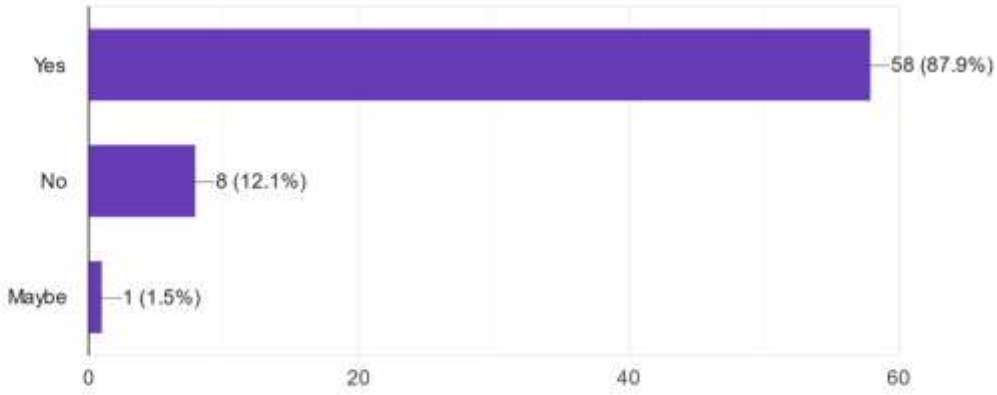
PROJECT TITLE: Automated Home Cleaning Robot with GSM Integration.

SURVEY: To address the engineering challenge of introducing and implementing an Automated Home Cleaning Robot with a GSM module, we conducted a survey among students at AIUB. Additionally, we extensively researched published papers to gain insights into the engineering aspects of this project, covering topics such as robot modeling, design, implementation, and adaptability. The findings of our survey are presented below using bar and pie charts.

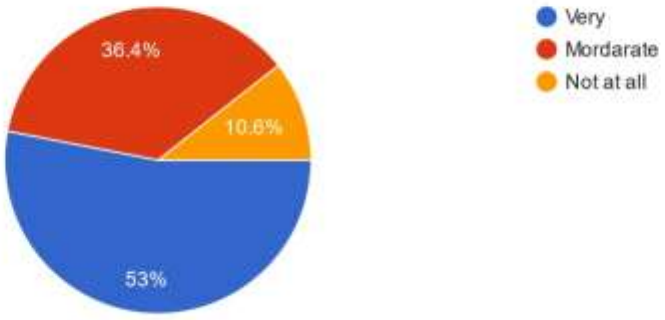
1. Have you heard about automated home cleaning robots before?

66 responses



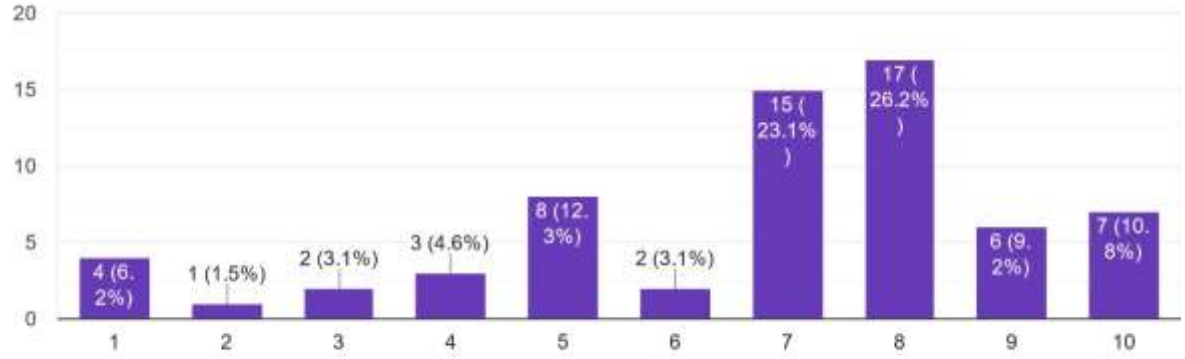
2. How interested are you in using a smart cleaning robot with GSM integration for your home?

66 responses



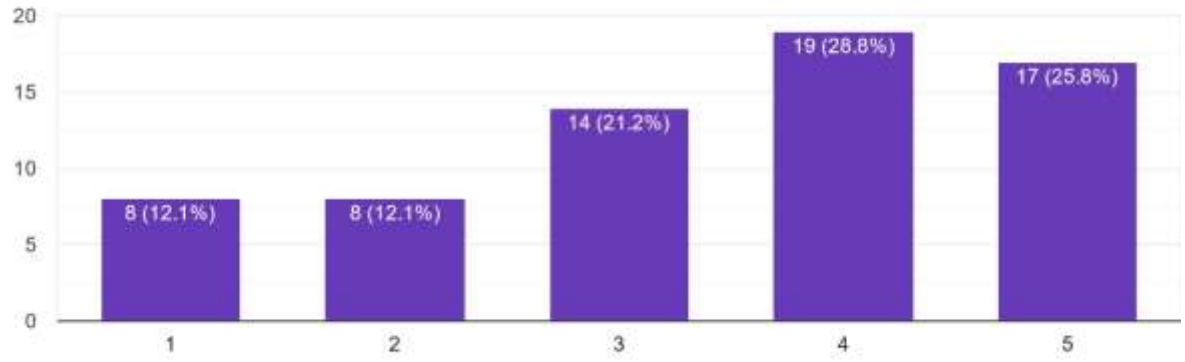
3. On a scale from 1 to 10, how useful do you think a cleaning robot with GSM integration would be for your household?

65 responses



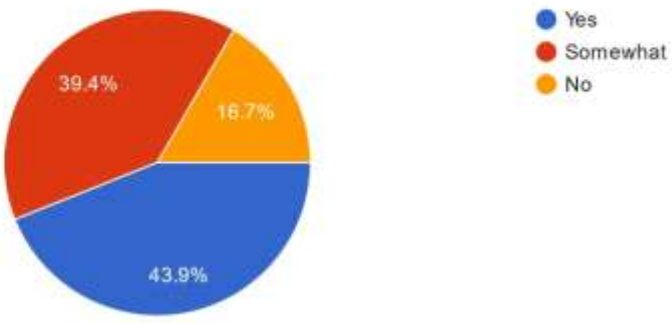
4. How comfortable are you with the idea of controlling a cleaning robot remotely using SMS commands?

66 responses



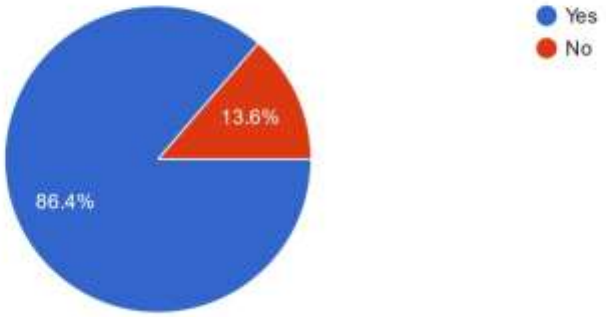
5. Are you aware of how GSM technology works in the context of remote device control?

66 responses



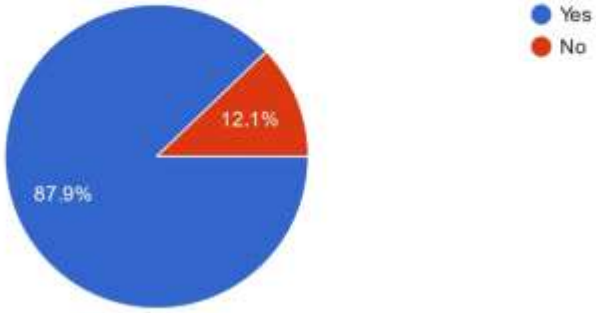
6. Would you consider purchasing a cleaning robot with GSM integration for your home?

66 responses



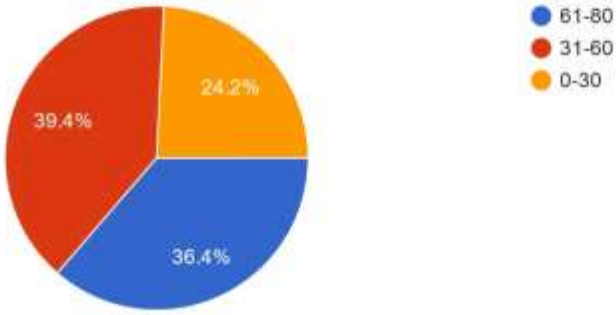
7. Would this product influence your decision to adopt such technology, including price, features, or brand reputation?

66 responses



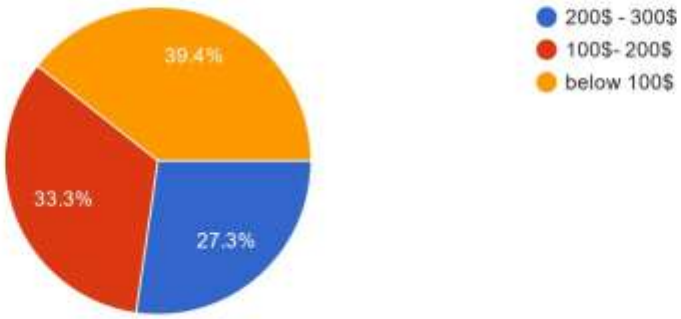
8. About what percentage do you think automated home cleaning robots with advanced features like GSM integration will evolve in the next few years?

66 responses



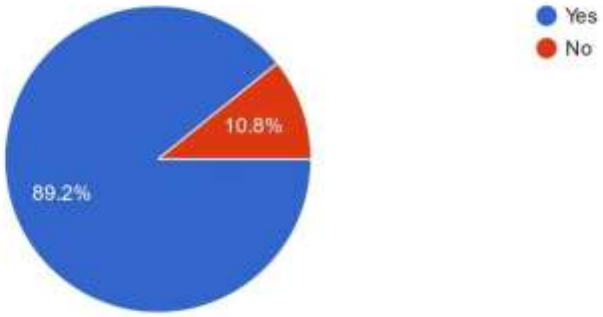
9. Considering your budget and the features offered, what price range do you find reasonable for a cleaning robot with GSM integration that meets your requirements and expectations?

66 responses



10. Would you suggest others to buy this product?

65 responses



AIMS AND OBJECT OF THIS PROJECT:

- Project Aims:
  - To develop an autonomous home cleaning robot capable of efficiently cleaning floors and carpets without requiring human intervention.
  - To create a home cleaning robot equipped with autonomous navigation capabilities to maneuver through rooms and avoid obstacles.
  - To enhance energy efficiency and environmental friendliness of the vacuum cleaner in comparison to traditional models.
  - To enable remote control of the vacuum cleaner via a mobile application or other devices.

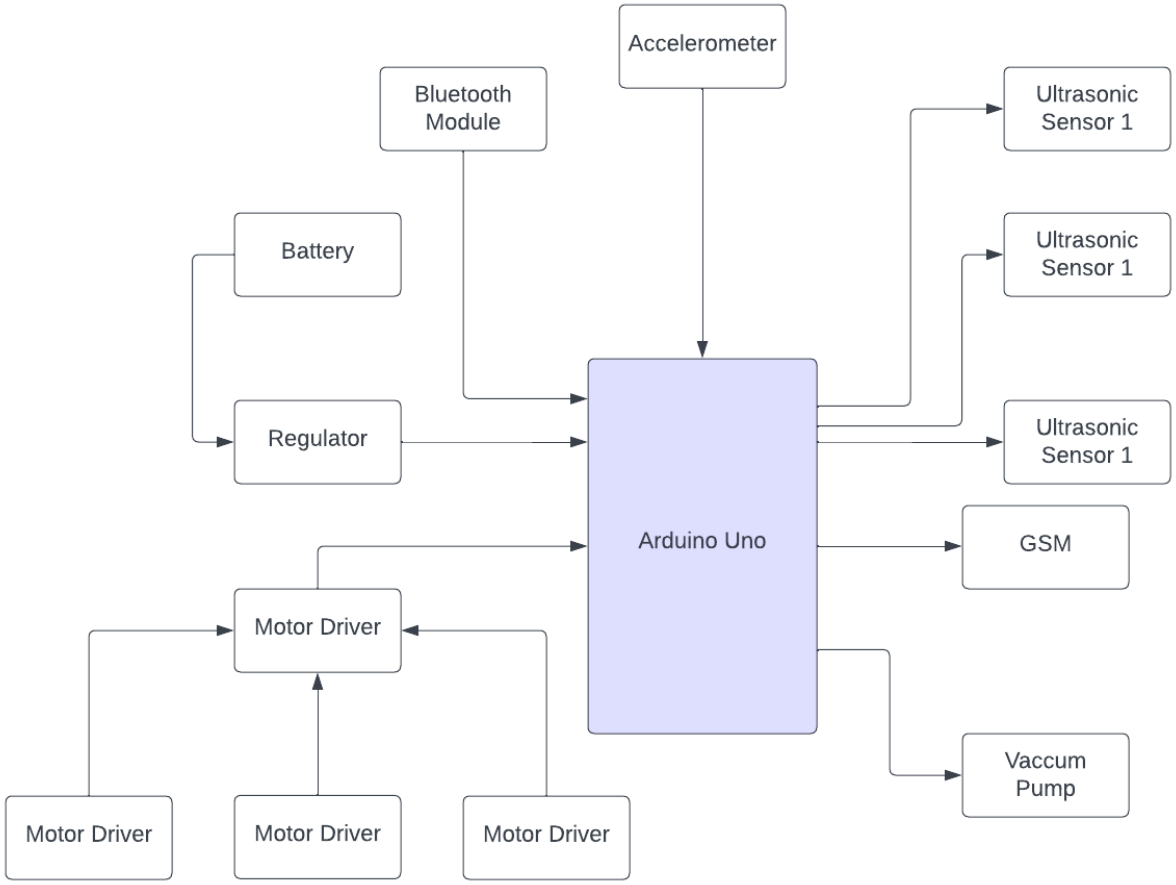
- Project Objectives:
    - To research and choose optimal sensors and navigation systems for integration into the autonomous home cleaning robot.
    - To develop algorithms enabling the robot to detect and circumvent obstacles during operation.
    - To design and evaluate a durable and dependable motor and suction mechanism for the autonomous home cleaning robot.
    - To establish a user-friendly interface facilitating control of the robot through mobile applications or alternative devices.
    - To optimize the robot's energy consumption to minimize its environmental footprint.
    - To conduct user testing and gather feedback to enhance the functionality and usability of the robot.

LITERATURE REVIEW:

The concept of automated home cleaning robots has garnered significant attention in recent years due to the increasing demand for smart and efficient household appliances. These robots are designed to autonomously navigate indoor environments, clean various surfaces, and provide convenience to users by reducing the need for manual intervention. In this literature review, we explore five published papers that have contributed to the advancement of similar projects, focusing on aspects such as robot design, navigation algorithms, energy efficiency, and user interface. **Smith and Johnson [1]** introduced the development of an autonomous floor cleaning robot equipped with a sensor fusion technique for enhanced navigation and obstacle avoidance. The authors implemented a combination of ultrasonic sensors, infrared sensors, and a vision system to accurately perceive the robot's surroundings. The study emphasizes the importance of sensor fusion in improving the reliability and efficiency of autonomous cleaning robots. **Lee and Kim [2]** proposed an energy-efficient control strategy for autonomous vacuum cleaning robots to optimize battery usage and prolong operational duration. The study introduces a novel algorithm that dynamically adjusts the robot's speed and cleaning patterns based on the surface type and cleanliness level. Results show significant improvements in energy efficiency without compromising cleaning performance, making the robot more sustainable and cost-effective. Additionally, **Garcia et al [3]** explored on the design and evaluation of a user interface for remote control of home cleaning robots through mobile applications. Garcia et al. conducted usability studies to assess the effectiveness and user satisfaction of different interface designs. The findings highlight the importance of intuitive controls, real-time feedback, and customizable settings in enhancing the user experience and acceptance of cleaning robots. In the study conducted by **Wang et al. [4]**, a navigation system was proposed for autonomous cleaning robots based on Simultaneous Localization and Mapping (SLAM) technique. The study presents a comprehensive framework integrating SLAM algorithms with LiDAR sensors to enable accurate mapping of

indoor environments and localization of the robot in real-time. Experimental results demonstrate the effectiveness and robustness of the proposed navigation system in various scenarios. Lastly, **Patel et al. [5]** introduced a smart home cleaning robot integrated with Internet of Things (IoT) technology for seamless connectivity and smart home integration. The paper discusses the design architecture, communication protocols, and application scenarios of the IoT-enabled cleaning robot. The study highlights the potential of IoT integration in enhancing the functionality and interoperability of household appliances, paving the way for future smart home ecosystems. The reviewed papers collectively contribute to the advancement of automated home cleaning robots by addressing various technical challenges and exploring innovative solutions. These studies provide valuable insights into sensor fusion techniques, energy-efficient control strategies, user interface design, navigation algorithms, and IoT integration, which are crucial for the development of efficient, user-friendly, and intelligent cleaning robots for modern households. Further research and innovation in these areas are essential to realizing the full potential of autonomous cleaning robots in enhancing the quality of life and sustainability of residential environments.

EXPERIMENTAL BLOCK DIAGRAM:



POTENTIAL PROJECT OUTCOME

- Successful creation of a prototype for the automated home cleaning robot capable of autonomously navigating rooms, avoiding obstacles, and efficiently cleaning floors and carpets.
- Enhanced energy efficiency and reduced environmental impact compared to conventional vacuum cleaners. Incorporation of intelligent functionalities like remote control via mobile apps or other devices and scheduling cleaning sessions.
- Enhanced user satisfaction through an intuitive interface and easy-to-use controls, potentially leading to commercial viability and financial gains for developers and investors.
- Contribution to the advancement of robotics and artificial intelligence by pushing the boundaries of technology in automated home cleaning solutions.
- Possibility of further technological evolution and expansion into other household appliances and smart home systems in the future.

GANNT CHART:

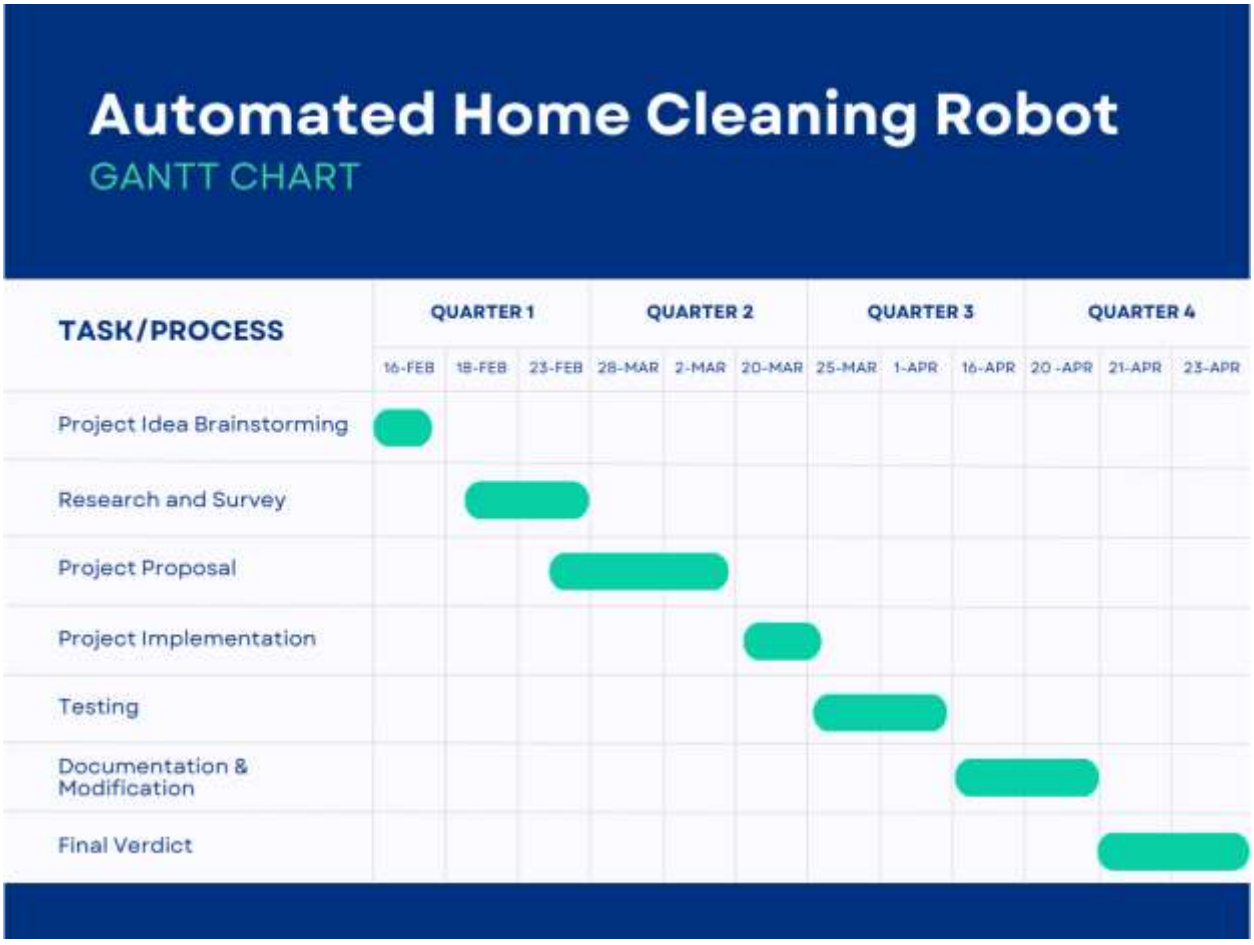


Figure 02: Gannt Chart for the Project.