Title : **Development of Smart LED Street Lighting System for Smart City Applications**

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Project Title:

Background :

Street lights have an important role involving traffic and pedestrian safety especially in urban areas, but expenses regarding these street lights account for almost 40 percent of the total consumption of electricity of a city. Though, other countries are addressing issues regarding the consumption of power and conservation of energy by integrating smart technologies to their street lighting systems; which is not given enough attention by the Philippines today. And with concurrent studies indicating that the total power demand will increase within the next few decades.

Targets:

The proposed system in this study takes the conventional street lighting system's efficiency to another step by using a dimmable LED lamps. More systems are upgrading to LEDs due to its low power consumption and uses for various applications, such as agricultural, monitoring, and communications applications besides street lighting purposes which makes LEDs a good option to consider when upgrading street lighting systems. These lamps not only consume less power but provides the option of further improving the lifetime of the LED lamp by controlling the amount of ambient light provided by the proposed street light lamps during certain downtime situations like when there are not any pedestrians using the pathway of the park where the lamps are installed. Some of the additional aspects that this study can potentially add to the existing conventional street light system by using the dimmable LEDs as replacement lamps instead of the lamps used in the current setup today. Dimming the LED lamp will improve its lifetime and its efficiency.

Proposed Method

As of today here in the Philippines, the idea of the implementation of smart street lighting system is done by utilizing renewable energy sources, mainly solar energy, with the help of regulating the power transmitted to streetlights in order to lessen the consumption of electricity provided by power plants by integrating solar panels in the street light, but using solar energy to manage the current issue of occasional shortages in power is not entirely efficient to counteract this issue alone.

This study takes the smart street lighting system's efficiency a step further by adding a smart LED lighting system that also consumes less power, this can be done by controlling the amount of lighting provided by street lights when there are no pedestrians present nearby. The additional aspects that this study adds to the existing traditional street lighting system are using dimmable LEDs as a replacement for the conventional streetlights, and the use of face detection done with the use of image processing to confirm if a person is present nearby.

Proposed Method

The study generally aims to implement a system that helps further lessen the power consumption of street lights and be a more eco-friendly lighting system, and integrating smart technologies in order to make this possible. Moreover, this study specifically aims to:

- Develop an LED-based street lighting system with a dimming functionality.
- Implementation of a face detection algorithm
- Applying the technique and mechanism for regulating the luminous intensity of the LED-based street lighting system.
- Create a comparative analysis about the power consumption of three different street lighting setups, one consisting of the conventional street lighting system, the other is an LED-based street lighting system, and lastly an LED-based street lighting system with face detection.

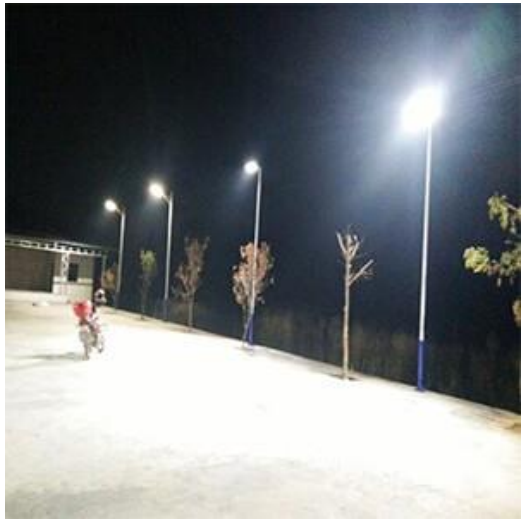
Proposed Method

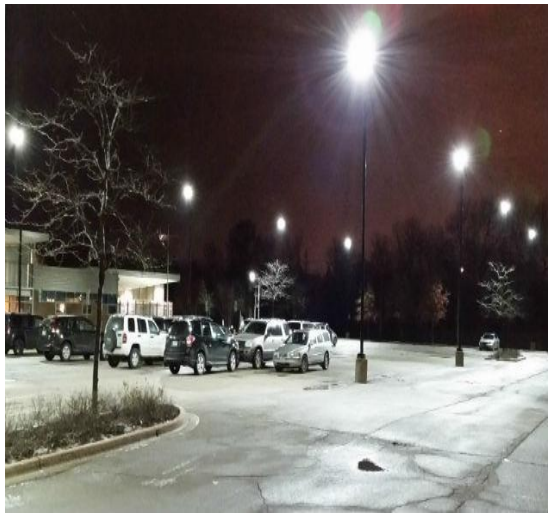
Conceptual Framework

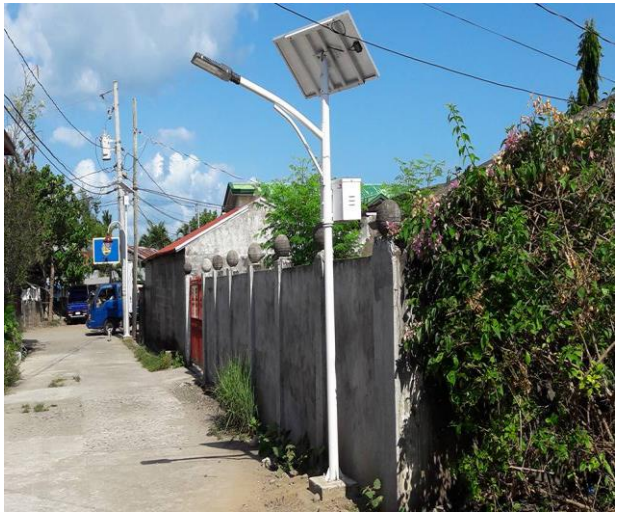
Dimming Light | Human Deterction | Light Intensity Adjustment

Impact:

This study will benefit the local government units by giving them another option in the ways of addressing the problem in shortages of electricity and overconsumption of energy which leads to higher cost. This study also benefits general public by still providing the needed lighting of paths from dusk until dawn to ensure them a sense of safety outside in the streets, especially walkways in public parks. Additionally, this study will also benefit experts and researchers that are interested in pursuing this field of study about finding new ways in implementing smart city lighting systems that consumes less power. When successfully implemented, this system can be used as another component in implementing smart cities in parts of the country.







Output/Outcome:

For cities in the Philippines looking to invest in smart technology, smart street lighting systems may offer controllable and dimmable LED lighting that promises to lower energy costs by using motion or face detectors to provide necessary light intensity only when needed.

Smart street lights can be implemented by combining different technologies such as face and motion detections algorithms, LED lighting technologies, control and automation, and even artificial intelligence to provide a better management and control of street lighting.

Conclusion:

Traditional street-lighting systems that are currently used today consumes a lot of power which contribute to the total power consumption of a city. By replacing the existing lamps with the more power saving dimmable Light Emitting Diode (LED) lamps, a difference on the total power consumption can be noticed. The purpose of this study aims to implement a street lighting system that uses a light emitting diode (LED) as its lamp connected to an appropriate dimmer for a brightness that can be controlled by a microcontroller unit, together with a face detection algorithm as a basis on controlling the amount of brightness emitted by the street light. By default, the brightness of the LED street light is dimmed to save power when there are no pedestrians present. The system uses a face detection algorithm, once a pedestrian is detected using this algorithm, the brightness of the LED will be set to maximum.

The study will give LGUs another option to use when replacing their current street lighting systems. This study focuses on certain locations of a public parks which are not frequented by pedestrians since those are locations where the functions of proposed system will be maximized and will yield more noticeable results for the comparative analysis that this study will use.