IMPROVING LIGHTING EFFICIENCY FOR TRAFFIC ROAD NETWORK USING IOT

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Abstract- **The deployment of (LEDs) based traffic system control created the problem of dim displays when ambient light is similar to traffic lights. It causes some drivers' disability of seeing and obeying traffic signs. This makes drivers violate traffic rules. In this Project an attempt to use hybrid lighting technology to mitigate this problem was developed. Incandescent lightings provided an instantaneous source of highly efficacious illumination which is brighter than the drivers' ambient lights (daylight, electrical lights and their reflections), which can help drivers get access to enough warning and help them initiate traffic safety warning as necessary. The lightings also offered the required high current draw needed in electrical circuitry to help brighten the LED displays. The result of hybrid lighting system design was found to be high luminosity and capability of gaining driver attention Using IOT in real-time Applications.**

Keyword **- Traffic management, Autonomous vehicles, Light Efficiency.**

I.INTRODUCTION

The Smart Cities paradigm has recently gained an increasing interest in both academic and industrial communities for their novel and challenging methodological aspects and for their application potentialities. Because of the large amount of data arising, the development of advance control system architectures dedicated to the analysis of their features is mandatory. As a matter of fact, the management of an urban smart lighting infrastructure involves several disciplines and the multidisciplinary design and integration of different solutions, as the estimation and prediction of the traffic patterns , the management and control of all manipulable devices, and the sensors' data collection via Wireless Sensors Networks (WSNs) in the Internetof-Things (IOT) context. The traffic signal works on light signals and includes three colors: red, yellow and green. Here 'red' indicates that the vehicles must stop, 'yellow' means that the vehicles must slow down and finally 'green' means to go ahead. A light monitoring system which will automatically turn on the light when it will detect that the intensity of the light has reduced. The system connects with the vehicle lighting circuits to monitor the lights and alert when the load of a circuit falls below the stored fault threshold. Vehicle counting system is a solution that automates the process of vehicle detection and classification. Vehicle counting is a computer vision solution that automates the process of vehicle detection and classification. Vehicle counting software focuses on keeping track of the number and type of vehicles that enter and leave through a particular route for accurate monitoring of traffic. Vehicle counting is a huge leap towards achieving a safer environment on traffic-heavy roads. A critical aspect in approaching these tasks is the tradeoff usually arising between the number of cameras and traffic sensors installable on the roads, often limited by economical and environmental constraints, and the quality and quantity of data available over which the optimization takes place. For thisreason, the sensors allocation and selection problems are key issues in deciding where to place a limited set of sensors over alarge number of possible positions. Along these lines, smart lighting systems have received global attention and several research programs have been carried out to show the potential and the positive impact provided by smart technologies in increasing the efficiency of the street lamps management. As a matter of fact, the management of an urbansmart lighting infrastructure involves several disciplines and the multidisciplinary design and integration of different solutions, as the estimation and prediction of the traffic patterns, the management and control of all manipulable devices, and the sensors' data collection via Wireless Sensors Networks (WSNs) in the Internet-of-Things (IoT).

II.LITERATURE SURVEY

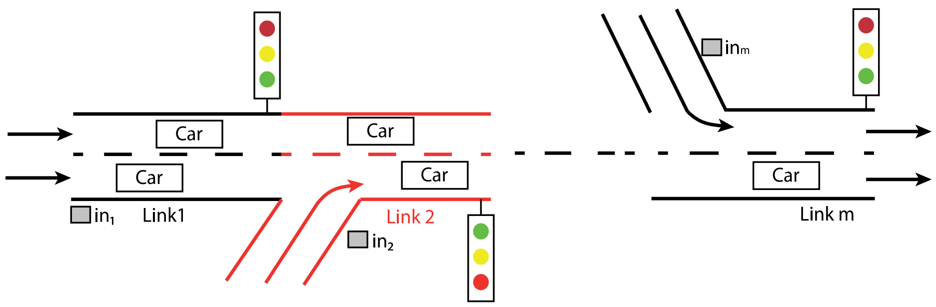
In past years, several studies and projects on smart lighting infrastructures have been presented in the literature covering various aspects of a Smart Street lighting system. Among them,the technical aspects of the design of smartinfrastructures for public lighting networks based on different wireless short-range communication technologies had been investigated. A case study concerning a smart-building application based on the LoRa low-rate, long-range communication protocol is also presented. the advantages of using LED dc lampswith respect to traditional street lamps were emphasized. In fact, the LED technology is characterized by longer lifetime, lower maintenance costs, higher efficiency, and most of all, the lampsare mercury-free and turn out to be easily disposable. Further energy consumption reduction can be achieved if theLED lamps intensity is controlled by a logic able to compute, on the basis of current traffic and weather information, suitablebrightness set-points for specific areas, or segments of the streets so as to implement a sort of "on-demand" lighting system.The reference presented a case study of an adaptive street lighting system based on a model that, from a theoretical pointof view, can ensure energy saving up to 88% with respect to using conventional sodium lamps.
On the other hand, many studies have addressed the problemof keeping the lamps brightness at their minimum allowable level, compatibly with national/regional standards, and/or withsafety limits for both vehicular and pedestrian traffic. These strategies can be very sophisticated and can modulate theminimum allowable brightness on different levels dependingif a single or many vehicles are present in the street segmentof interest. They can also take care of the presence of bikersor motorcyclists along with cars or trucks. Traffic monitoring usually requires significant sensor deployments. Often, due to economical and environmental

constraints, this task must be accomplished by using a limited number of sensors/cameras: This consequently leads to state a sort of sensors selection problem. In literature, several approaches from different perspectives have been proposed to address such a problem: Asan example, the work in provided a solution to the optimalsensor placement by using the notion of system observability as the optimality criterion that, in turn, suits well the proposedtrustworthy mechanism. Further aspects to be considered for setting down the lamp brightness are related to pedestrians anddrivers safety. In this work, for the first time, an observability measure to solve this class ofproblems is proposed.

III.CONTRIBUTION

Starting from these premises, the main aim here is to keep the lamps brightness at their minimum allowable level in a certain segment of the street according to the vehicular traffic intensity. Because it is practically impossible to have traffic sensors in each street sector of interest in large-scale infrastructures, the idea is to design a bank of distributed traffic observers that possibly uses a minimum subset of the available traffic data to keep low the need of data exchange. A single observer at a time is selected online, on the basis of adequate performance criteria on the amount of energy saved, and used to estimate the traffic in every street segment of interest. To this end, a recent approach based on opinion dynamics for distributed system configurations is exploited to address the sensors/observer selection problem, and the underlying state estimation problem, via trustworthy selection concepts.Although, in principle, one can collect any data coming from exploited sensors, this could give rise to erroneous decisions because corrupted observations (QoS degradation) cannot be straightforwardly addressed, The proposed method overcomes the need for complex evaluation architectures that could result in high demanding computations during the online operations.Moreover, by referring to the specific problem here considered, the capability of promptly selecting the set of reliable sensors allows achieving significant energy savings during street lighting operations. According to this reasoning, the main aim of this article relies on showing the applicability of the approach presented in by exploiting the following ingredients.

- **Road traffic model -** by using arguments proper of hydro dynamics , a dynamical description of the traffic flow in urban streets is proposed. Because traffic lights, sensor cameras, and road intersections are also present, the resulting state space model is hybrid in nature and belongs to the class of switching LTI systems.
- **Trust-based sensor selection architecture -** It is conceived to formally characterize the interactions amongst street segments (agents) and sensors, exploited to select the “best” sensor set according to given QoS specifications. The distributed adaptive reputation law, recently proposed, has been customized to take care neighbors’ opinions according to energy saving criteria. Specifically, a street lamps’ brightness criterion is formalized based on the vehicle flow estimates in the area of interest. Therefore, the lightning road networks problem has been formally recast according to the network framework. This leads to the following customization..

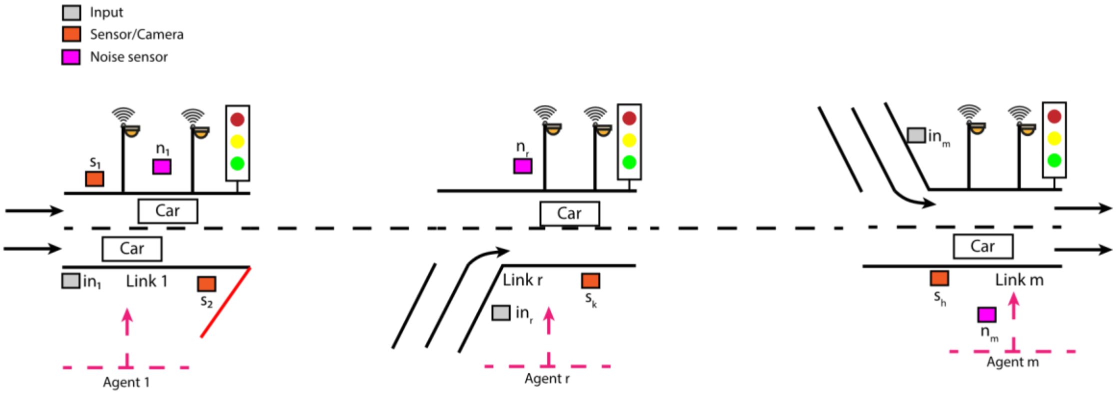


1. A nontrivial operating scenario has been conceived in order to comply with real road network demands.
2. A proper optimization function to comply with energysaving requirement.

Finally, the achieved results have testified that this relevant IoT scenario can be efficiently addressed by means of the proposed trust-based methodology. In fact, the simulation section shows the effectiveness of the proposed architecture. From one side, it can manage complex road traffic networks under severe operating conditions. On the other hand, it allows the achievement of remarkable energy savings with respect to standard LED lighting systems.

IV. PROBLEM STATEMENT

Here, by taking advantage from the scenario described in, the road scheme of is endowed with lighting poles on which sensor cameras are mounted. In order to maximize the energy saving, each link j of the road is associated to one agent (control entity) that is instructed to establish the optimal lighting, on the basis of current queue length (t) and according to the characteristic.



As a consequence, the lighting profile (or brightness profile) is defined by means of an adaptive law based on the traffic volume. In particular, it is computed according to the following dimming rules Unfortunately, is not directly available. Therefore, it has to be estimated by using the information θjk provided by the camera to the agent where the term Fjkzk, zk(t) ∈ IR, in principle unbounded and completely unknown to the agents, accounts for the data and/or degradation level that leads to the concept of QoS related to the kth sensor performance. In view of this, it is worth to underline that the lighting optimization task assigned to each agent is completely independent from the capability to acquire trustworthy information from the available set of sensors.

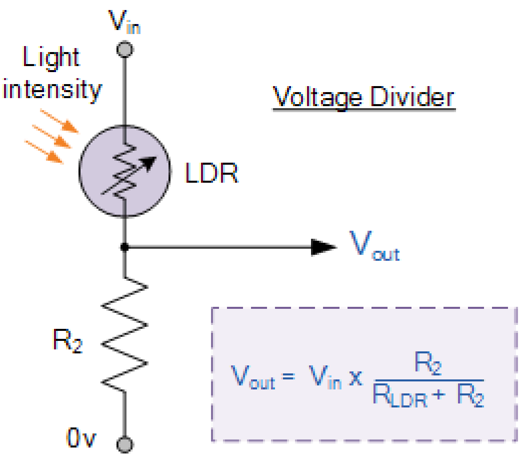
V. ARTICLE STRUCTURE

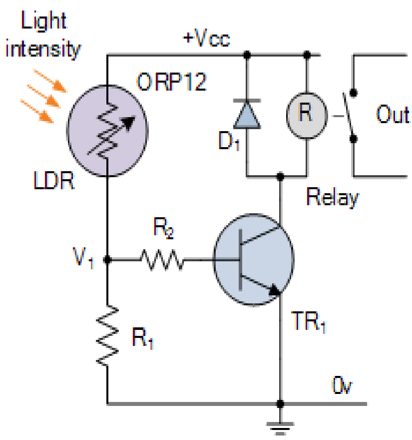
The rest of the article is organized as follows. After a preliminary section containing some useful notation, in Section II, an accurate state space model of traffic flows in road networks is derived and the lighting optimization problem is formally stated. In Section III, the state estimation selection architecture is discussed in depth and properly customized to the proposed road traffic network model in terms of the reputation mechanism, observers, and sensor selection logic. Section IV collects the simulation results where a road network consisting of five street segments is considered. Finally, Section V concludes this article.

VI. MODULES:

1. LDR SENSOR:

This resistor works on the principle of photo conductivity. It is nothing but, when the light falls on its surface, then the material conductivity reduces and also the electrons in the valence band of the device are excited to the conduction band. These photons in the incident light must have energy greater than the band gap of the semiconductor material. This makes the electrons to jump from the valence band to conduction. An LDR or light Dependent Resistor is also known as photo resistor, photocell, and photoconductor. It is a one type of resistor whose resistance varies depending on the amount of light falling on its surface. When the light falls on the resistor, then the resistance changes. These resistors are often used in many circuits where it is required to sense the presence of light. These resistors have a variety of functions and resistance. For instance, when the LDR is in darkness, then it can be used to turn ON a light or to turn OFF a light when it is in the light. A typical light dependent resistor has a resistance in the darkness of 1MOhm, and in the brightness a resistance of a couple of K Ohm.





2. IR SENSOR:

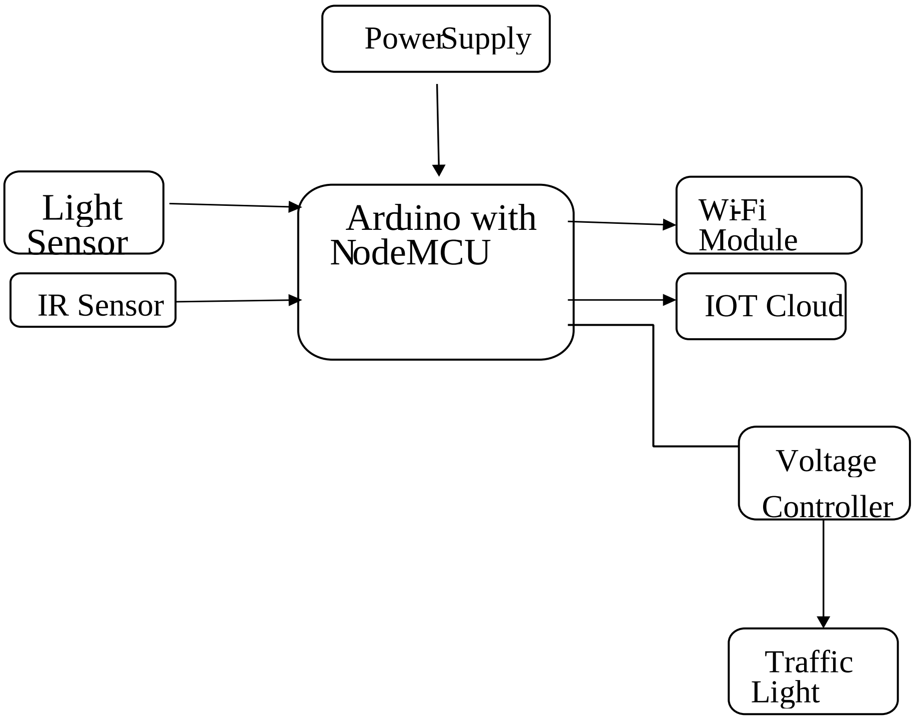
The emitter is simply an IR LED (Light Emitting Diode) and the detector is simply an IR photodiode. Photodiode is sensitive to IR light of the same wavelength which is emitted by the IR LED. When IR light falls on the photodiode, the resistances and the output voltages will change in proportion to the magnitude of the IR light received. There are five basic elements used in a typical infrared detection system: an infrared source, a transmission medium, optical component, infrared detectors or receivers and signal processing. Infrared lasers and Infrared LED's of specific wavelength used as infrared sources. The three main types of media used for infrared transmission are vacuum, atmosphere and optical fibers. Optical components are used to focus the infrared radiation or to limit the spectral response. There are different types of infrared transmitters depending on their wavelengths, output power and response time. An IR sensor consists of an IR LED and an IR Photodiode; together they are called as Photo Coupler.

3. IR Transmitter or IR LED

Infrared Transmitter is a light emitting diode (LED) which emits infrared radiations called as IR LED's. Even though an IR LED looks like a normal LED, the radiation emitted by it is invisible to the human eye.

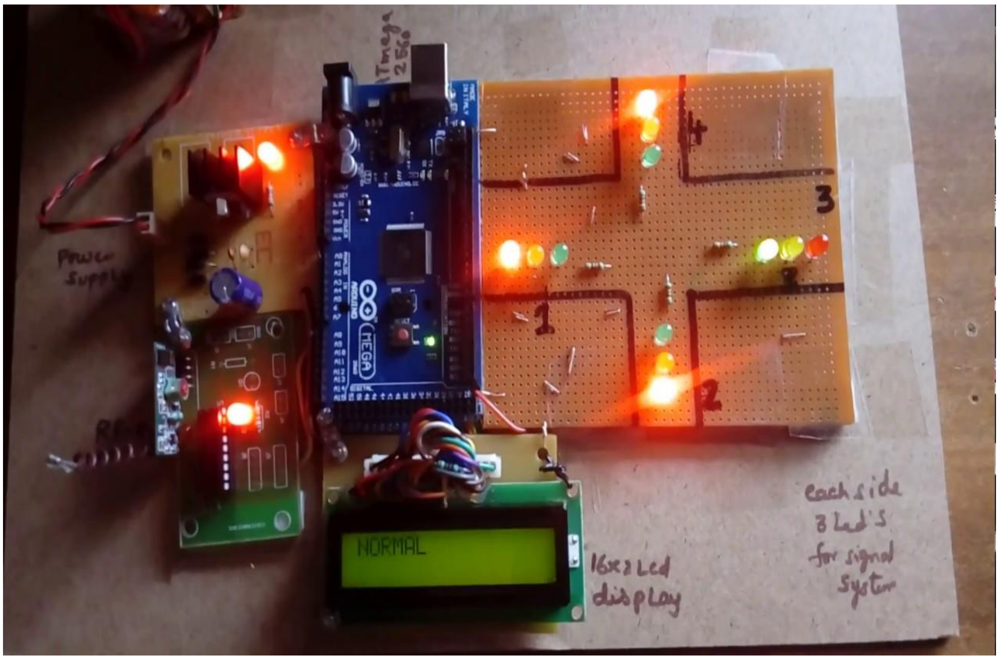
4. IOT Module

The Internet of Things (IOT) describes the network of physical objects "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet. Arduino Community launched their IOT platform called Arduino IOT Cloud. The Arduino IOT Cloud provides an end-to-end solution that makes building connected projects easy for makers, IOT enthusiasts, and professionals from start to finish. The platform enables different methods of interaction, including HTTP REST API, MQTT, command-line tools, Java script, and Web Sockets. You can connect multiple devices to each other and allow them to exchange real-time data. You can also monitor data from anywhere using a simple user interface.



5. TRAFFIC SIGNALS:

The traffic signal works on light signals and includes three colors: red, yellow and green. Here 'red' indicates that the vehicles must stop, 'yellow' means that the vehicles must slow down and finally 'green' means to go ahead.



CONCLUSION:

The conducted theoretical analysis and the simulation study show that transition to direct control in route and departure time choice aspects can significantly increase the road traffic network efficiency. The traffic flow formation management system framework with MPC based approach is developed using a special criterion of network efficiency. It can be stated that the proposed framework have all necessary parts to perform main functions of proposed approach and it is relatively easy to implement. There are some benefits that can be expected from the implementation of the proposed system, even without autonomous vehicles.

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