JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Smart IoT Based Light Intensity Monitoring System

Sumanta Chatterjee[1], Aindrila Chanda[2], Amit Dey[3]
[1]Assistant Professor, [23]UG Student
[123]Department of Computer Science and Engineering
[123]JIS College of Engineering, Kalyani, India

Abstract: Light is very important for plants. In the presence of sunlight, plants produce their own food in the process of photosynthesis. Plants require sunlight for their healthy growth. Sunlight sometimes increases and sometimes decreases. As a result, the temperature sometimes rises and sometimes falls. But for healthy growth of plants, certain temperature is required. However, at times farmers and gardening lovers may not be able to keep track of it maybe they are not sure if the plants are getting enough sunlight. In this research paper, a light measuring system is introduced so that the coming sunlight can be measured. This system will show the data in the form of graphs. And it will alert the user. In this way, the user will take the necessary steps. This system is very easy to make. Anyone like farmers, gardening lovers, any industry, etc. can use it easily.

Keywords: LDR, Light Intensity, IoT

I. INTRODUCTION:

Agriculture is the art and science of cultivating the soil, growing crops and raising livestock. Agriculture was the key development in the rise of sedentary human civilization, whereby farming of domesticated species created food surpluses that enabled people to live in cities. It includes the preparation of plant and animal products for people to use and their distribution to markets. Light intensity influences the manufacture of plant food, stem length, leaf color and flowering. Generally speaking, plants grown in low light tend to be spindly with light green leaves. A similar plant grown in very bright light tends to be shorter, better branches, and have larger, dark green leaves. Weather forecasting is the application of science and technology to predict the conditions of the atmosphere for agiven location and time. People have attempted to predict the weather informally for millennia and formally since the 19th century. Weather forecasts are made by collecting quantitative data about the current state of the atmosphere, land, and ocean and using meteorology to project how the atmosphere will change at a given place. The effect of Light intensity on weather is one of the most important factors. It is affecting the rate of photosynthesis. Other factors are concentration of carbon dioxide, temperature and to a lesser degree, water. Light intensity directly affects the light-dependent reactionin photosynthesis and indirectly affects the light-independent reaction. Light is a limiting factor when the light intensity is too low to allow the light-dependent reaction to proceed at its maximum rate.

Light is notnormally a limiting factor except for plants in forest understory of other shaded plants. This system is a combination of agriculture and weather report system. By using the system the intensity of sunlight can be found and all the data points are shown in a tabular as well as an graphical format along with the date and time. After turning on the system for specific time period such as live or 1 day or 1 week or 1 month or 1 year the total numbers of intensity data are provided which can help for taking the necessary steps. In section 2 Literature reviews, in section 3 the Proposed work, in section 4 Circuit diagram, in section 5 Working process, in section 6 Experimental analysis and results, in section 7 Conclusion and Futurescope and section 8 References are presented in this paper.

II. Literature Survey:

The paper published on 2021 by Calvin Marian Netto; Cifha Crecil Saldanha; Davin Dsouza, titled "Room Light Intensity Control with Temperature Monitoring System Using Arduino" that in this system uses an Arduino and PWM technology for controlling the intensity of the LED. LDR is used as the LUX meter. The power losses incurred in PWM switching devices is extremely low. A PWM voltage regulator is built using a LM2596 buck converter which is driven by the PWM signal from the Arduino. By mapping the LDR output values to the PWM signal duty cycle the LED light intensity is varied. In addition to the light intensity controller is a temperature monitoring system, using a DHT11 sensor to measure temperature and humidity. This system is more functional than analog dimmers and timer based light controllers. Through the intended system we aim to reduce power consumption of lights throughlight dimming using PWM technology. It uses the available resources and is suitable for other light dimming applications as well[3].
The paper published on 2020 by Sadek U. Z. Laskar;L Abhinav;R. B Heera;D Anusua;Prakash Kodali titled "Development of Versatile Low Power Light Intensity Monitoring Gadget" the present work is an application that records the ambient light states of different workplaces and light intensity emitted by medical gadgets. The application records the light intensity estimations of a solitary room and can be stretched out to numerous study halls on a floor. By examining a study hall's ambience light, it can test the perceptibility aspect of a room and track any association's power utilization[1].
The paper published on 2022 by Murie Dwiyaniti;Ajeng Bening Kusumaningtyas;Silawardono;Sri Lestari Kusumastuti;Yoga Saefullah;Tohazen;Fairuza Qonitah Tireno;Daniswara Ramadhan titled "Energy Saving of IoT-based Light Intensity on Smart Streetlight"discusses the energy-saving efficiency of streetlights using two operating modes, namely timer mode and light intensity mode. Energy measurements are carried out in real time through an IoT-based smart streetlight monitoringsystem. The data used to compare the energy consumption in the two modes is the power and the length of time the streetlights are on. The results of this comparison will show the value of energy savings[2]. The paper published on 2021 by Sefi Novendra Patrialova;Tedy Agasta;Idha Nurmalita Sari;Daniswara Ramadhan titled "Prototype Design of Automatic Light Intensity Control in SmartGreenHouse"discussed a system that is equipped with Grow LED that can provide light intensity differaccording to the type of plant.The result of the Variation of Grow LED is produced by utilizing dimmer rotation controlled by Arduino Mega, Light Intensity Requirement (BH1750) which is then able to bemonitored through the Website. Retractable Roof works automatically based on seed and Planting Modes so that it can be seen the response of light intensity values that adjust to the Servo Motor andGrowing LED[6].

The paper published on 2021 by Zhouheng Wang;Haicheng Li;Ying Chen;Yu Cao;Yinji Ma;Xue Feng titled "Ultrathin Flexible Inorganic Device for Long-Term Monitoring of Light and Temperature" shows an ultrathin flexible inorganic device integrated with photodetectors across wide ranges of optical wavelengths from ultraviolet (UV) to infrared (IR).A temperature sensor for simultaneous long- term monitoring of light intensity and temperature during the daytime. The flexible device is fabricated by nanodiamond thinning technology[8].

III. Proposed Method:

A. Components required:

1. Wi-Fi Module: Wi-Fi modules (wireless fidelity) also known as WLAN modules (wireless local area network) are electronic components used in many products to achieve a wireless connection to the internet. Wi-Fi modules or wifi microcontrollers are used to send and receive data over Wi-Fi. They canalso accept commands over the Wi-Fi. Wi-Fi modules are used for communications between devices. They are most commonly used in the field of Internet of things. The most important component of this system is Wi-Fi Module. Every component is connected with the module. After monitoring the temperature it basically converted the voltage into Celsius, and also helps to run the system without any connector just only use the wi-fi that running on the computer and mobile also.

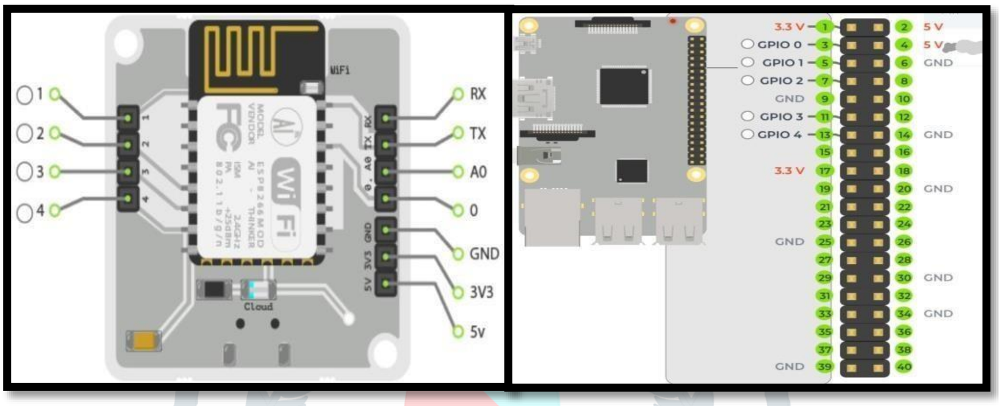

Fig.01 Wi-Fi Module

2. LDR: LDR is a sensor that can be used to see how much light is at any location. The internal resistance of LDR changes depending upon the intensity of light falling on it. It is connected to the Analogue input pin. The change in resistance coming from LDR can be converted into a change in voltage by using the Voltage Divider Circuit.

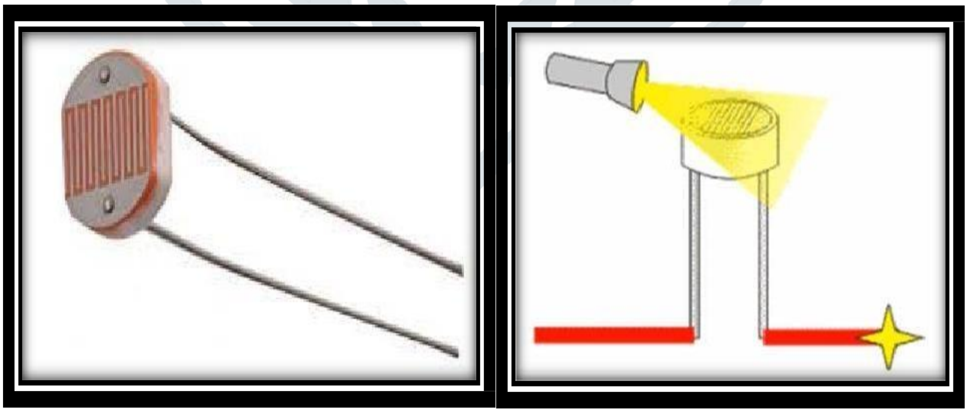

Fig: 02 LDR.

3. Resistor: Resistor is defined as. A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits. The main purpose of resistor is to reduce the current flow and to lower the voltage in any particular portion of the circuit.

Fig: 03 Resistor

B. Circuit Diagram:

Here, one pin of the LDR is connected to the 3x3 pin and the other is connected to the AO pin. The resistor is connected to GND on one side and AO on the other side. The GND and 3x3 pins should not touch each other or it will result in a short circuit and the Wi-Fi module will be damaged.

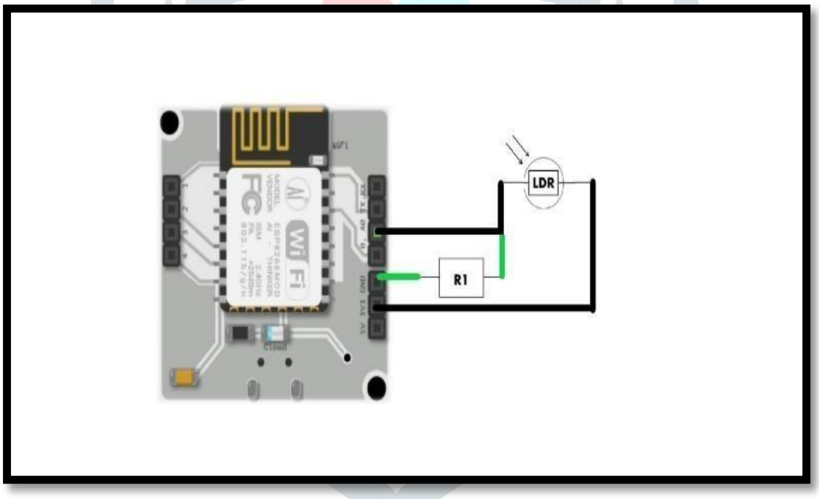

Fig: 04 Circuit Diagram

C. Pin Diagram:

Connect the pins as given in the table below.

LDR Pin	Responding Wi-Fi Module Pin	Comment
Vs Supply Voltage	5V	LDR sensor operates at 5V
Vout -Output	A0	Since the output is analogue and A0 is the onlypin onWi-Fi module that can read an analogueinput.
GND Ground	GND Ground	The ground pin of the LDR to be connectedto theground pin of Wi-Fi module with the resistor.

III. Working Process:

This system is based on the principle that whenever the light falling on the sensor changes, the resistance of sensor changes which is then converted into a change in voltage. The ADC pin on Wi-Fi Module converted this analog voltage level into digital values which are shown on the graphs. Connecting the LDR between 5v pin and the analog input pin (A0), so that when light intensity increases, the resistanceof LDR decreases so the voltage across the LDR decreases and as a result, the voltage on the analog input pin increases. This means that as the light intensity increases, the voltage onthe analog input pin also increases**.** Then converts that the voltage a 10 bit (10 places in binary number system) digital value that varies from 0-1024 (0 to 2 raised to 10).This digital data is then sent to the cloud where it is plotted for visual representation.

IV. EXPERIMENTAL DATA AND ANALYSIS:

The system is used in actual scenario, where it measures the intensity of sunlight . After sensing and converting the reading into digital values it present it through with the graph which shows the intensity values along with particular date and time. The system is run for one day, and it is found that the intensity values are same with the actual intensity values. But in few cases, it gives wrong value and they are very few in occurrence .It is assumed that the results are 98% accurate. In the following table there are total 50 results have been shown and a link is also attached for the rest of the output.

Link: https://drive.google.com/drive/folders/18fRbT6qrzoh6yeDMUN43UYtq_G8aiVI3?usp=sharing

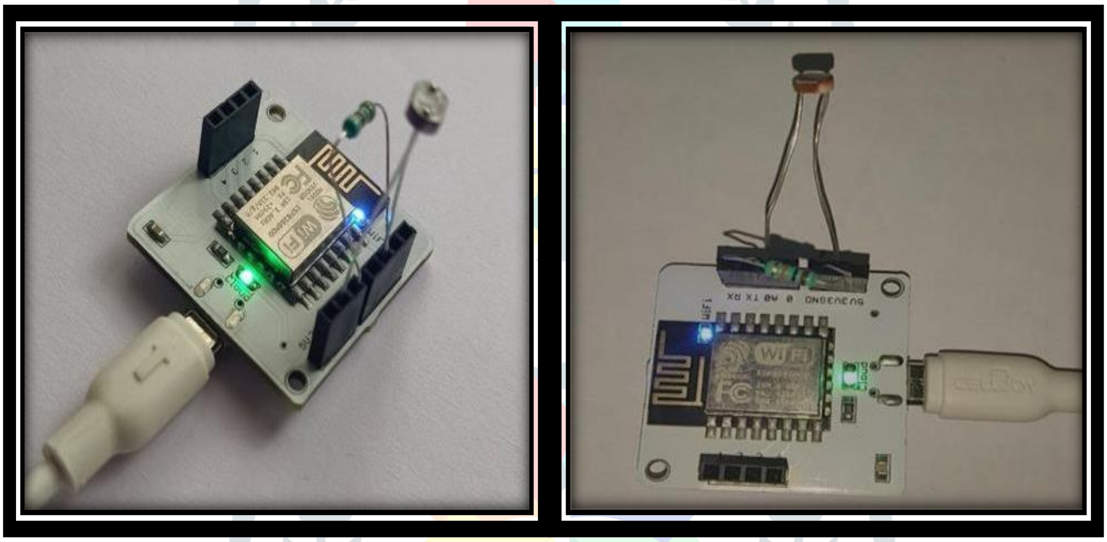

Fig: 06 Prototype of the proposed system

A. Light Intensity Measurement Table (Day wise):

Serial No	Time	Intensity
1.	7:00 am	200
2.	7:05 am	200
3.	7:10 am	200
4.	7:15 am	250
5.	7:20 am	250
6.	7:25 am	250
7.	7:30 am	280
8.	7:35 am	270
9.	7:40 am	270

10.	7:45 am	280
11.	7:50 am	290
12.	7:55 am	290
13.	8:00 am	300
14.	8:05 am	320
15.	8:10 am	320
16.	8:15 am	300
17.	8:20 am	340
18.	8:25 am	350
19.	8:30 am	350
20.	8:35 am	350
21.	8:40 am	350
22.	8:45 am	400
23.	8:50 am	450
24.	8:55 am	450
25.	9:00 am	450
26.	9:05 am	500
27.	9:10 am	500
28.	9:15 am	500
29.	9:20 am	550
30.	9:25 am	570
31.	9:30 am	570
32.	9:35 am	580
33.	9:40 am	570
34.	9:45 am	570
35.	9:50 am	580
36.	9:55 am	580
37.	10:00 am	580
38.	10:05 am	600
39.	10:10 am	600
40.	10:15 am	650
41.	10:20 am	700
42.	10:25 am	700
43.	10:30 am	750
44.	10:35 am	750
45.	10:40 am	800
46.	10:45 am	850
47.	10:50 am	900
48.	10:55 am	900
49.	11:00 am	950
50.	11:05 am	950

In the following graph the values are presented and the variance of data is clearly visible. The data points are shown by date and time separately which will help for tracking the information and can take needful steps. The graph can show live output, 1 day output or can give time as per the requirement.

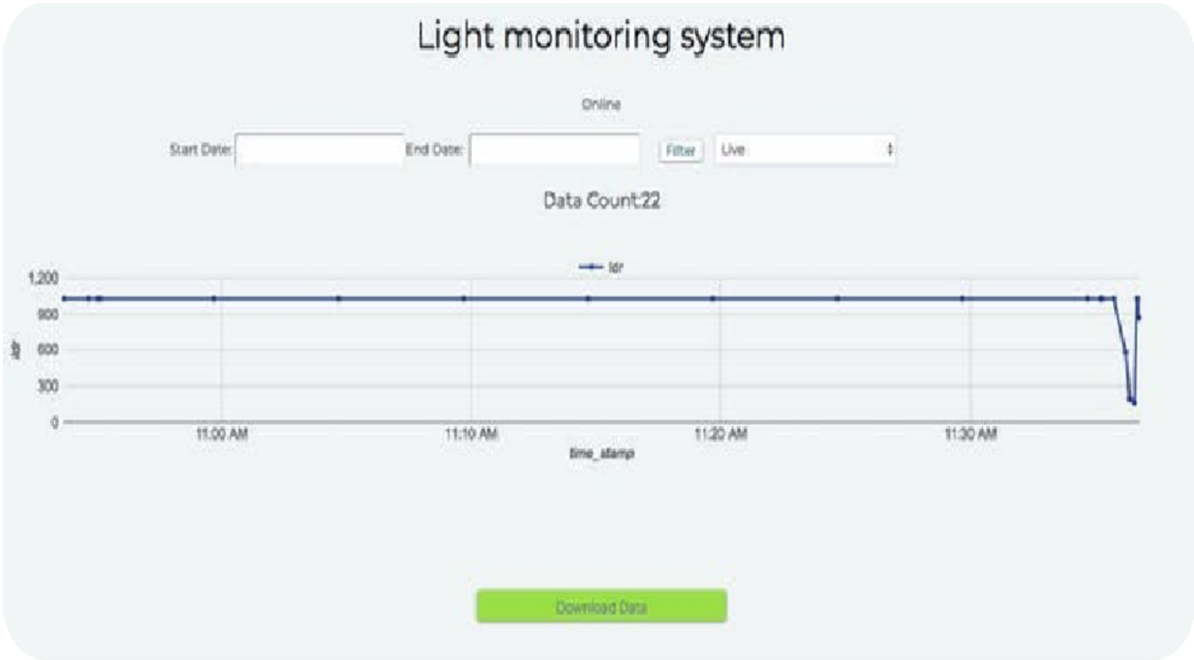

Fig: 07 Intensity vs.Time & Date Graph

V. CONCLUSION AND FUTURE SCOPE:

By implementing this system, the movement is become one step closer to a smarter digital world by eliminating efforts in tasks that require us to manually operate them by being physically present near the target electronic equipment. It is an efficient implementation of the internet of things. It is easy to setup and implement and requires no extra maintenance compared to the already existing system. This system can be further enhanced by writing logic into the code that can be capable of retrieving information of the time of sunset and sunrise from a reliable weather reporting source and automate the process completely by turning on the street light at the time of sunset and turning it off by sunrise. This further eliminates human intervention and a manual visit to the location of the street lights will be required only in case of a malfunction.

VI. REFERENCES:

1. Development of Versatile Low Power Light Intensity Monitoring Gadget Sadek U. Z. Laskar;L Abhinav;R. B Heera;D Anusua;Prakash Kodali 2020 International Conference on Communication and Signal Processing (ICCSP)Year: 2020 | Conference Paper | Publisher: IEEE

2. Energy Saving of IoT-based Light Intensity on Smart Streetlight Murie Dwiyaniti;Ajeng Bening Kusumaningtyas; Silawardono; Sri Lestari Kusumastuti;Yoga Saefullah;Tohazen;Fairuza Qonitah Tireno;Daniswara Ramadhan 2022 5th International Conference of Computer and Informatics Engineering (IC2IE)Year: 2022 | Conference Paper| Publisher: IEEE

3. Room Light Intensity Control with Temperature Monitoring System Using Arduino Calvin Marian Netto;Cifha Crecil Saldanha;Davin Dsouza 2021 IEEE International Conference on Distributed Computing, VLSI, Electrical Circuits and Robotics (DISCOVER)Year: 2021 | Conference Paper | Publisher: IEEE

4. A CMOS Wearable Infrared Light Intensity Digital Converter for Monitoring Unplanned Self-Extubation of Patients Cheng-Ta Chiang;Kang-Yu Liu IEEE Sensors JournalYear: 2019| Volume: 19, Issue: 15 | Journal Article | Publisher: IEEE

5. A Sensor for Monitoring the Lifespan of Color-LEDs in Traffic Lights C. E. Ngene;T. Shongwe 2019 International Conference on Advances in Big Data, Computing and Data Communication Systems (icABCD)Year: 2019 | Conference Paper | Publisher: IEEE

6. Prototype Design of Automatic Light Intensity Control in Smart Green House Sefi Novendra Patrialova;Tedy Agasta;Idha Nurmalita Sari 2021 International Conference on Advanced Mechatronics, Intelligent Manufacture and Industrial Automation (ICAMIMIA)Year: 2021| Conference Paper | Publisher: IEEE

7. Calibration of an imaging system for monitoring light pollution from small UAVs Pietro Fiorentin;Carlo Bettanini;Damiano Bogoni;Alessio Aboudan;Giacomo Colombatti 2019 IEEE 5th International Workshop on Metrology for AeroSpace (MetroAeroSpace) Year: 2019| Conference Paper | Publisher: IEEE

8. Ultrathin Flexible Inorganic Device for Long-Term Monitoring of Light and TemperatureZhouheng Wang;Haicheng Li;Ying Chen;Yu Cao;Yinji Ma;Xue Feng IEEE Transactions on Electron Devices Year: 2021 | Volume: 68, Issue: 7 | Journal Article | Publisher: IEEE

9. Monitoring System and Control of Air Quality and Light Intensity at ITTelkom Surabaya Greenhouse with Fuzzy Logic Anas Ittaqullah;Khodijah Amiroh;Helmy Widyantara 2022 1st International Conference on Software Engineering and Information Technology (ICoSEIT) Year: 2022 | Conference Paper | Publisher: IEEE

10. Re-Referencing and Calibration for Robust Ratiometric Light Intensity Measurement Damian Tohl;Meseret N. Teferra;Angus Wallace;Anh Tran Tam Pham;Youhong Tang IEEE Transactions on Instrumentation and Measurement Year: 2022 | Volume: 71 | Journal Article |Publisher: IEEE

11. Comparison Between the Traditional and Solar System Street Lighting System Ameer Al-khaykan;Ali Jawad Alrubaie;Kahtan A. Mohammed;Azher M. Abed;Yahya I. Alyasiri 2022 Muthanna International Conference on Engineering Science and Technology (MICEST) Year: 2022 | Conference Paper | Publisher: IEEE

12. A proposal for characterizing global light pollution using a LEO nanosatellite Jelena Bratulić;Leonardo-Max Golušin;Josipa Rendulić;Dominik Stipić;Jakov Tutavac;Dubravko Babić;Sonja Grgić;Tomislav Grubeša 2019 42nd International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)Year: 2019 | Conference Paper | Publisher: IEEE

13. A Smart Automated Greenhouse: Soil Moisture, Temperature Monitoring and Automatic Water Supply System (Peaty, Loam and Silty) Safaa Najah Saud Al-Humairi;Prasad Manimaran;Muhammad Irsyad Abdullah;Junaidi Daud 2019 IEEE Conference on Sustainable Utilization and Development in Engineering and Technologies (CSUDET)Year: 2019 | Conference Paper | Publisher: IEEE

14. Monitoring Harmful Sound Density, Light Intensity State in Industrial Workplace Jobair Al Rafi;Lutful Kader Msbah;Md. Abu Bakar Siddiq Sayem;Syeda Tanzina Hossain;Sohan Ul Alam;Mohammad Jahed Hasan 2019 International Conference on Signal Processing and Communication (ICSC) Year: 2019 | Conference Paper | Publisher: IEEE

15. MAS Concept for PIR Sensor-Based Lighting System Control Applications Krists Kviesis;Leslie Robert Adrian;Ansis Avotins;Olegs Tetervenoks;Donato Repole 2020 IEEE 8th Workshop on Advances in Information, Electronic and Electrical Engineering (AIEEE) Year: 2021 | Conference Paper | Publisher: IEEE

16. Data Monitoring System of Solar Module with Data Logger for Public Street Lighting Application Edi Mulyana;Aan Eko Setiawan;Sony Sumaryo;Achmad Munir 2019 26th InternationalConference on Telecommunications (ICT) Year: 2019 | Conference Paper | Publisher: IEEE

17. A Light Monitoring System with Smartphone Control based on Industry 4.0 Sung-Tsun Shih;I- Cheng Li 2021 International Symposium on Intelligent Signal Processing and Communication Systems (ISPACS) Year: 2021 | Conference Paper | Publisher: IEEE

18. Design of intelligent lighting energy saving system for Expressway Tunnel Based on Internet of things Chen Chen 2022 International Conference on Artificial Intelligence in Everything (AIE) Year: 2022 | Conference Paper | Publisher: IEEE

19. Cyber-Physical Smart Light Control System Integration with Smart Grid using Zigbee Gelli Ravikumar;Alex Nicklaus;Manimaran Govindarasu 2020 IEEE Power & Energy Society Innovative Smart Grid Technologies Conference (ISGT) Year: 2020 | Conference Paper | Publisher: IEEE

20. Effect of Ambient Lighting and Skin Tone on Estimation of Heart Rate and Pulse Transit Time from Video Plethysmography F. Shirbani;N. Hui;I. Tan;M. Butlin;A. P. Avolio 2020 42nd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)