IoT Enable Relay Network for Demand Based Light Intensity Controlled Seamless Highway Lighting System

ITEX'18 29TH INTERNATIONAL INVENTION, INNOVATION & TECHNOLOGY EXHIBITION, MALAYSIA

Universiti Malaysia PAHANG

www.ump.edu.my

INVENTOR: DR. MD ARAFATUR RAHMAN
FACULTY: FACULTY OF COMPUTER SYSTEMS & SOFTWARE ENGINEERING, UNIVERSITI MALAYSIA PAHANG, 26600 PEKAN, PAHANG, MALAYSIA
EMAIL: arafatur@ump.edu.my
CO-INVENTORS: YAN SYAFRI HIDAYAT, MUHAMMAD KAMIL, DR. MUHAMMAD NOMANI KABIR, DR. A. TAUFIQ ASYHARI, DR. SAIFUL AZAD,

PRODUCT BACKGROUND

- Highway authority spends huge amount of money per year for Highway Lighting System worldwide (e.g., Malaysia **USD 25 Million per year**).
- **Internet of Things (IoT)** becomes one of the popular concepts that provides prominent solutions in various paradigms.
- Exploiting IoT, this work develops a prototype for efficient highway lighting system at **lower energy consumption.**
- Two key features need to be taken into account for designing such a system are: i) **Road users' point of view** (i.e., Comfort and safety) ii) **Road service providers' point of view** (i.e., Reduce Energy Consumption and Maintenance Cost).
- The characteristics of this prototype revile the effectiveness of the proposal.

BENEFITS/USEFULLNESS

- It reduces energy consumption based on the percentage of busyness of highway without compromising the comfort of the driver => **Seamless Lighting System**
- In term of **cost reduction**, **100 lamp-posts can save USD 480, USD 350, and USD 160 per month**, if the busyness of highway is 10%, 40% and 70%, respectively.
- The **break-even points** of the proposed system are around 1, 1.8, and 3 years in terms of the road busyness of 10%, 40% and 70%, respectively.
- Novel **automated maintenance technique** for identifying the faulty lamppost by using **back tracking detection.**
- The devices embedded in this system are for **long-term use**, cost reduction thereby.

NOVELTY

A prototype for demand based light-intensity controlled seamless highway lighting system has been developed.

COMMERCIALIZATION / POTENTIAL MARKET

MOSTI KEMENTERIAN SAINS, TEKNOLOGI DAN INOVASI MINISTRY OF SCIENCE, TECHNOLOGY AND INNOVATION · TENAGA NASIONAL · JKR · FUSI PT. Fusi Global Teknologi

COLLABORATION

PT. Fusi Global Teknologi, Indonesia.

FUNDER

Pre-Commercialization Grant (UIC170303**) –** funded by **UMP**.
International Grant – funded by **Fusi Global Teknologi**

ACHIEVEMENT

1. **Gold Medal**, ITEX'2017, Malaysia. 2017.
2. **Best of the Best Award**, CITREX 2017, Malaysia.
3. **Most Commercial IT Innovation Award**, CITREX 2017.
4. **Gold Medal**, CITREX 2017, 2018, Malaysia.
5. **Silver Medal**, iENA'2017, Germany.

PUBLICATION

1. Privacy-Protected Patient Data Collection in IoT-based Healthcare Systems, IEEE Communications Magazine, 2018. (**ISI Q1 IF = 10.435**).
2. Big Data Reduction for Smart City's Critical Infrastructural Health Monitoring, IEEE Communication Magazine, 2018 (**ISI Q1 IF = 10.435**).
3. L-CAQ: Joint Link-Oriented Channel-Availability and Channel-Quality Based Channel Selection for Mobile Cognitive Radio Networks, Journal of Network and Computer Applications, 2018. (**ISI Q1 IF= 3.5**)

DEVELOPED PROTOTYPE

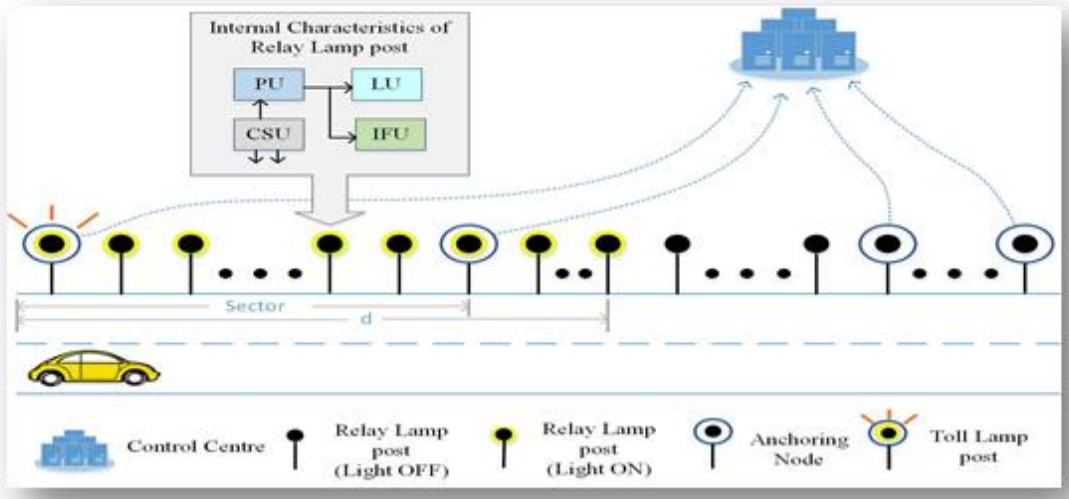

Figure 1: Architecture of proposed system

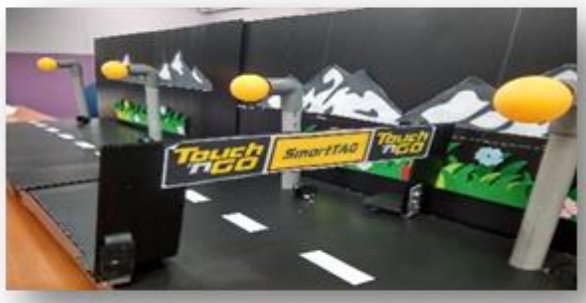

Figure 2: Prototype

Figure 3: Site Visit at UMP Pekan

LAMPPOST MAINTENANCE ALGORITHM

```
// The algorithm executes once the DATA packet is received by the Second Anchoring Node of the Sector. 2: if Received-Packet-Source-ID == First-Anchoring-Node-ID then
        Status = ok.
4: else
        Status = no
6: // Send information to Maintenance Department using the ReceivedPacket-Source-ID
        while TRUE do
8:              Go to the Lamppost whose NodeID = (Received-Packet-Source-ID - 1) and Repair Go
                to the Lamppost whose NodeID = (Received-Packet-Source-ID- 2)
                if Current-Node-Received-Packet-Source-ID == First-AnchoringNode-ID then
                Status = ok.
12:                     Exit
                Else
14:             Received-Packet-Source-ID = Current-Node-Received-PacketSource-ID end if

16:     end while
   end if
```

CHARACTERISTICS OF PRODUCT

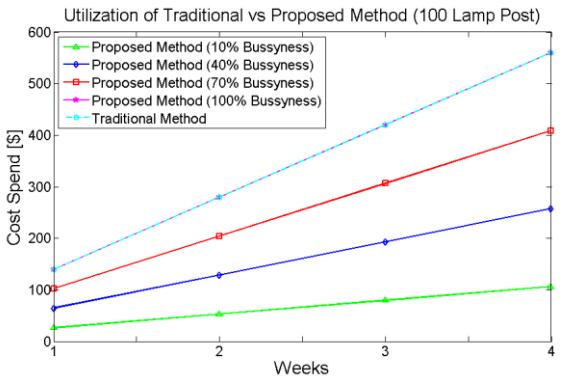

Figure 4: Utilization of Traditional vs Proposed Method

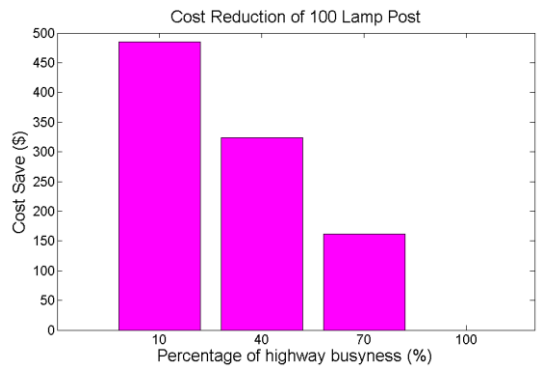

Figure 5: Saving Cost

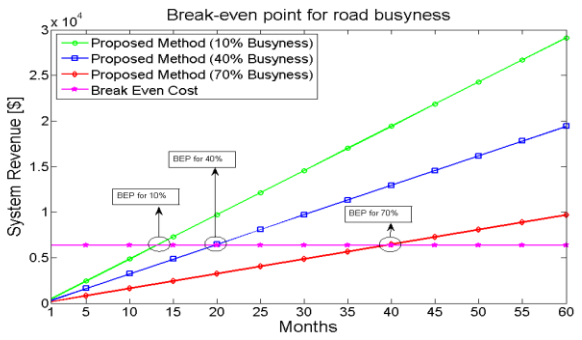

Figure 6: Break-even point

COPYRIGHT & PATENT

NUMBER: LY2017001578 &
DATE: 09-05-2017

NUMBER:UI2018701046
DATE: 15 03 2018