LUMI NODE

SMART STREET LIGHT FAULT DETECTION AND CLOUD INTEGRATION :

TECHNICAL REPORT & VISUAL IMPLEMENTATION

PROJECT TEAM MEMBERS:

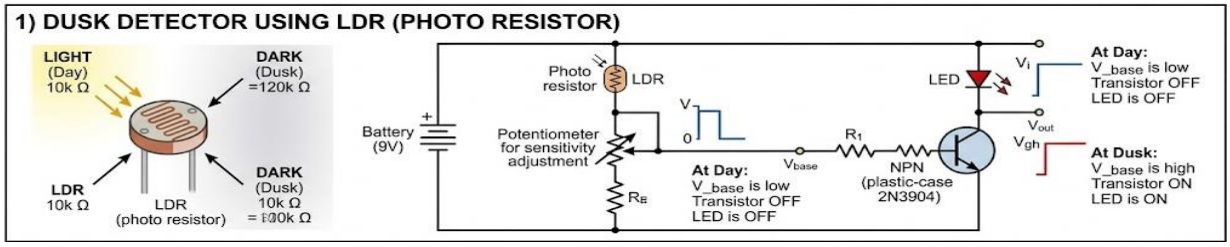
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SYSTEM CONCEPTUALIZATION AND POSTER DESIGN

The automated street light system was developed to solve two major municipal inefficiencies: energy wasted on daytime illumination and the high cost of manual night time patrols to locate broken lamps. To effectively communicate this localized-to-global smart grid concept, our team, LUMI NODE, designed a comprehensive wall magazine. We structured the poster to visually trace the data flow from physical hardware components on the left—featuring detailed line-art and circuit blueprints of the sensors—to the cloud supervisor dashboard on the right. This visual narrative was critical in demonstrating how a physical street lamp translates environmental and electrical data into an actionable digital interface.

AUTOMATED DUSK DETECTION (THE PHYSICAL LAYER)

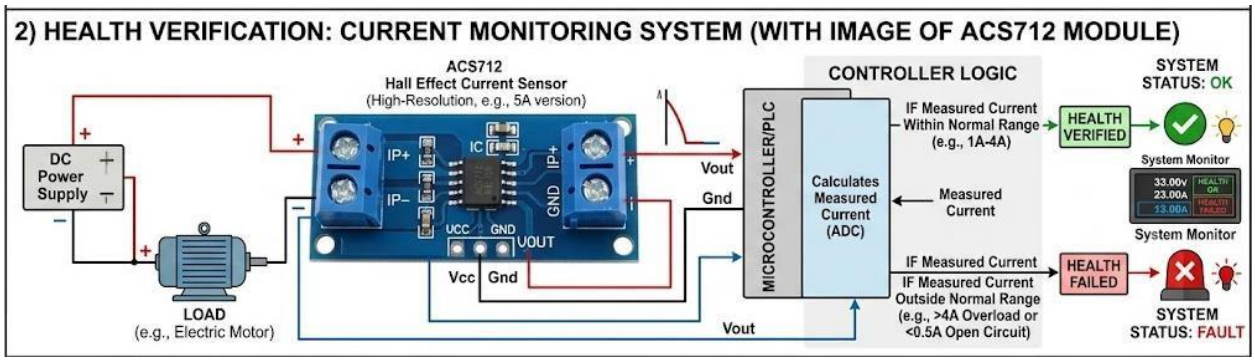
The system operates on an energy-management paradigm that initiates through precise environmental sensing. A Light Dependent Resistor (LDR) functions as the primary dusk detector. During daylight, the LDR's resistance is low (typically around 10kΩ), keeping the microcontroller's baseline voltage below the activation threshold.



As ambient light drops, the resistance spikes (up to 120kΩ), signaling the Arduino Nano to actuate a 5V relay module and power the lamp. On our poster, we illustrated this using a vibrant schematic showing the LDR and relay interaction, emphasizing the shift from rigid timer-based schedules to dynamic, real-time light sensing.

HEALTH VERIFICATION AND FAULT PROCESSING (THE DIAGNOSTIC LAYER)

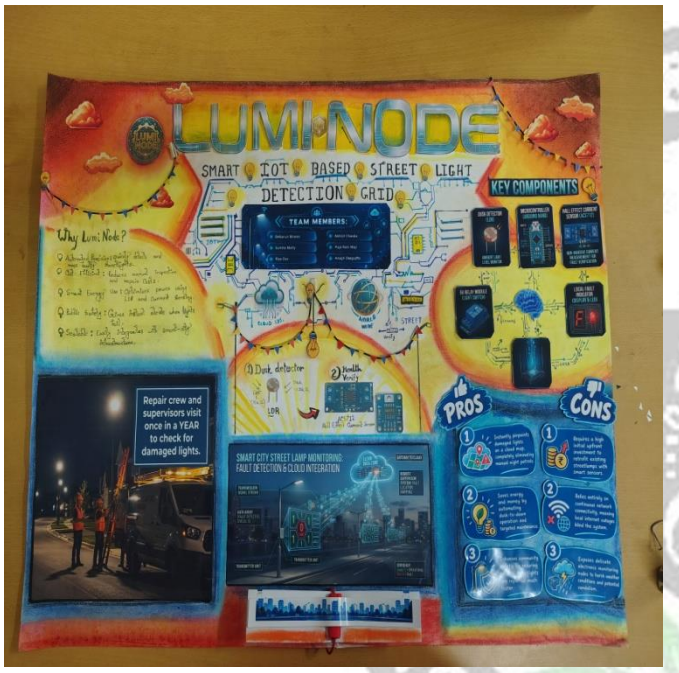
Once the street lamp is activated, the system transitions into its diagnostic phase using an ACS712 Hall Effect Current Sensor. This module performs non-invasive, -time electrical current measurements directly line. The microcontroller processes these analog readings against predefined operating thresholds. If the lamp draws the expected baseline current, the system registers a '1' (Healthy). An open circuit from a blown bulb or an overload from a short circuit triggers a '0' (Fault state). To convey this technical logic on the wall magazine, we incorporated high-contrast graphics and a visual decision-tree, breaking down how analog current is translated into a binary status.



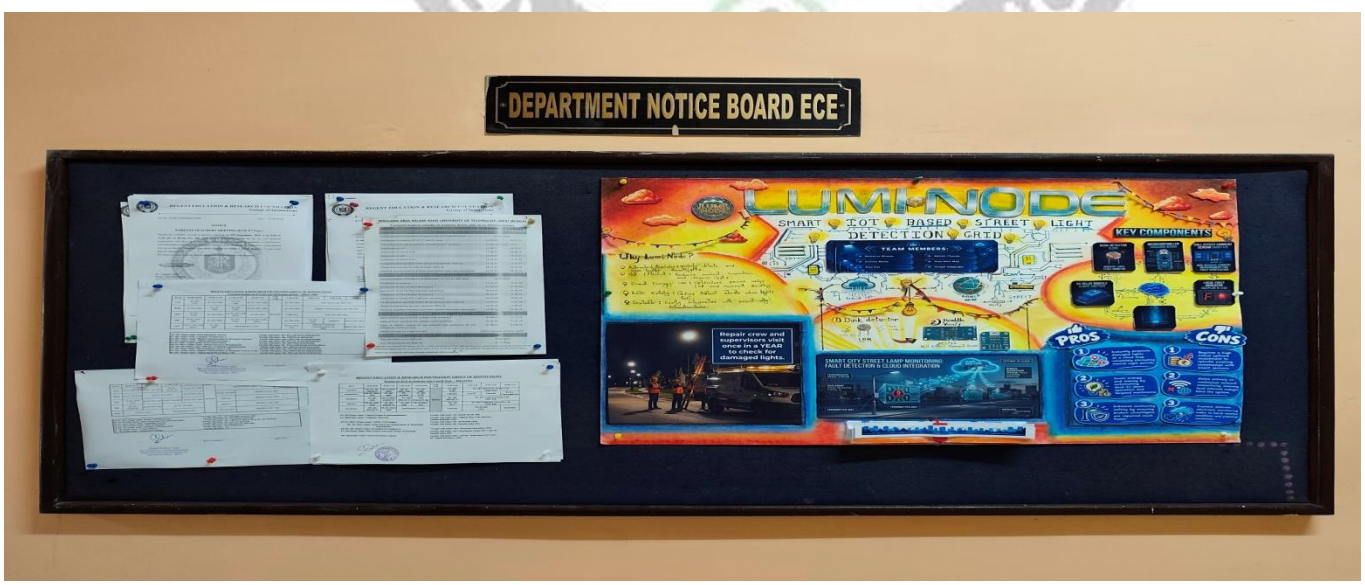
CLOUD TRANSMISSION AND SUPERVISOR INTERFACE (THE NETWORK LAYER):

The localized binary status of each street light is aggregated into a data array and pushed to a central database. Utilizing a communication module, the microcontroller transmits this array to a Cloud Network Hub. In the supervisor's remote system, this data stream maps onto a geo graphical dashboard. Any node transmitting a '0'generates an immediate alert, pin pointing the exact location for maintenance crews. We highlighted this on the poster's centerpiece: a glowing, futuristic cloud hub routing data streams into a supervisor's fault map, boldly reinforcing our central theme that crews only need to visit when a verified fault occurs.

PHOTOGRAPHS (OF THE WALL MAGAZINE AS WELL AS THE TEAM!)







CONCLUSION: FUTURE SCOPE AND SCALABILITY:

The foundational architecture of this fault detection system provides a highly scalable platform for broader smart city integration. Future iterations will incorporate Machine Learning (ML) algorithms to analyze historical current fluctuations, enabling predictive maintenance that flags degrading lamps before they completely fail. Additionally, the network nodes can be upgraded to support independent solar power generation and house auxiliary multipurpose sensors for monitoring urban air quality and traffic movement. By merging automated localized control with global cloud diagnostics, this system reduces municipal overhead and ensures consistent public safety. The LUMI NODE wall magazine successfully captures this transition, illustrating how simple sensory components can scale into an intelligent, responsive urban infrastructure.

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