

# INTELLIGENTNI SISTEMI KONTROLE JAVNE RASVETE ZA PAMETNE GRADOVE

## INTELLIGENT PUBLIC LIGHTING CONTROL SYSTEM FOR SMART CITIES

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*У овом раду је описано комплетно решење које омогућава градовима да лако, са једног места, надгледају и управљају јавном расветом. Даље, ово решење омогућава планирање смањења трошкова одржавања јавне расвете детекцијом различитих кварова у реалном времену.*

**Кључне речи:** Улично осветљење, надзор и управљање, паметни енергетски сензор.

*In this paper, complete end-to-end solution which allows cities to monitor and control public lighting easily, from one place, is described. Additionally, the solution enables maintenance planning and cost reduction by real-time detection of various malfunctions.*

**Key words** Street Lighting, Monitoring and Control, Smart Energy Sensor.

### 1 Introduction

There are many activities involved in creating lively, safe and sustainable space in a modern city. An important part of all public spaces includes lighting. Good city lighting contributes to increased safety, alongside with being one of the primary factors influencing transformation of cities into more sustainable operations.

Over the course of the last few decades, the planning and design of lighting have changed, bringing forth the transformation from road lighting to lighting focusing more on pedestrians, which includes parks and other public spaces. All these factors led to increased energy consumption and an increase in the overall lighting system complexity, which in turn created demand for more sophisticated lighting control system.

Belgrade's public lighting operates a relatively old system, which is getting harder to maintain and run. The system is unable to detect breakdowns automatically and notify operators in the headquarters if something goes wrong alongside a specific corridor, boulevard, park, playground area, etc. Information about malfunctions is often received through citizens phone calls, and fixing problems is slow and inefficient, requiring additional manpower and higher costs. Deploying a system that can be used for monitoring and control of the public lighting infrastructure is described in this project. [1]

A modern Light Control Sensor (Figure 1), based on the smart power sensor, will provide following benefits :

- High reliability
- Automatic light control based on configurable calendar
- Using 3G and 4G mobile network to monitor and control street lighting
- Possibility to control and switch lights remotely by operators in the dispatcher centres
- Monitoring of energy consumption and detect faults in energy delivery

### 2 Solution

This project successfully fulfilled all project demands by installing monitoring and control system based on Light Control Sensor in the part of the recently reconstructed Vojvode Stepe boulevard

(Figure 2), one of the longest ones in Belgrade. The system is connected to the server installed in the dispatcher centre. [2]

The Light Control Sensor is an industrial-grade device capable of delivering following functionalities:

- provides three phase monitoring
- measures variety of energy parameters (voltage, current, power, etc.) and stores these measurements
- Built in rule engine allows for flexible and easy definition of alarm and event rules
- Provides comprehensive calendar management functionality for configuration of automated lights management

Installed at feeders which bring power to the street light infrastructure, sensor measures a number of electrical parameters including currents, line voltages, frequency, active and reactive power, power factor, current and voltage harmonics (up to 31st harmonic). All measured parameters are stored locally on the sensor device for up to 5 years with the aggregate resolution of 5 minutes. The system uses stored data to perform advanced analytics and provide better insight into trends, reduce energy consumption and increase the reliability of the overall public lighting grid. It turns On & Off public lights in accordance with predefined calendars. Real-time clock with support of simple network time protocol (SNTP) provide time synchronisation.



*Figure 1 – Light Control Sensor*



*Figure 2 – Light Control System installed in Belgrade*

### **3 Conclusion**

Installing intelligent public light control system with smart light control sensors in Belgrade provides following benefits:

- Automatic breakdown detections
- Automatic or remote from dispatch center on/off turns
- Power consumptions is optimised

In the future, this system could be upgraded with light dimishing depending on street traffic.

### **4 Acknowledgement**

The authors gratefully acknowledge financial support from the Ministry of Education and Science, Government of the Republic of Serbia.

### **5 References**

- [1] **Javna rasveta**, *Upgrade of the Public Lighting System*, 2021.
- [2] **Robert Simpson**, *Lighting Control: Technology and Applications*, 2020.

