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IoT Based Smart Garbage Monitoring System and Domestic Care

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Abstract - The IoT-Based Smart Garbage Monitoring and Domestic Care System leverages Arduino and various sensors to provide an intelligent solution for waste management and domestic care. The system utilizes ultrasonic sensors to measure the fill levels of bins, detecting when they are near capacity. An IR sensor identifies the presence of waste in real time, and a moisture sensor classifies the waste as either wet or dry. This classification enables the system to segregate waste using a servo motor for proper disposal. Additionally, a gas sensor monitors harmful gases like methane, which may indicate hazardous conditions. The ultrasonic sensor measures the bin's level by emitting ultrasonic waves and measuring the time taken for the waves to bounce back after hitting the surface of the waste. By utilizing this data, the system can determine the fill level of the dustbin.

***Key Words*:** IoT-Based Waste Management, Smart Garbage Monitoring, Domestic Care System, Arduino Microcontroller, Ultrasonic Sensor, IR Sensor, Moisture Sensor, Wet and Dry Waste Segregation, Servo Motor, Gas Sensor, Methane Detection, Real-Time Monitoring, Smart Dustbin, Hazardous Gas Monitoring, Intelligent Waste Disposal, Ultrasonic Wave Measurement, IoT Applications, Sustainable Waste Management, Environmental Monitoring

1. INTRODUCTION

As urbanization accelerates, effective waste management has become a pressing challenge for cities globally, often resulting in overflowing bins and environmental hazards. The IoT-based Smart Garbage Monitoring and Domestic Care System presents an innovative solution that leverages Arduino and various sensors to enhance waste management practices. By utilizing ultrasonic sensors to measure bin fill levels, infrared technology for real-time waste detection, and moisture sensors to classify waste, the system facilitates efficient segregation and disposal. Additionally, gas sensors ensure safety by detecting harmful gases, while a GSM module provides timely alerts and an LCD offers user-friendly monitoring. This comprehensive approach not only streamlines waste management processes but also promotes sustainable practices, contributing to cleaner and safer urban environments. Effective waste management and domestic care are critical challenges in urban and suburban settings. Overflowing garbage bins lead to unhygienic conditions, environmental pollution, and inefficiencies in waste collection. Simultaneously, domestic waste management requires better monitoring and timely reminders to ensure cleanliness and sustainability. The IoT-Based Smart Garbage Monitoring System and Domestic Care aims to address these challenges by leveraging Internet of Things (IoT) technologies. This system uses smart sensors to monitor garbage levels in real time, detect harmful gases, and send alerts to users and waste management authorities. Additionally, it incorporates domestic care features, such as reminders for cleaning schedules and waste segregation.

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2. METHEDOLOGY

1.Problem Definition: Identify waste management issues and domestic care needs. Set objectives: reduce manual monitoring, improve cleanliness, and provide care alerts.
2.System Design: Hardware: Ultrasonic sensors for bin levels, gas sensors for odors, and microcontrollers like Arduino UNO Software: Cloud integration for data storage and mobile apps for alerts and monitoring.
3.Prototype Development: Assemble sensors and microcontrollers. Write embedded system code for real-time data processing.
4.AI and Analytics: Predict garbage bin fill times and optimize collection routes. Provide actionable domestic care tips.
5.Testing and Deployment: Validate system performance through pilot testing. Ensure reliability and scalability for broader use.
6.Maintenance and Sustainability: Regular updates for better performance. Promote eco-friendly practices via GSM module.

3. HARDWARE OVERVIEW

1.Arduino UNO Microcontroller to control and interface all components.

2.Ultrasonic Sensor Measures distance to detect objects or obstacles. 3.GSM Module Enables communication via SMS or calls for remote notifications.

3.Buzzer Provides audible alerts for warnings or events. 4.Power Supply Supplies required power to all components. 5.LCD Displays real-time data and system status.

6.Gas Sensor Detects harmful gases like smoke or LPG. 7.Servo Motor Provides precise motion for controlling mechanisms.

8.IR Sensor Detects obstacles or objects using infrared light. 9.Moisture Sensor Measures soil moisture levels for monitoring or control.

4. BLOCK DIAGRAM AND STATE DIAGRAM

This block diagram represents a system where a microcontroller integrates multiple sensors (gas, ultrasonic, IR, and moisture sensor) and outputs (LCD, buzzer, GSM module, and servo motor) to perform monitoring and control tasks. The methodology involves designing the system with a stable power supply, calibrating sensors for accurate data, programming the microcontroller to process inputs and trigger outputs, and integrating all components. Testing is carried out in stages, starting with individual components and culminating in full system functionality to ensure reliable performance. The system is then deployed and fine-tuned based on its application needs.

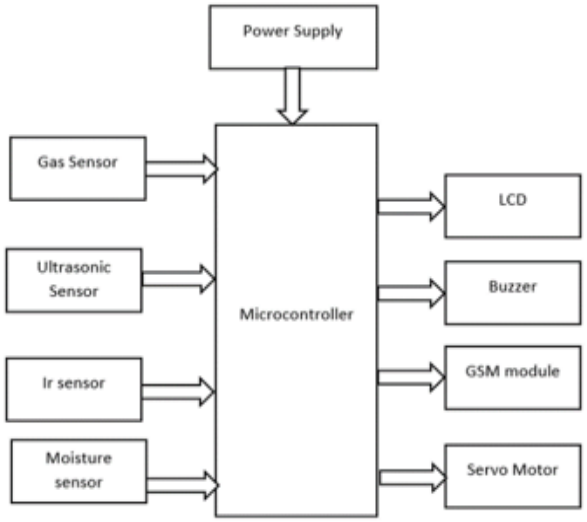

FIG 1: BLOCK DIAGRAM

STATE DIAGRAM

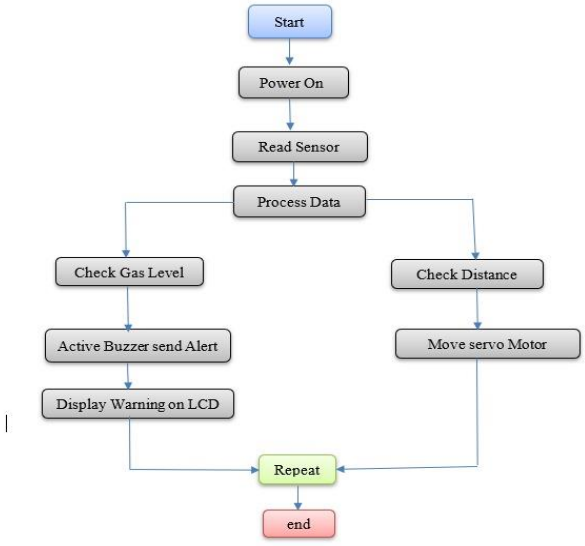

FIG 1.2: FLOW CHART

5.RESULTS AND DISCUSSION

Results

1. Garbage Monitoring: Sensors detected bin levels and gas presence effectively. Timely alerts ensured proper waste collection.

2.Domestic Care: Temperature and humidity monitoring provided environment insights. Notifications improved cleaning schedules and waste segregation.

3.Performance: Quick response times and energy efficient operation. User-friendly app interface for monitoring and alerts.

Discussion

1.Effectiveness: Automated waste monitoring reduced manual effort and improved hygiene.

2.Challenges: Occasional sensor inaccuracies due to waste shape. Connectivity issues in low-network areas.
3.Improvements: Use advanced sensors for better accuracy. Add AI for optimized predictions and route planning.

4.Impact: Promoted cleaner environments and sustainable habits. This system proved efficient, with potential for further development.

7. FUTURE WORK

Future developments will focus on:

1. Advanced Sensors: Use AI-enabled sensors for better accuracy and waste type detection.
2. AI Integration: Implement predictive algorithms for bin fill-time and route optimization.
3. Energy Efficiency: Use solar power and low energy modes for sustainability.
4. Scalability: Expand to municipal or industrial use with centralized dashboards.
5. User Features: Add multilingual support and waste tracking insights through GSM Module and Thingsspeak
6. Sustainability: Encourage recycling and use eco-friendly hardware.

8. CONCLUSION

The IoT-Based Smart Garbage Monitoring System and Domestic Care project successfully demonstrated the integration of IoT technology in addressing waste management and domestic care challenges. The system effectively automated the monitoring of garbage levels, detected harmful gases, and provided timely alerts, ensuring cleaner and safer environments. Additionally, domestic care functionalities like environmental monitoring and reminders improved household waste management practices. While challenges such as occasional sensor inaccuracies and connectivity issues were encountered, they highlight opportunities for further refinement, such as incorporating advanced sensors and hybrid communication technologies. Overall, the project underscores

the potential of IoT solutions to enhance hygiene, sustainability, and efficiency in urban and domestic settings.

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REFERENCES

1. Mahmood, A., & Kumar, A. (2020). "Smart Waste Management System Using IoT." International Journal of Advanced Research in Computer Science, 11(2), DOI: 10.26483/ijarcs.v11i2.7815

2. Gupta, P., & Kumar, S. (2019). "IoT-based Smart Waste Management System: A Review." Journal of Environmental Management, 231, 1080-1091. DOI: 10.1016/j.jenvman.2018.10.029

3. Zhang, Y., Wang, Y., & Zhang, C. (2018). "Research on IoT-Based Smart Waste Management System." IEEE Access, 6, 15228-15235. DOI: 10.1109/ACCESS.2018.2813517

4. Chowdhury, S., & Islam, M. S. (2021). "Smart Dustbin: An Innovative IoT-Based Approach for International Applications, Waste Journal 975, DOI: 10.5120/ijca2021921132

5. Alzahrani, A. S., & Alghamdi, A. M. (2020). "IoT in Waste Management: A Review of the Latest Trends." Waste Management & Research, 38(10), DOI: 10.1177/0734242X20944384

6. Kumar, S., & Bansal, S. (2018). "Implementation of Smart Waste Management System using IoT." International Journal of Engineering and Technology, 7(2.14), 10-16. DOI: 10.14419/ijet.v7i2.14.10377

7. Bandyopadhyay, S., & Bhattacharya, S. (2019). "A Review on Smart Dustbin: A Sustainable Solution for Waste Management." Journal of Clean Energy Technologies, 7(5), 385 391. DOI: 10.18178/jcet.7.5.385-391