International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

COPY RIGHT

IJIEMR Transactions, online available on 21th Dec 2024. Link

https://ijiemr.org/downloads.php?vol=Volume-13&issue= Issue12

DOI:10.48047/IJIEMR/V13/ISSUE12/59

Title: " AUTOMATED STREET LIGHT CONTROL AND MANHOLE MONITORING WITH FAULT DETECTION & REPORTING SYSTEM FOR MUNICIPAL DEPARTMENT"

Volume 13, ISSUE 12, Pages: 445 - 449

Paper Authors
K Mounika, Ponna Srinitha, Midiyam divya, B Vaishnavi

International Journal for Innovative Engineering and Management Research
PEER REVIEWED OPEN ACCESS INTERNATIONAL JOURNAL
www.ijiemr.org

AUTOMATED STREET LIGHT CONTROL AND MANHOLE MONITORING WITH FAULT DETECTION & REPORTING SYSTEM FOR MUNICIPAL DEPARTMENT

K Mounika[1], Ponna Srinitha[2], Midiyam divya[3] B Vaishnavi[4]
[1,2,3,4]Department of ECE, CMR Institute of Technology, Medchal, Hyderabad, Telangana, India.
Correspondence mail: ponnasrinitha75@gmail.com

Abstract-Color consistency optimization for multiple images is a challenging task in remote sensing and computer vision. To ensure that the visual quality of corrected images is satisfactory, not only should the color discrepancies between multiple images be invisible but also the contrast of individual images should be visually appealing. Most color correction approaches focus on eliminating drastic color discrepancies, but ignore the problem of image contrast enhancement. Some color correction approaches even tend to degrade the image contrast to ensure that the image tones are consistent especially when the contrast of input images is low. To solve this problem, we present a contrast-aware color consistency correction approach in this article.

Keywords: Image Processing, Enhancement, Intensity, Preprocessing

I. Introduction

The project work described here is quite useful for the state electricity and municipal departments, generally the line men either he belongs electricity department or municipality, it is the duty him to energize the street lights in the evening of preferably after Sun set, and he is supposed to be switched off these lights in early in the morning, when the Sun is raised again. But unfortunately due to many reasons the line men may forget to switch off these lights in the morning in this regard lot of energy is wasted, resulting power cuts.It will also focus on monitoring manholes using sensors. f drainage gets blocked and water overflows, and if manhole lid is opens, it is sensed by the sensors, then that sensor sends information via GSM module which is located in that area to the corresponding managing station

II. Literature review

In most urban and semi-urban cities, the street lights are installed and maintained by municipalities. The most cities are still using a combination of high-pressure sodium lamps, fluorescent, CFL and metal halide bulbs, which does not meet area-wise lighting needs. The aim of this project is to develop a comprehensive and efficient system for the real-time detection of street light faults, precise location tracking, and streamlined maintenance processes in urban areas. This IoT-based system tackles manual street light monitoring. Sensors automatically detect malfunctions. GPS modules pinpoint faulty light locations for faster repairs. GSM modules send alerts with details to respective addresses. This offers several benefits: eliminates manual efforts, enables quicker response times, improves maintenance management through real-time data, and has the potential to optimize energy use.The objective of the project is to provide automatic control and fault detection on street lamps. The lighting system which targets the energy and automatic operation on economical affordable for the streets and immediate information response about the street lamp fault. Moreover, errors which occur due to manual operation can also eliminate. The street light switched ON/OFF through an Internet of Things (IoT). The street light system is checking the weather for street lamp ON/OFF condition. The weather is light or dark are sense through a LDR sensor, If the weather is light, the system will OFF. If the weather is dark, the light system will ON. After the light on the light condition also check through LDR sensor for light glow or not glow status. If light is not glowing, the sensor sends the value to street light system.

III. System Model

Creating a system model for automatic streetlight and manhole monitoring with fault detection involves integrating IoT (Internet of Things) devices, sensors, and a centralized monitoring system to ensure efficiency and proactive maintenance. Below is a conceptual system model:
Streetlight Monitoring Subsystem Components:
Light sensors (LDRs): Detect ambient light levels for automatic streetlight control. Motion sensors (PIR): Activate lights when motion is detected in low-traffic areas. Smart controllers: Control on/off operations based on sensor data. Energy meters: Monitor power consumption of individual street lights. Communication modules (e.g., LoRa, Zigbee, GSM): Transmit data to a central server. Fault Detection: Voltage /current sensors: Detect anomalies in power supply. Real-time monitoring: Alerts for bulb failures or electrical issues. Manhole Monitoring Sub system Components: Gas sensors: Detect harmful gases like methane (CH_4), carbon monoxide (CO), etc., inside manholes. Water level sensors: Monitor water levels to prevent overflows or blockages. Tilt sensors: Detect unauthorized access or displacement of manhole covers. Communication modules: Send alerts to the central system about abnormalities. Fault Detection: Alerts for high gas concentrations or rising water levels. Notifications for open or displaced manholes. Centralized Monitoring and Control Subsystem Components: Cloud-based server: Collects and stores data from streetlights and manholes.
IoT platform/dashboard: Displays real-time data and analytics for municipal staff. Machine learning algorithms: Predict potential faults based on historical data. Mobile app integration: Enables on-the-go monitoring and alert notifications. Fault Detection: Anomaly detection algorithms for abnormal sensor readings. Predictive maintenance alerts to schedule repairs. Workflow Streetlight Operation: During the day, light sensors deactivate streetlights. At night, lights are activated based on ambient light levels or motion detection. Fault detection reports are sent to the central monitoring system if irregularities occur. Manhole Monitoring: Gas and water level sensors continuously monitor environmental conditions inside the

manhole. If critical thresholds are exceeded, alerts are sent to the municipal staff for immediate action. Unauthorized access or displacement of manhole covers triggers security alerts. Data Transmission: Sensor data is transmitted via communication modules to the central monitoring system. Data is analyzed, and actionable insights are provided to municipal staff. Fault Reporting: Automatic fault detection and alert generation. Maintenance teams receive notifications via the mobile app or email for quick response. Technological Stack Hardware:

Microcontrollers (e.g., Arduino, ESP32, Raspberry Pi).Sensors: LDR, PIR, methane, CO, tilt, and water level sensors. Communication: LoRa, Zigbee, GSM, or Wi-Fi modules. Software: IoT platforms: Things Board, Google IoT Core, or AWS IoT. Data processing: Node.js, Python, or similar. Visualization: Power BI, Grafana, or custom dashboards. Communication Protocols', HTTP, or CoAP for secure and efficient data transmission. Power Supply: Solar panels with battery backup for streetlights. Battery-powered or solar-powered manhole monitoring devices. Benefits of the System Automatic control of streetlights reduces energy consumption. Real-time monitoring prevents accidents due to open manholes or hazardous gases. Fault detection minimizes downtime and ensures timely repairs. Cost-effective and scalable solution for municipalities.

IV. Result

The system integrates fault detection capabilities for both streetlights and manholes. The MCU can identify malfunctions in streetlights, such as burnt-out bulbs. For manholes, the system can detect critical situations like exceeding pre-defined water level thresholds. Upon detecting a fault, the MCU can trigger an alert message. Depending on the system design, the alert can be transmitted via a communication module (e.g., GSM) to a central control center or directly to designated personnel through SMS or email. This prompt notification allows for timely intervention and troubleshooting by municipal departments. Early warnings regarding open manholes can prevent accidents for pedestrians and vehicles. Additionally, timely notifications of high water levels can help mitigate potential flooding risks, safeguarding public safety and property. Various parameters are adopted from [23- 33].

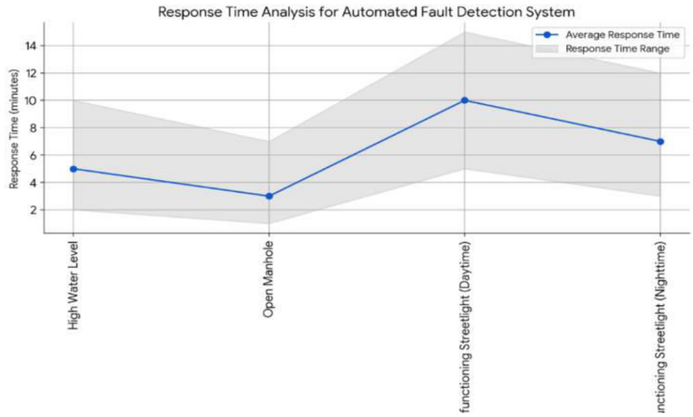

Fig. 2. Response time analysis

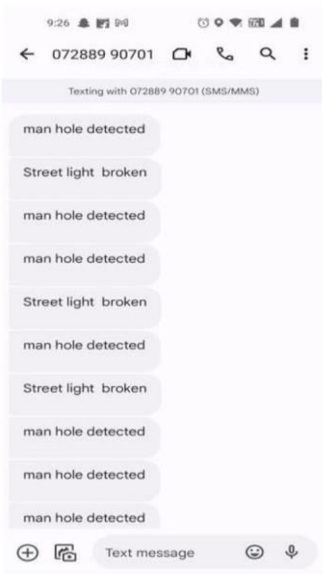

Fig. 3. Alert SMS

V. Conclusion

The proposed system for automated street light control and manhole monitoring with fault detection and reporting presents a promising approach for municipal departments. It offers potential benefits in energy conservation, improved infrastructure management, and enhanced public safety. Addressing the challenges associated with initial cost, maintenance, cybersecurity, and data management will be crucial for successful implementation. Further research and development efforts could explore cost-effective alternatives, optimize system performance, and investigate integration with existing city management platforms. Overall, this system has the potential to contribute to more efficient and sustainable urban infrastructure management. The system utilizes Light-Dependent Resistors (LDRs) to detect ambient light levels. Based on pre-programmed thresholds, the microcontroller unit (MCU) in each streetlight automatically controls its operation. During dusk, the LDR detects decreasing light levels, triggering the MCU to switch on the streetlight. Conversely, during dawn, the LDR detects increasing light levels, prompting the MCU to turn off the streetlight. This automation helps conserve energy by ensuring streetlights are only operational when necessary. The system employs ultrasonic sensors to monitor water levels within manholes. These sensors emit sound waves and measure the time it takes for the reflected echo to return. By calculating the time difference, the MCU can determine the distance to the water surface, translating it to an estimated water level within the manhole. This real-time monitoring allows municipal authorities to identify potential issues like blockages or high water levels before they escalate into overflows or infrastructure damage.

References

[1] A.K. Kasim, A. Raheem, Bluetooth based smart home automation system using Arduino UNO microcontroller, Al-Mansour J. 27 (2017) 139.

[2] A.B.H. Amirah, H.I.I. Mohamad, K Chan, Bluetooth based home automation system using an android phone, J. Teknologi (Sci. Eng.) 70 (3) (2014) 57–61.

[3] B. Yuksekkaya, A.A. Kayalar, M.B. Tosun, M.K. Ozcan, A.Z. Alkar, A GSM, internet and speech controlled wireless interactive home automation system, IEEE Trans. Cons. Electr. 52 (3) (2006) 837–843.

[4] R.S. Diarah, D.O. Egbunne, B.A Aaron, Design and implementation of a microcontroller based home automation system using AIWA remote, Int. J. Sci. Res. Educ. 2 (3) (2014) 575–588.

[5] A. Gurek, G. Caner, A. Mustafa, K., .M.. Senem, K Ilker, An Android Based Home Automation System, in: Proceedings of the 10th International Conference on High Capacity Opt. Net. and Enabling Techn. (HONET-CNS), 2013.

[6] S. Kannapiran, A. Chakrapani, A novel home automation system using Bluetooth and Arduino, Int. J. Adv. Comp. Elect. Eng. 1 (5) (2016) 41–44.

[7] B. Pandya, et al., Android based home automation system using Bluetooth & voice command, Int. Res. J. Eng. and Tech. 3 (3) (2016).

[8] N. Sriskanthan, T. Karande, Bluetooth Based Home Automation Systems, J. Micro-Proc. Micros. 26 (2002) 281–289.

[9] StatCounterMobile Operating System, 2019 Available at https://gs.statcounter.com/os-market-share/mobile/worldwide .

[10] R. Teymourzadeh, et al., Smart GSM based home automation system, in: Proceedings of the IEEE Conference on System (ICSPC2013), Kuala Lumpur, Malaysia, 2013.