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A.V. Kovalenko, A.M. Klipa Ph. D., Assoc. Prof.
(National Aviation University, Ukraine)

Determination of requirements for the control system of a robotic lawnmower

The purpose of this work is to determine the requirements for the control system of a robotic lawnmower and describe the main functions and capabilities that influence these requirements.

A robotic lawnmower is an automated tool designed for maintaining lawns and cutting grass. It has various characteristics, such as size, speed, power, range, and energy consumption, and features like automatic return to base, self-charging, navigation, and area control. These characteristics and capabilities affect the requirements for the control system.

After analyzing the literature on the design and development of control systems for robotic lawnmowers, the following requirements can be identified:

1. Safety: The control system must ensure the safety of the user and others during operation. This can be achieved by installing emergency switches, obstacle sensors that stop the lawnmower when an obstacle is detected, and incorporating safety features such as blade guards.
2. Efficiency: The system should optimize the lawnmower's trajectory, accommodate different operating modes depending on weather conditions and lawn conditions, and minimize energy consumption.
3. Precision and Reliability: The control system should employ modern navigation methods and sensors to determine the lawnmower's precise location and execute tasks with high accuracy. This includes employing technologies such as GPS, IMUs (Inertial Measurement Units), and computer vision.
4. Modularity: The system should allow for the replacement or upgrade of individual components without changing the entire system. This can be achieved through standardized connectors and interfaces, as well as modular software architecture.
5. User-friendly Interface: The control system should provide a convenient and intuitive user interface, as well as remote control capabilities using a mobile application or web interface.
6. Electromagnetic Compatibility: The control system should be resistant to electromagnetic interference and noise to ensure reliable operation in various environments.
7. Energy Efficiency: The system should have low power consumption to increase battery life and reduce charging time.
8. Remote Access and Monitoring: The control system should allow for remote access to information about the robotic lawnmower, such as its status, location, and performance metrics. This can be achieved using cloud technologies and internet connectivity.

9. Software Updates and Diagnostics: The control system should support remote software updates and diagnostics to maintain maximum productivity and efficiency.

10. Manual Control: The control system should provide the option for manual control if necessary, giving users the ability to intervene and take control in certain situations.

11. Data Collection: The control system should store and analyze statistical information about the lawnmower's operation, including operating time, distance traveled, and other relevant metrics.

12. Automatic Support: The control system should offer automatic support, including performing preventative maintenance tasks and self-calibration.

13. Automatic Problem Detection and Resolution: The control system should be capable of detecting issues and resolving them automatically, increasing productivity and efficiency.

14. Weather Resistance: The control system should be reliable and resistant to various weather conditions, such as rain, snow, wind, and other atmospheric phenomena.

Taking all these requirements into consideration, it is evident that developing an advanced control system for a robotic lawnmower is a complex task that involves addressing various aspects of performance, safety, adaptability, and user experience. By incorporating the latest technologies and carefully considering user needs, a highly efficient and user-friendly control system can be created. This control system will not only improve the overall performance of the robotic lawnmower but also contribute to making lawn care more convenient and enjoyable for homeowners.

As technology continues to evolve, the prospects for robotic lawnmowers and their control systems become even more promising. Future advancements in artificial intelligence, sensor technology, and materials engineering will likely result in more efficient, eco-friendly, and intelligent robotic lawnmowers. These innovations can pave the way for new features, such as advanced terrain mapping, improved energy management systems, and better integration with other smart devices, further enhancing the user experience.

In the future, we may also witness a broader adoption of robotic lawnmowers in commercial settings, such as public parks, golf courses, and sports fields. As control systems become more sophisticated and reliable, the potential applications for robotic lawnmowers will expand, ultimately contributing to more sustainable and efficient lawn care practices.

In conclusion, the control system of a robotic lawnmower must meet certain requirements to ensure safe and efficient operation. Key aspects include high accuracy, weather resistance, user safety, and ease of use. Furthermore, adaptive learning capabilities, integration with smart home systems, and the incorporation of advanced sensor technologies can enhance the robotic lawnmower's performance and user experience. By addressing these requirements and considering future advancements, robotic lawnmowers can deliver optimal performance while providing a user-friendly experience and contributing to more sustainable lawn care practices.

References

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