

Kiona – A Smart Society Automation Project

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Abstract – *The Smart Society Automation project represents a visionary initiative to revolutionize modern community life through the integration of advanced automation technologies. Covering key aspects such as Smart Parking, Intercom Systems, Hazard Management, Waste Management and Water Management, the overall scope of the project addresses various challenges faced by users. Urban residents have to face. The overarching goal is to create high-performing, safe and sustainable communities that promote a holistic approach to social life. This article provides an in-depth exploration of each project component, detailing their functionality and contribution to the project's ultimate goal. Through the seamless integration of smart systems and centralized web application interfaces, the Intelligent Social Automation project strives to usher in a new era of safe, efficient and sustainable living in modern society, providing residents with real-time information and promoting a sense of belonging community connection.*

Automation project in fostering secure, efficient, and sustainable living for urban communities.^{[1][6]}



Figure 1: Overview and idea of Society Automation.

Keywords: Smart Society, Automation, Urban Living, Advanced Technologies, Security, Efficiency, Sustainability, Community Engagement, Web Application Interface, Future-Ready, Urban Solutions.

II. Purpose & Scope

I. Introduction

In the pursuit of transforming traditional living spaces, the Smart Society Automation project emerges as a groundbreaking endeavor that leverages advanced automation technologies to address the multifaceted challenges of modern urban living. The vision encompasses a range of critical components, each meticulously designed to enhance security, streamline daily operations, and optimize resource utilization. From the implementation of a **Smart Parking System** for heightened security to the meticulous visitor screening facilitated by the **Intercom System**, the project delves into **Hazard Management** for rapid threat detection and a **Water Management System** to reuse water for recreational purposes or other activities. A central hub, the Web Application Interface, binds these components together, offering residents a user-friendly platform for accessing society data and overseeing various systems. This paper provides a detailed exploration of the project's purpose, scope, and individual components, shedding light on the transformative potential of the Smart Society

By utilizing advanced automation technologies, the Smart Society Automation project seeks to transform traditional residences into highly efficient and sustainable communities. With a focus on Smart Parking, Intercom Systems, Hazard Management, Waste Management and Water Management, the project aims to address key aspects of modern urban life. Its main objective is to improve security measures, streamline everyday activities and maximize resource utilization, promoting an integrated approach to community life.

The initiative seeks to transform social life by addressing the issues faced by urban residents.

By integrating smart systems, such as smart parking systems for enhanced security, intercom systems for meticulous visitor screening, and hazard management for threat detection threatening quickly, project aims to create a safer and more productive environment for residents. Additionally, the integration of automated waste management and optimized water and wastewater management processes will contribute to a more sustainable and environmentally friendly community.

A central web application interface is the core platform, providing residents with an easy-to-use means of accessing corporate data and monitoring a variety of systems. This not only provides individuals with real-time information but also fosters a sense of community engagement.

In essence, the aim of project Smart Society Automation is to initiate a new phase of secure and sustainable existence in urban areas by responding to the diverse needs and challenges faced by citizens.

III. Core Features

1. Smart Parking System

The Smart Parking System is a sophisticated and technology-driven solution designed to optimize parking space usage, enhance security, and streamline the parking experience within urban environments. This system leverages advanced automation technologies to provide real-time information about parking space availability and efficiently manage parking resources. Key components of a typical Smart Parking System include sensors, cameras, and a centralized processing system.

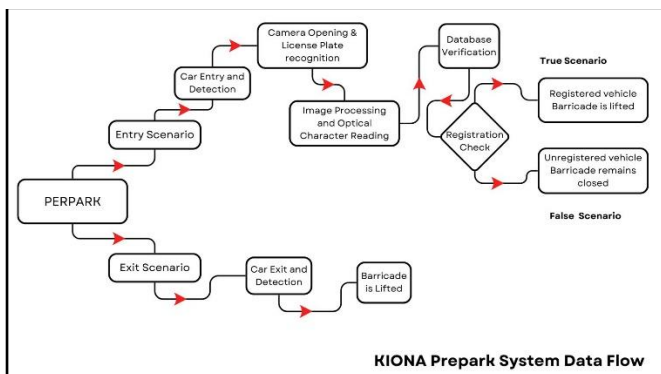


Figure 2: Data flow of Smart Parking System.

Working:

Data Sources:

- Raspberry Pi 3B+ (Microprocessor)
- IR Sensor, Servo Motor, Raspberry Pi Camera Module, RFID Reader, Tag
- Access control system.

Data Flow:

The Smart Parking System seamlessly operates through the coordination of various components, all under the control of the Raspberry Pi 3B+, serving as both a microprocessor and IoT device.

When a vehicle approaches a parking space, an infrared (IR) sensor detects its presence, triggering the microprocessor to instruct a servo motor to lower a barricade, restricting access.

As the vehicle proceeds, a Raspberry Pi Camera Module captures an image of its front, focusing on the license plate. The system then extracts the license plate number and checks it against a database to determine if the vehicle is registered.

Based on this information, an access control decision is made. If the vehicle is registered, the microprocessor commands the servo motor to lift the barricade, allowing access to the parking space. Conversely, if the vehicle is not registered, the servo motor keeps the barricade lowered, denying access for security reasons.

Moreover, for every registered vehicle, there is a dedicated RFID tag. This tag corresponds to a specific parking slot, ensuring that the vehicle is parked in its assigned space. An RFID reader in the slot validates the correctness of the parked vehicle.

In the event of a mismatch, where a registered vehicle is parked in the wrong slot, the owner of that slot receives an alert about the situation. Similarly, if a registered vehicle is missing from its designated slot, the owner of the vehicle is promptly notified, prompting them to address the issue.

This comprehensive system optimizes parking space usage, enhances security, and provides real-time information to users through a user-friendly interface, contributing to an improved overall parking experience for drivers in urban areas.

Key Features:

1. **Real-time Availability:** Users can check the real-time availability of parking spaces before reaching their destination, reducing the time spent searching for parking.
2. **Optimized Resource Utilization:** The system optimizes the use of parking spaces, reducing congestion and maximizing the efficiency of parking facilities.
3. **Security Enhancement:** Integration with security features, such as surveillance cameras, enhances overall security in parking areas.
4. **User Convenience:** The user-friendly interface improves the overall parking experience for drivers, making it more convenient and efficient.^{[2][3]}

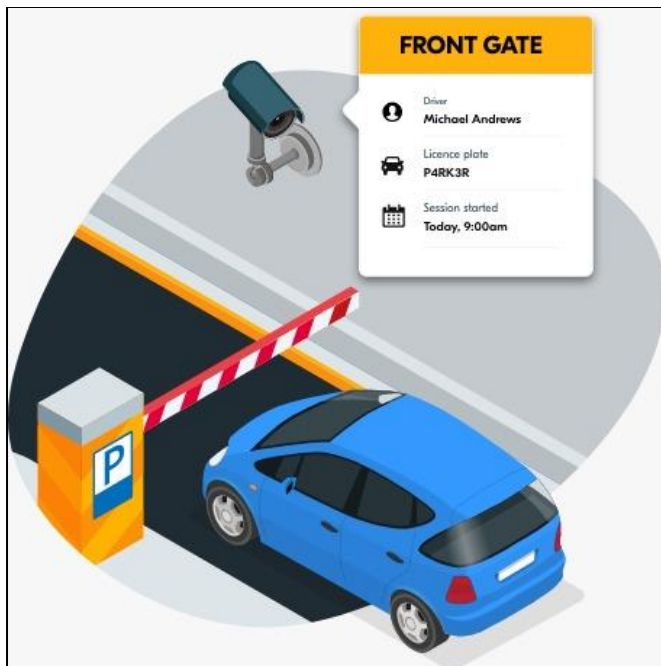


Figure 3: Working of the Pre-Park System.

Benefits:

- Time Savings:** Users save time by quickly finding available parking spaces, reducing congestion and improving traffic flow.
- Reduced Environmental Impact:** Efficient parking reduces unnecessary vehicle circulation, minimizing fuel consumption and environmental impact.
- Enhanced Security:** The system contributes to the security of parking areas through real-time monitoring and surveillance.
- Improved User Experience:** The convenience and ease of finding parking contribute to an improved overall user experience for drivers in urban areas.

The Smart Parking System is a technological solution designed to address the challenges associated with parking in urban environments. By leveraging sensors, data processing, and user interfaces, it offers a comprehensive and efficient approach to managing parking resources for the benefit of both drivers and the overall urban infrastructure.^[11]

2. Intercom System

The Intercom System is a communication solution that facilitates secure and efficient communication between individuals at different locations, particularly at entry points to buildings or gated communities. This system typically consists of audio and sometimes video components, allowing for real-time two-way communication. Its primary purpose is

to enhance security by enabling individuals inside a secure space to identify and communicate with visitors before granting access.

Working:

Data Sources:

- Raspberry Pi 4B (Microprocessor)
- Door Bell, Camera Module, 7inch LCD Display-C, Graphical User Interface, Microphone, Speaker.
- Control System

Data Flow:

The Visitor Interaction System is designed to simplify and enhance the process of welcoming guests to a residence, using a combination of technology components connected through a Raspberry Pi 4B acting as a central controller.

When a visitor arrives, they can press the doorbell to notify the resident. The system responds by ringing the doorbell, and a picture of the visitor is taken by the camera for security purposes, creating a record of the visit. This image is then stored in a history log.

Simultaneously, a 7-inch LCD Display-C shows a live video stream of the visitor outside the residence. A call is automatically generated to the resident, who has the option to receive or decline the call. If the resident chooses to answer, both the visitor and resident can communicate using microphones and speakers, allowing for easy and secure conversation.

However, if the resident declines the call, the visitor is unable to communicate with the resident and is not granted permission to enter. This straightforward process ensures that residents have full control over who they allow into their homes, offering a user-friendly and secure solution for managing visitor access.^{[4][10][12]}



Figure 4: User Interface of Intercom System.

Key Features:

1. **Visitor Screening:** Residents can visually or audibly identify visitors before granting access, enhancing security.
2. **Remote Communication:** Residents can communicate with visitors from the convenience of their location, providing added convenience and safety.
3. **Access Control Integration:** Integration with access control systems allows for secure and controlled entry.

Benefits:

1. **Enhanced Security:** The Intercom System acts as a first line of defence, allowing residents to verify the identity of visitors before granting access.
2. **Convenience:** Residents can communicate with visitors without physically approaching the entry point, adding convenience to the entry process.
3. **Access Control:** Integration with access control systems provides an additional layer of security and control over entry points.

The Intercom System is a vital component of secure access control systems, providing a means for residents or security personnel to communicate with and verify the identity of visitors before allowing entry into a building or community.^{[10][13][14]}

3. Hazard Management

Hazard Management, within the context of the Smart Society Automation project, is a proactive system designed to swiftly detect and manage potential hazards within a community or urban environment. This component integrates advanced technologies to monitor and analyse environmental conditions, aiming to provide timely alerts and responses to mitigate risks.

Working:**Data Sources:**

- Hazard detection sensors, emergency response systems.

Data flow:

In our safety management system, we utilize Hazard Detection Sensors and Emergency Response Systems to ensure the swift identification and handling of potential dangers. Here's a simplified breakdown for non-technical users:

When our hazard detection sensors detect any potential risks or dangers, quick alerts are immediately transmitted to our Web Application Interface. This interface acts as a central hub where all safety-related information is gathered. Community administrators, responsible for overseeing the safety of the environment, receive real-time notifications through the Web Application Interface. This ensures that they are promptly informed about any potential hazards or incidents.

In the event that the hazard is severe and requires immediate action, our Emergency Response Systems are activated. These systems are designed to swiftly and effectively respond to emergencies, coordinating resources and actions as needed. This integrated approach to hazard detection and emergency response provides a robust and reliable safety net for the community, allowing for proactive management of potential risks. Our priority is to ensure the safety and well-being of everyone in the community, and this system allows us to respond swiftly and efficiently to any unforeseen challenges.

Key Features:

1. **Swift Detection:** The system is designed for rapid detection of potential hazards, minimizing response time.
2. **Real-time Alerts:** Residents receive real-time alerts about potential hazards, allowing for quick and informed actions.
3. **Integration with Emergency Services:** In advanced implementations, the system may be integrated with emergency services to ensure a coordinated and prompt response.

Benefits:

1. **Enhanced Safety:** Hazard Management enhances overall safety within the community by providing timely alerts and responses to potential threats.
2. **Preventive Measures:** The system allows for the implementation of preventive measures, reducing the likelihood of hazards escalating into emergencies.
3. **Community Resilience:** By promptly addressing potential hazards, the community becomes more resilient and better prepared to handle unexpected events.

Hazard Management is an integral part of the Smart Society Automation project, contributing to the safety and well-being of residents by continuously monitoring environmental conditions and providing swift alerts and responses to potential hazards.^{[5][6][9]}

4. Water Management

The Water Purification System is a sophisticated solution designed to ensure the availability of clean and safe water within urban environments. This advanced system incorporates various components, including TDS and Turbidity sensors, a pH sensor, and an LCD display.



Figure 5: Using Water Management System to clean the water for washing of cars.

Working:

Data Sources:

- TDS Sensor, Turbidity Sensor, pH Sensor
- LCD Display

Data Flow:

The Water Purification System employs a meticulous process to guarantee a continuous supply of high-quality water for end users. Using advanced TDS and Turbidity sensors, the system conducts a thorough Quality Check each time water enters the tank, swiftly identifying impurities or particles. The results are presented on an intuitive LCD Display, offering users a clear visual representation of the water quality.

In addition to the initial check, the system incorporates pH Testing through a dedicated sensor, evaluating the water's acidity or alkalinity levels. This crucial step ensures that the water not only meets safety standards but also aligns with optimal pH levels for consumption. Based on the collective outcomes of these assessments, the system makes a Distribution Decision. If the water quality is deemed satisfactory, the system allows for distribution, guaranteeing that users receive clean and safe water. Conversely, if any issues are

identified during the quality check or pH testing, the system initiates corrective measures before permitting distribution.

In summary, this systematic process, involving real-time monitoring and corrective actions, ensures that end users consistently receive water of the highest quality. The clear visual feedback provided by the LCD Display enhances user understanding and confidence in the reliability and effectiveness of the Water Purification System.

Key Features:

1. **Real-time Quality Check:** Users can monitor water quality in real-time through the LCD display.
2. **Efficient Water Usage:** Sensors monitor water usage, promoting responsible consumption.
3. **User-friendly Interface:** The LCD display provides a user-friendly interface for quick assessments.
4. **Automated Decision Making:** The system automates distribution decisions based on real-time water quality.

Benefits:

1. **Safe Water Supply:** Ensures a safe and clean water supply for residents.
2. **Real-time Monitoring:** Residents can monitor water quality in real-time, promoting transparency.
3. **Resource Conservation:** Efficient water monitoring contributes to responsible resource usage.
4. **Timely Maintenance:** Automated alerts prompt timely corrective measures, ensuring consistent water quality.

The Water Purification System, with its intelligent sensors and user-friendly interface, stands as a crucial component in maintaining a healthy and sustainable water supply within urban communities.^{[15][16]}

IV. Implementation Of Core Features In A Single Web Application

Web Application Interface

The Web Application Interface stands as the central command centre within the Smart Society Automation project, serving a dual purpose as a repository for society data and a platform for comprehensive system oversight. This online interface is meticulously designed to offer a real-time gateway to valuable information, benefiting both residents and administrators.

For residents, the Web Application Interface provides an intuitive and user-friendly platform that enables effortless access to real-time information about the community. This includes updates on parking space availability, hazard alerts, and other relevant data, enhancing their ability to stay informed and engaged with the smart community. The interface acts as a window into the dynamic workings of the community, allowing residents to seamlessly navigate through features that impact their daily lives.

On the administrator's end, the Web Application Interface serves as a powerful tool for efficient system management. Community administrators gain access to comprehensive data that aids in decision-making processes related to overall community well-being. From overseeing the Smart Parking System to managing permissions and responding to hazard alerts, the interface streamlines administrative tasks, promoting effective governance.

The user-friendly design of the interface is a cornerstone of its functionality, ensuring that both residents and administrators can interact with the system effortlessly. This design promotes community engagement by making complex data and system controls easily accessible and understandable for users with varying levels of technological proficiency.

In summary, the Web Application Interface is a dynamic and accessible platform that acts as the digital heart of the smart community. It empowers residents with real-time insights, facilitates efficient community administration, and promotes a user-friendly experience that encourages active participation and engagement within the smart society.

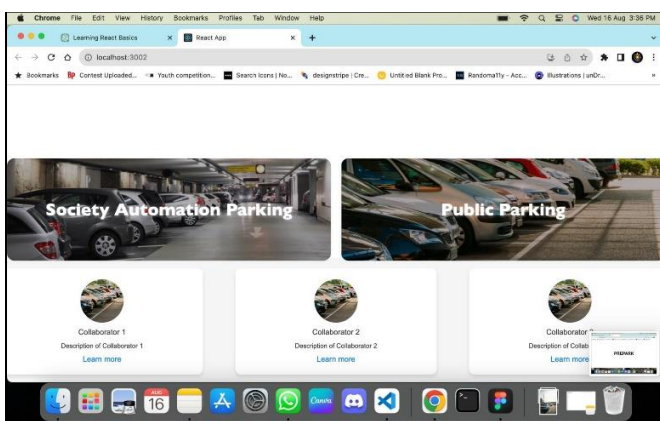


Figure 6: Web Application Interface for Smart Parking

Implementing all core features in web application:

1. Smart Parking System:

- **Data Input:** Aggregated data from parking sensors.

- **Implementation:** The Web Application Interface displays real-time information on parking space availability, indicating open slots and occupancy status. Residents can access this information to find suitable parking, and administrators can oversee the overall parking system.^{[7][8]}

2. Intercom System:

- **Data Input:** User inputs and verification data.
- **Implementation:** The Web Application Interface integrates a user-friendly interface for residents and administrators to interact with the Intercom System. Residents can screen and communicate with visitors through the interface, while administrators can manage access permissions.^{[13][14]}

3. Hazard Management:

- **Data Input:** Aggregated data from hazard detection sensors.
- **Implementation:** Real-time hazard alerts and notifications are prominently displayed on the Web Application Interface. Community administrators can receive and address alerts promptly, ensuring the safety of the community.

4. Water Management:

- **Data Input:** TDS Sensor and Turbidity Sensor data.
- **Implementation:** The Web Application Interface incorporates real-time information on water quality, displaying TDS and turbidity levels. Administrators can monitor and make informed decisions regarding water distribution, ensuring a safe and reliable water.^{[15][16]}

Data Flow:

The Web Application Interface plays a pivotal role as the central nervous system of the smart community, acting as a consolidated hub for society data by aggregating information from all integral systems. This includes real-time data seamlessly derived from the Smart Parking System, Intercom System, Hazard Management, Water Management, and Waste Management, providing a comprehensive overview. Residents benefit from the user-friendly interface by actively engaging with the system to access and utilize key features, such as finding available parking spaces, initiating communication through the Intercom System, and staying informed about potential hazards in their community. Meanwhile, administrators leverage the interface's oversight capabilities to receive instantaneous alerts, manage parking allocations and access permissions, and monitor the operational status of various systems. In essence, the Web Application Interface serves as the dynamic focal

point that empowers both residents and administrators to interact with, oversee, and optimize the functionality of the smart systems, fostering a seamlessly integrated and user-centric experience within the smart society.^{[11][12]}

In essence, the Web Application Interface consolidates and presents information from all core features, providing a one-stop solution for residents and administrators to interact with and oversee the smart systems, fostering a cohesive and user-friendly experience within the smart society.

V. Targeted Customers and User Guide

Targeted Customers

This project is specially designed to cater to a diverse range of users, each possessing specific roles and characteristics. Understanding these distinct user classes is crucial to tailor the system effectively to meet their unique needs, ensuring accessibility and benefit for all stakeholders. The following are the primary user classes and their characteristics:

1. Residents:

Residents come from varied demographic backgrounds and possess differing levels of technological proficiency. They are key stakeholders invested in the security, efficiency, and sustainability of the community. Residents interact with the system by accessing the Web Application Interface for real-time information, utilizing the Smart Parking System for secure parking, and engaging with the Intercom System for visitor screening and communication.

2. Community Administrators:

Community administrators are responsible for the overall management and well-being of the community. They need access to comprehensive data for decision-making and require technical proficiency for overseeing and troubleshooting automated systems. Their interactions involve utilizing the Web Application Interface for system oversight, receiving alerts and notifications from the Hazard Management system, and managing parking spaces and permissions through the Smart Parking System.

3. Urban Planners and Policymakers:

Professionals involved in city planning and development, urban planners, and policymakers focus on sustainability, efficiency, and technology integration. They make decisions based on the impact of technology on urban living. Their interactions include analysing data from the project for city planning purposes, assessing the environmental impact of Waste, Sewage, and Water

Management systems, and evaluating the overall effectiveness of the smart community model.



Figure 7: Clubhouse proposed for Entertainment and Get together functions

4. Technology Maintenance Team:

The Technology Maintenance Team comprises technical experts responsible for system maintenance, troubleshooting, and regular updates. They conduct routine maintenance on the Smart Parking System, Intercom System, and other components, responding to alerts and issues raised by the Hazard Management system to ensure the continuous functionality of all automated systems.

5. Visitors and Guests:

Visitors and guests are temporary users within the smart community with varying degrees of familiarity with automated systems. Their interactions involve using the Intercom System for communication and verification, following guidance from the Smart Parking System for parking within the community, and adhering to waste disposal guidelines outlined by the Waste Management system.

The comprehensive design for this project ensures that each user class can seamlessly engage with the system, promoting a user-friendly and effective smart community experience.

User Manual

In the Smart Community, residents can easily access the Web Application Interface by visiting the community's website and logging in with their credentials. Once logged in, they gain real-time insights into parking availability and receive alerts about any hazards. Additionally, residents can use the Intercom

System for convenient communication with visitors at the community entrance.

Community administrators play a vital role in overseeing the community's operations. They can monitor the Smart Parking System through the Web Application Interface, ensuring efficient parking space management. Administrators also promptly receive and address hazard alerts and monitor waste management status to maintain a clean environment.

For visitors entering the community, the Intercom System simplifies the process. Visitors need to approach the community entrance, interact with the Intercom System to verify their identity and communicate their purpose. Access is then granted based on resident permissions.

Efficient technology management is crucial for the community's functionality. The Technology Maintenance Team receives alerts and notifications from automated systems, conducts routine maintenance on Smart Parking, Intercom, and other components, and troubleshoots and resolves technical issues promptly.

Lastly, the Smart Community provides valuable data for city planning and analysis. Urban planners and policymakers can access project data for city planning purposes, evaluate the environmental impact of water management, and assess the overall effectiveness of the smart community model. By following these user-friendly steps, residents, administrators, maintenance teams, and city planners can actively engage with and benefit from the smart community's features, ensuring a seamless and efficient living experience for all.

VI. Benefits of this project

The project Smart Society Automation has numerous benefits, including positive effects on people and the community as a whole:

1. Enhanced Security:

- Advanced surveillance and access control mechanisms.
- Meticulous visitor screening through the Intercom System.
- Swift detection and alerting of potential hazards.

2. Efficient Operations:

- Streamlined parking experiences with the Smart Parking System.
- Automated waste segregation and disposal processes.

- Optimization of water resources through Water Management.

3. Sustainability:

- Eco-friendly waste management practices.
- Efficient use of water resources, contributing to sustainability.
- Reduction of the community's environmental footprint.

4. Community Engagement:

- Real-time access to society data through the Web Application Interface.
- Improved communication channels with the Intercom System.
- Fostering a sense of community through shared information and oversight.

5. Resource Optimization:

- Optimal utilization of parking spaces with the Smart Parking System.
- Efficient handling of sewage and water resources through management systems.
- Reduction of waste through automated segregation processes.

By focusing on the key features and benefits of the Smart Society Automation project, one can create an intelligent and contemporary society. By incorporating modern automation, the safety and efficiency of the facility are enhanced, as well as sustainability and community welfare.

VII. Future Scope

The Smart Social Automation project demonstrates that there is potential for growth in the future by adapting to changing urban conditions and emerging technologies. In the future, the integration of artificial intelligence (AI) and machine learning (ML) could improve the predictive capabilities of smart parking systems, providing more accurate predictions of parking availability. Advanced security features can include facial recognition technology in intercom systems and further developing a risk management component with AI-based threat detection.

It has the potential to explore smart grid integration for improved energy efficiency and extend automation capabilities to every home, resulting in a fully intelligent lifestyle.

Additionally, implementing blockchain technology can improve data security and transparency in web application interfaces.

Future developments may also involve environmental monitoring, use of 5G technology, collaboration with planning authorities, global expansion and user education programs, ensuring continued growth.

VIII. Conclusion

In conclusion, the Smart Society Automation project represents a transformative approach to modern community living, addressing key facets of security, efficiency, sustainability, and community engagement. The integration of advanced automation technologies, such as the Smart Parking System, Intercom System, Hazard Management, Waste Management, and Water Management, collectively contributes to the creation of a secure, efficient, and sustainable living environment.

As Winston Churchill aptly stated, "We shape our buildings; thereafter, they shape us." In a parallel sense, the thoughtful design and seamless functionality of the project's technology mold a community that is not only informed and secure but also actively engaged and interconnected. The Web Application Interface serves as a centralized hub, providing residents and administrators with real-time access to crucial information, fostering a sense of community engagement.

The user flow, as outlined in the Resident Interaction, Administrator Oversight, Visitor Entry Process, Maintenance and Troubleshooting, and City Planning and Analysis sections, highlights the seamless integration of various components, ensuring a well-coordinated and user-friendly experience for residents, administrators, maintenance teams, and city planners.

Looking to the future, the project has promising avenues for expansion and enhancement. Integration of artificial intelligence, enhanced security features, smart energy management, and emerging technologies like augmented reality and blockchain can further elevate the project's capabilities. Moreover, collaboration with broader smart city initiatives and continuous user feedback will contribute to the ongoing evolution and improvement of the smart community model.

In essence, the Smart Society Automation project embodies a holistic vision for the future of urban living, where technology plays a pivotal role in creating communities that are not only secure and efficient but also sustainable and interconnected. The project aims to set new standards for intelligent and responsive community living, shaping a future where technology enriches the lives of residents and fosters a sense of community resilience.

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