

IOT BASED STREET LIGHT INTENSITY OPTIMIZATION AND AIR POLLUTION MONITORING SYSTEM

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ABSTRACT The project is to develop a smart street lightening system based on the intensity of the traffic and also monitoring the environment to control the air pollution. By calculating the number of vehicles, we will come to know in which side the density is and the brightness of the street lights are adjusted according to that traffic density. Arduino UNO is used as a microcontroller which provides the signal timing based on the traffic density. The temperature and the humidity level of the air are monitored periodically for the environmental sustainability. The data are stored in cloud which are accessible through the web Keywords: Air Pollution, Sensor & Moisture absorber

1. INTRODUCTION The 21st century is striving hard to save electrical energy. Street lights are essential but expensive, therefore there is a need to optimize the system in a way that it is affordable and efficiently conserves energy. Manually controlling the street lights is a time taking and tedious process. Working in such a manner could sometimes result in large disasters and destruction. The main problem that manual controls on the street lights face is that there would be a lot of time talking during evening times when they are to be switched ON and a significant waste of energy is done in the morning at all could not be turned OFF together at once. Another way in which the wastage is done is that at midnights lights glow at full intensity although there is not much traffic. Therefore, there is a need to come up with a system that overcomes the problems of existing systems. A system that reduces manual control and saves the energy efficiently. This could be done by using low power, robust and efficient components. Nowadays, the highest percentage of air pollution comes directly from road traffic and not anymore from large industries, currently placed outside metropolitan & urban areas. Road traffic is considered to be responsible for 25% of all emissions in Europe, rising up to 31% only in Spain. Moreover, 90% of all transport emissions are due to road traffic. Loss of environmental quality is one of the biggest threats of our century to health and human well-being, together with environmental impacts. Recently, natural disasters and extremely abnormal climate situations happen frequently and globally, the culprit of which is the exacerbation of global warming. One of the measure reasons behind global warming is Air Pollution. A human can live or survive without water and food for a few days but when it comes to air then surviving for 2 to 3 minutes may seem to be impossible. Air Pollution has a significant influence on the concentration of constituents in the atmosphere leading to effects like global warming and acid rains. Air pollutants are added in the atmosphere from a variety of sources that change the composition of the atmosphere and affect the biotic environment. The concentration of air pollutants depends not only on the quantities that are emitted from air pollution sources but also on the ability of the atmosphere to either absorb or disperse these emissions. Transport has a significant impact on the environment in which we live. In general, these impacts can be divided into four broad headings: local air quality, climate change, noise, and watercourse pollution, while clean air is vital to human health. High levels of fine particulate (PM10) air pollution in 2005 were estimated to have caused 1,031 accelerated deaths and 1,088 respiratory hospital admissions in London. By considering all these issues and facts we will go to design a system which will help to overcome these issues. The system is all about detecting air pollution, monitoring the traffic density which is measure cause for air pollution also managing the Lamps brightness dynamically. This system is designed based on IoT. Internet of Things (IoT) is a recent communication paradigm that envisions a near future, in which the objects of everyday life will be equipped with microcontrollers, transceivers for digital communication, and suitable protocol stacks that will make them able to communicate with one another and with the users, becoming an integral part of the Internet. The IoT concept, hence, aims at making the Internet even more immersive and pervasive. Furthermore, by enabling easy access and interaction with a wide variety of devices such as, for instance, home appliances, surveillance cameras, monitoring sensors,

actuators, displays, vehicles, and so on. This paradigm indeed finds application in many Air pollution monitoring is extremely important as air pollution has a direct impact on human health and the environment. Here, we introduce IoT system for participatory air pollution monitoring. The traditional air quality monitoring system, controlled by the Pollution Control Department, is extremely expensive. In contrast to traditional air pollution monitoring stations, we present the design, implementation, and evaluation of low power, low-cost IOT Based Air Pollution Monitoring System which provides real-time monitoring. And finally we designed a dash board to view the air pollution monitoring and automatic control for lights to adjust its brightness using vehicles count. This system is more efficient and energy saving one

2. LITERATURE SURVEY

2.1. AN INNOVATION IN THE FIELD OF STREET LIGHTING SYSTEM WITH COST AND ENERGY EFFICIENCY - Akshay Balachandran, Murali Siva, V. Parthasarathi, Surya and Shriram K. Vasudevan, Indian Journal of Science and Technology This paper focus on the necessity of automated street light system and the peculiar way of implementation with embedded system tools. As automation booming in the industry with a fast pace, the requirement of replacing the primitive operation of street lights with quite intelligence is necessary. Methods/Statistical Analysis: The previous systems were implemented with LDR and IR sensors, here the presence of movement in the roads are sensed by IR sensors and LDR powers the street lights only after evening. The excess use of IR sensors and energy involved in the above operation are reduced in our prototype. Here we use piezo electric sensors to detect the movement in the roads instead of IR sensors. The microcontroller MSP430 as the brain to control the processes involved. The results are found to be very encouraging and the sample results are presented in the results section of the paper. LEDs are going to be vital lighting option in near future due to its peculiar low power consumption and cost effective nature. Our prototype will help in eliminating the current sodium vapour street lamps with better LED comprised lamps operated smartly using LDR, and piezo knock sensor. Discover the world's research

2.2 MONITORING VEHICLES AND POLLUTION ON ROAD USING VEHICULAR CLOUD ENVIRONMENT - Sumit A. Khandelwal, Dept. of Computer Engineering MIT Academy of Engineering, AlandiPune, India, Ashwini B. Abhale, Dept. of Information Technology, D. Y. Patil, College of Engineering, AkurdiPune, India India is having numerous amounts of vehicle's owner and more than that 50% of vehicles are continuously running on a road. As a contrast, most of the vehicles are meeting with an accident, it causes human fatalities and generated a large amount of toxic gases are emitted out during vehicle running as well as meet into an accident. Hence, various technologies have deployed to preserve and encourage Intelligent Transportation Systems (ITS). A numerous results were suggested the related challenges and current issues of vehicular networks as well as limitation related to the cost and accessibility of a resource. Vehicular Cloud Environments (VCE) is unitary of the results. Vehicular Cloud Environments is a novel technology that point to impact on handing traffic condition and providing road safety using various vehicular resources, such as computing units, storage devices and internet facility for correct decision-making. In this paper, we focus on the vehicular cloud environments can be the future technological changing model that offers economically feasible solutions by using intelligent vehicular networks with autonomous traffic condition information, self vehicle control on road and develop opinion systems to prevent an accident as well as analysis amount of toxic gases emitted from a vehicle on a road.

2.3 OPTIMAL DEPLOYMENT OF WIRELESS SENSOR NETWORKS FOR AIR POLLUTION MONITORING - Ahmed Boubrima, FrédéricMatigot*, WalidBechkit*, HervéRivano* and Anne RuasUniversité de Lyon, INRIA, INSA-Lyon, CITI-INRIA, F-69621, Villeurbanne, France, ÉcolenationaleSupérieurede l'Informatique, LMCS Lab, Algiers, Algeria, IFSTTAR, Paris, France The paper proposes, two integer linear programming formulations based on real pollutants dispersion modelling to deal with the minimum cost WSN deployment for air pollution monitoring. We depicted the concept by applying our models on real world data, namely the Nottingham City street lights. We compare the two models in terms of execution time and show that the second one based formulation is much better. We addressed in this work the optimal deployment of wireless sensor networks for air pollution monitoring. To this end, the careful study of the dispersion modelling is something that should not be overlooked. We therefore studied a known model of diffusion of atmospheric pollution. We proposed two ILP optimization models that ensures both pollution coverage and network connectivity. We implemented and compared the

two models in terms of execution time; the results showed that the second flow-based formulation is much better. We also conducted extensive simulations and derived some results to guide the choice towards an optimal deployment. As a future work, we plan to consider the impact of other parameters such as wind direction, the nature of pollutants, urban topography, etc. Moreover, we are also working on the design of specific heuristics to solve the addressed problem.

2.4 DEVELOPMENT OF IOT BASED VEHICULAR POLLUTION MONITORING SYSTEM - Ramagiri Rushikesh, M. Tech, Department of ECE, JNTUA College of Engineering, Chandra Mohan Reddy Sivappagari, Assistant Professor and Head, Department of ECE, JNTUA College of Engineering, The main objective of the paper is to introduce vehicular pollution monitoring system using Internet of Things (IoT) which is capable of detecting vehicles causing pollution on the city roads and measures various types of pollutants, and its level in air. The measured data is also shared. This system is a low cost and provides good results in controlling the air pollution especially in the urban areas. At monitor location, the RFID reader, wireless gas sensors are integrated along with microcontroller. This entire system is placed in either of the road. Whenever the vehicles equipped with RFID tags passed through the sensor Node, RFID reader presented in the monitoring system detects the vehicles and the sensors measures quality of their produced by that vehicle. The sensed continuous data assent to the microcontroller for verification of the pollution. Level of the vehicle. The microcontroller verifies the levels of the pollutants of the air produced by the vehicle.

2.5 INTELLIGENT STREET LIGHT SYSTEM USING RF TRANSMISSION - Sakshi Anand*, Dr. NeeluJainDepartment of Electronics &Comm., PEC University of Technology, Chandigarh, India In this paper, A Street light use HID (High-Intensity Discharge) Lamp as light source. Due to global concerns regarding the amount of power consumed by HID lamps and the amount of atmospheric CO₂ released because of power consumption, LED array illumination has received attention recently as an energy reducing light source. LED illumination requires about one third to one half of the electric power needed for HID lighting. The life cycle of an LED can be more than three times as long as an HID light and LED system would be comparatively maintenance free. In recent years, LED lighting can be expected to fully replace earlier used light sources. Street lights are the large consumer of energy in the cities, consuming up to fifty percent of the city's energy. In order to reduce energy consumption, an intelligent street light system based on LED lamps and wireless communication technologies can be designed. The proposed prototype of intelligent street light can detect daylight and vehicles and vary the intensity of the LED based street lamps as per the traffic flow. It can also help in monitoring of street light system and fault detection through RF wireless technology. If intelligent street light is designed and installed in the cities, then, lot of power can be saved and this will also minimize the cost of maintenance over traditional wired systems. The system is versatile, and can be extended as per user needs.

3. SYSTEM ANALYSIS

3.1 EXISTING SYSTEM: Existing system works for both indoor and outdoor lightening. On the one hand it improves efficiency of the system by sending alert signal in case of any defect and on the other hand it drastically reduces the electric energy consumption by providing central control over the lights. This system can be installed as energy efficient system to control street lamp that requires a lot of energy and needs manual intervene. traffic street lamps which grow in number in one direction. So this is different from the on premise as here we have challenge of communication range. Master Controller: It acts like brain for the whole device control and monitoring system. Micro controller receives and transmits signals to and fro slave nodes over wired connection. At the same time, it sends the feedback to a central monitoring application for visual display of the status of different electrical devices. Slave Node: Each lamp controller is connected to master controller to send and receive information about the status of the device. Based on the current sensor detector which is connected to electrical device, signal is send to the Master controller about the working status of the device. If any signal is send from the master to the slave, then the relevant action is performed based on the data received. As wireless connection range (router or Node MCU) is in meters, so it is not possible to use in cases where Wi Fi connection is require in Kilometers. Moreover, to make the system reliable wired connection is used to connect Master Controller to the street lamp device. This micro controller is turn is connected to Cloud server and web application

3.2 PROPOSED SYSTEM:

In this project, we are going to make real time deployment of sensors to design and implement an intelligent system in which we will monitor Air quality by measuring temperature and humidity level and also designed an automatic street lighting system. We collect the temperature and humidity using dht11 sensor and collect the air quality level with help of mq135 sensor. And we used two IR Sensor to count the vehicle. Based on this count we can adjust the lamp brightness and save the energy. We used MQTT protocol to share the sensor information to Dashboard. The protocol, which uses a publish/subscribe communication pattern, is used for machine-to-machine (M2M) communication and plays an important role in the internet of things (IoT). It works on top of the TCP/IP protocol. It is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited. In this IOT project, you can monitor the pollution level from anywhere using webpage. We can install this system anywhere and get information from devices using web application by MQTT protocol.

3.3.INTERNET OF THINGS(IOT): IoT is creating a giant network where all the devices are connected to each other and providing them with the capability to interact with each other. This is driving the automation to a next level where devices will communicate with each other and make decisions on their own without any human interventions. Following are a few stats that reflect the growth in the demand for IoT certification training quite accurately: According to the Gartner report, by 2020 connected devices across all technologies will reach to 20.6 billion. As per the Cisco report, IoT will generate \$14.4 trillion in value across all industries in the next decade. Unknowingly, IoT applications are becoming an important aspect of our life. Birth of IoT Introduction to IoT Benefits of IoT IoT Hardware IoT Across Various Domains Raspberry Pi IoT Application – Sensing the Environment & Notifying You may go through this recording of IOT Tutorial where our instructor has explained the topics in a detailed manner with examples that will help you to understand this concept better. IoT Hardware Now you would be wondering what the required hardware for preparing an IoT solution is. The answer to this question is, you'll first require sensors that will sense the environment, then you require a remote dashboard to monitor your output and display it in a clearer & conceivable form. At last, you will require a device with the capability of serving & routing. The key task of the system would be detecting specific conditions and taking actions accordingly. One thing to keep in mind is securing the communication between the devices and the dashboard. Some of the common sensors that you are surrounded by are accelerometers, temperature sensors, magnetometers, proximity sensors, gyroscopes, image sensors, acoustic sensors, light sensors, pressure sensors, gas RFID sensors, humidity sensors & micro flow sensors. Nowadays we also have many wearable devices like smart watches, shoes & 3D glasses. This is the best example of a smart solution. 3D glasses adjust television's brightness and contrast according to your eye and your smart watches keep track of your daily activities and fitness. But I feel the most important device which has tremendously contributed to IoT is the cell phones. Mobile apps have immensely contributed to revolutionizing the technology world. Cell phones are already encased with applications and sensors that reveal lots of information about its user. It has Geo-location information, it can sense and trace light condition, the orientation of your device and a lot more information. It also comes with multiple connectivity options like WiFi, Bluetooth and cellular that helps them to communicate with other devices. Thus, due to these default qualities of cell phones, it is the core of the IoT ecosystem. Today, Smartphone can interact with smart watch and fitness band to further ease and enhance the user experience. IoT uses multiple technologies and protocols to communicate with devices based on the requirements. The major technologies & protocols are Bluetooth, wireless, NFC, RFID, radio protocols and WiFi-Direct. IoT applications are flourishing across all industries & market. The IoT has a multitude of expansion over various industries. It spans over all groups of users, from those who are trying to reduce & conserve energy in their home to large organizations who want to improve their business operations. IoT has not only proved it useful in optimizing critical applications in many organisations, but also have boosted the concept of advanced automation which we have imagined a decade before. Let's understand the capabilities of IoT across different industries and look how they are revolutionizing them. IoT Across Various Domains Energy Applications: The energy rates have risen to a great extent. Individuals and organisations, both are searching ways to reduce and control the consumption. IoT provides a way to not only monitor the energy usage at the appliance-level but also at the house-level, grid level or could be at the distribution level. Smart Meters & Smart Grid are used to monitor energy consumption. It also detects threats to the system performance and stability, which protect appliances from

downtime and damages. Healthcare Application: Smart watches and fitness devices have changed the frequency of health monitoring. People can monitor their own health at regular intervals. Not only this, now if a patient is coming to the hospital by ambulance, by the time he or she reaches the hospital his health report is diagnosed by doctors and the hospital quickly starts the treatment. The data gathered from multiple healthcare applications are now collected and used to analyze different disease and find its cure. Education: IoT provides education aids which helps in fulfilling the gaps in the education industry. It not only improves the quality of education but also optimizes the cost and improves the management by taking into consideration student's response and performance. Government: Governments are trying to build smart cities using IoT solutions. IoT enhances armed force systems and services. It provides better security across the borders through inexpensive & highperformance devices. IoT helps government agencies to monitor data in real-time and improve their services like healthcare, transportation, education etc. Air and Water Pollution: Through various sensors, we can detect the pollution in the air and water by frequent sampling. This helps in preventing substantial contamination and related disasters. IoT allows operations to minimize the human intervention in farming analysis and monitoring. Systems automatically detect changes in crops, soil, environment, and more. Transportation: IoT has changed the transportation sector. Now, we have self-driving cars with sensors, traffic lights that can sense the traffic and switch automatically, parking assistance, giving us the location of free parking space etc. Also, various sensors in your vehicle indicate you about the current status of your vehicle, so that you don't face any issues while travelling. Marketing your product: Using IoT, organizations can better analyze& respond to customer preferences by delivering relevant content and solutions. It helps in improving business strategies in the real-time

CONCLUSION In this project we have discussed the low cost, secure, accessible IOT based street light optimization based on the traffic and also we discussed the air pollution monitoring system. Wi-Fi module controls all the process to the internet and monitor is used to display all the web pages over the internet. The system can upload the measured temperature, Humidity and Air Quality data on a website based on IoT. This system could be used to integrate Lamp control based on intensity. For micro controller containing the whole system would need to be installed at the monitoring site. The device to monitor the toxicity in the air environment is designed using Node-MCU, IoT technology is implemented to control the air quality in high traffic areas. The use of MQ135 sensor senses various hazardous gases, automatic lighting system and Node-MCU is the heart of this application, which controls the whole process. Micro controllers in build Wi-Fi module controls all the process to the internet and monitor is used for displaying all the web pages over the internet.

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