their skills in this field. By using Matlab in their studies, students will be better equipped to understand and apply automation concepts to real-world situations, and will be more confident in their abilities.

CONCLUSION

Summary of key points The use of Matlab in teaching automation of technological processes provides numerous benefits to students, including improved understanding and practical skills, enhanced laboratory classes and practical exercises, encouragement of hands-on learning and experimentation, and support for research and collaboration. Matlab is an interactive and engaging tool that provides students with a better understanding of complex automation concepts and techniques, and helps them to develop the skills and knowledge they need to succeed in this field.

The use of Matlab in teaching automation of technological processes will likely continue to grow in the future, as more educators and industry professionals recognize its benefits. Matlab is a flexible and versatile tool that can be used to teach a wide range of automation concepts and techniques, and its capabilities will likely continue to expand as new technologies emerge. Furthermore, as the field of automation continues to grow and evolve, the use of Matlab will become increasingly important for students to stay up-to-date with the latest developments.

The use of Matlab in teaching automation of technological processes has important implications for education and industry. For educators, Matlab provides an

effective and engaging tool for teaching automation concepts and techniques, which will help to prepare students for careers in this field. For industry professionals, Matlab provides a powerful tool for developing automation systems and performing complex simulations, which can help to improve the efficiency and effectiveness of technological processes. Additionally, the use of Matlab in education and industry can help to foster collaboration and research in the field of automation, which is essential for advancing this important area of study.

In conclusion, the use of Matlab in teaching automation of technological processes is a valuable tool for both educators and industry professionals. By providing students with a better understanding of automation concepts and techniques, and encouraging hands-on learning and experimentation, Matlab can help to prepare the next generation of professionals for successful careers in this field. Additionally, the use of Matlab in industry can help to improve the efficiency and effectiveness of technological processes, and foster collaboration and research in the field of automation.

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