

**Design of An Automated Mop Cleaner**

**Course Title: Microprocessors and Embedded Systems**

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1. **Abstract**This paper presents a sensor-driven, self-cleaning floor cleaner that makes it easier to keep places spotless. It maneuvers with ease and maintains cleaning while avoiding obstacles by using infrared and ultrasonic sensors. Its functionality is further enhanced by precision motor control and customizable cleaning solutions. The study examines the design's software, electrical, and mechanical components in great detail, highlighting its advantages and making optimization suggestions. For those who have huge spaces to manage or restricted mobility, this robot cleaner is a promising first step toward easier floor maintenance.
2. **Introduction and Background**Keeping floors clean can be difficult, particularly for people with restricted mobility or vast spaces. With their ability to navigate and clean floors on their own, automated mop cleaners provide a practical answer. The purpose of this paper is to describe the design of an automated mop cleaner that is easy to use, economical, and requires only easily accessible parts.  
     
   Our motors will be powered by Two H-Bridges connected to two 12-volt batteries. Two infrared and one ultrasonic sensor are used for obstacle avoidance, and a water tank with a water pump that can hold cleaning solution will also be used.
3. **Design**
4. **Mechanical**

* **Chassis:** Materials that are both strong and lightweight, (plywood and acrylic), are used to build the base unit. Wheels allow for mobility, and the floor is cleaned using a mop attachment.
* **Sensors**: An ultrasonic sensor measures distance for improved navigation, a temperature sensor will detect high temperatures to navigate away from, and two infrared sensors identify nearby hazards.
* **Water Tank and Pump**: The cleaning solution is kept in a special water tank and is dispensed onto the mop by a pump as needed.
* **Cleaning Unit:** The mop is compatible with different types of floors and can be created with microfiber cloths or easily accessible pads.

1. **Electrical**

* **Motors:** Two DC motors, controlled by H-bridges, drive the wheels for movement.
* **Microcontroller:** A PIC16F877A microcontroller governs the entire operation, interpreting sensor data, controlling motors, and managing cleaning cycles.
* **Power Supply:** Two 12V batteries provide power to the system.

1. **Software**

* The code includes interrupt routines for sensor data acquisition and timer-based delays for controlled movements.
* Ultrasonic sensor readings determine object proximity, triggering turns or stops to avoid collisions.
* The program implements a simple forward-backward, turn-on-obstacle logic for navigating around obstacles.
* Users can customize cleaning patterns and solution usage through the interface.

1. **Problems and Recommendations**

* **Navigation Complexity:** Our current code implements a basic obstacle avoidance logic. More advanced navigation algorithms could improve efficiency and coverage.
* **Limited Cleaning Features**: This design focuses on basic floor cleaning. Additional features like mop pressure control, obstacle climbing capabilities, and different cleaning modes could enhance functionality.
* **User Interface:** While currently controlled through hardware switches, introducing a mobile app or remote control would offer greater user convenience.
* **Obstacle Detection**: Depending on the environment, additional sensors like LIDAR or bump sensors could be integrated for improved obstacle detection.
* **Safety and Reliability**: Implementing safety features like automatic shut-off on overheating or collisions would enhance user confidence.

1. **Conclusion**

This automated mop cleaner design demonstrates the feasibility of building a simple yet effective autonomous cleaning robot. While the current prototype offers basic functionality, incorporating the recommended improvements can significantly enhance its capabilities and user experience. Further research and development can contribute to a more sophisticated and commercially viable product.

This report provides a comprehensive overview of the design, highlighting its strengths and areas for improvement. By addressing the challenges and implementing the recommendations, this automated mop cleaner can evolve into a truly autonomous and efficient cleaning solution for modern homes.