E2.04 – Smart Street Lights

By Kevin Mok, Megan Law, Ahmed Khawaja, & Bhabya Singh
Keysight Technologies

Project Summary

The Smart Street Light project aims to provide a solution to outdated suburban street lights by implementing distinct IoT elements. Using IoT elements, our prototype contains a network of dimmable street lights that utilize a sensor, a Cloud Network which displays LED status, and makes LED path decisions based on highest probable values

Why Smart Street Lights?

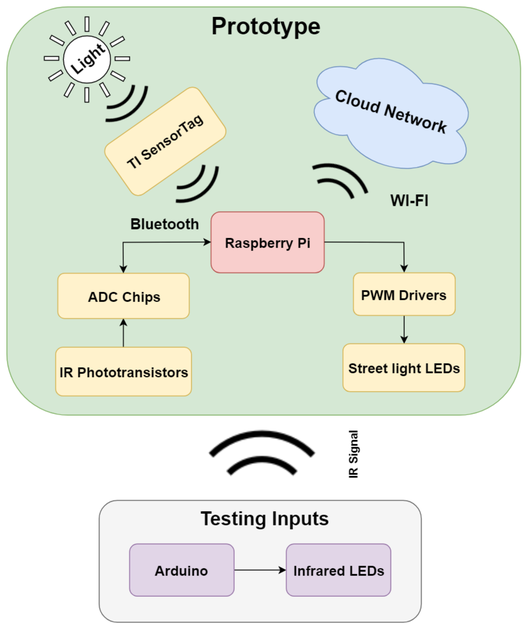
Existing System:

- HPS bulbs require frequent maintenance due to a shorter life span
- Manual checks are required on HPS bulbs
- HPS bulbs are omnidirectional which leads to higher light pollution

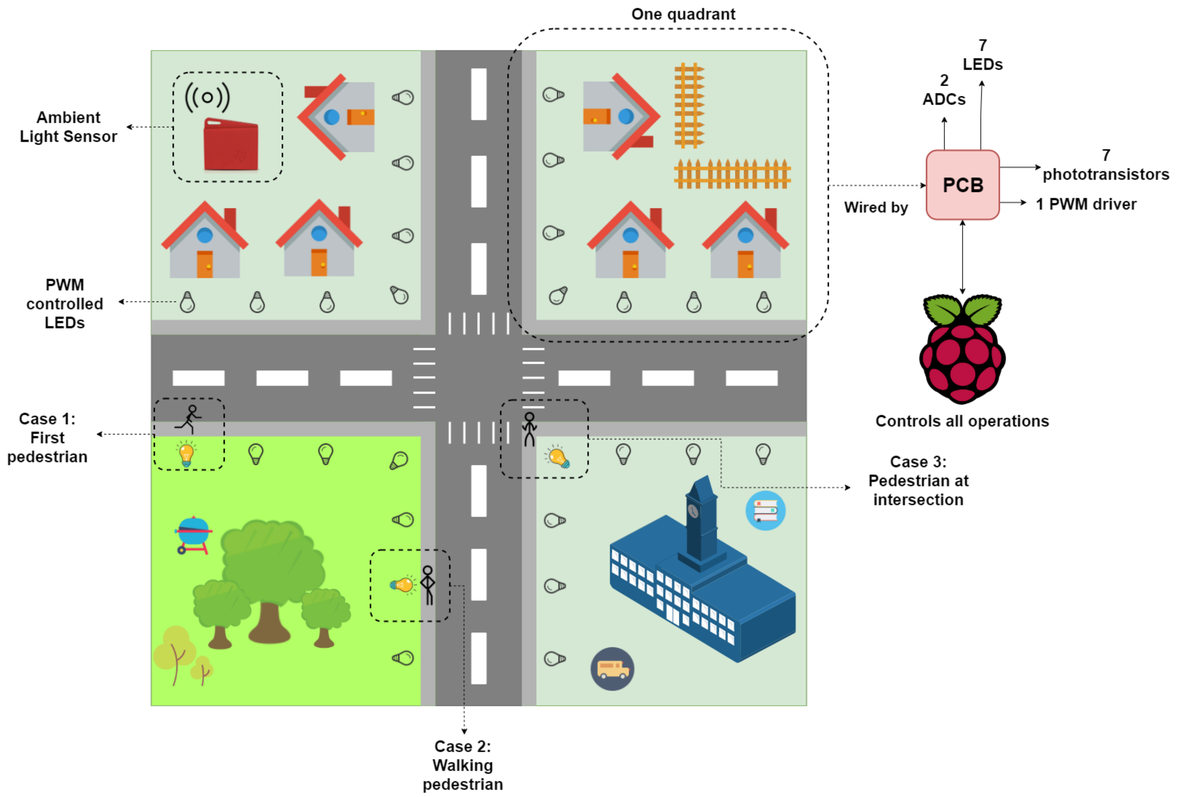
New System:

- LEDs live longer, are eco-friendly, dimmable & energy efficient
- Remote monitoring checks on LEDs via Cloud
- Sensors are connected wirelessly
- Autonomous control system

Block Diagram

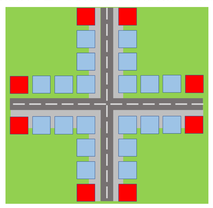


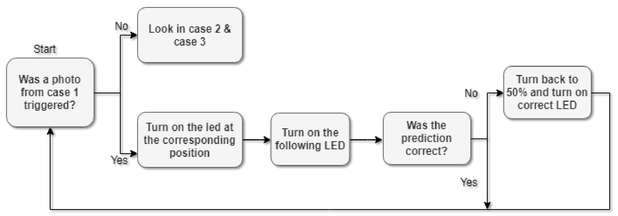
Design Layout



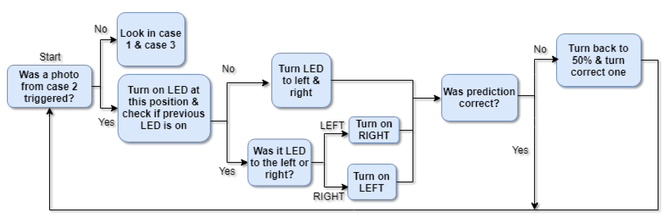
State Diagrams

Case 1: New Pedestrian

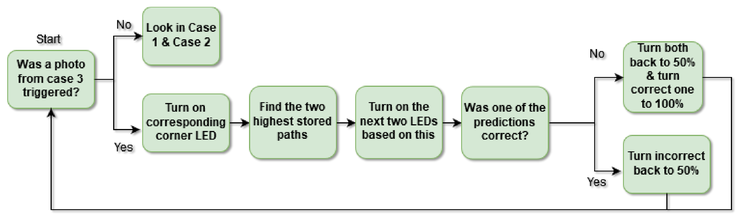




Case 2 : Walking Pedestrian



Case 3: Pedestrian at Intersection



Results

Test Cases	Functions	Results
Ambient Light Sensor System	Connect to ambient light sensor through Bluetooth	Automated connection of TI sensor tag to board via Bluetooth
	Read sensor data and convert it to lux	Sensor collects encoded 16 bit unsigned values & converts to lux
	Uses lux level values gathered to determine the street lights' intensity	Checks if 25 out of 30 values are below the safety lux level, setting duty cycle to 50 % otherwise it is set to 0%
Predictive System	IR LEDs mimic different pedestrian walking patterns	IR LEDs run pre-coded patterns that mimic a walking pedestrian
	Phototransistor recognizes an IR LED signal and checks its location	When phototransistor is triggered, it returns the location
	Based on location of the triggered phototransistor turn on LEDs from Case 1 & Case 2	When a phototransistor is triggered, the corresponding LEDs turn to full intensity
	In case 3 analyze phototransistors' response to IR LEDs to collect statistics	Different responses are collected but there are disparities in the statistics desired
LED Light Network	Chained PWM drivers connect and control all LEDs	Sends PWM signal to all LEDs in the network and individual LEDs
	Chained ADC drivers check LEDs status and Raspberry pi uploads the status to the Cloud	Monitors the status of LEDs and sends ON/OFF status to the Cloud

Meet the Team

Kevin Mok
Project Manager

Megan Law

Bhabya Singh

Ahmed Khawaja

Acknowledgements

Instructor: **Mr. Lee B. Hinkle**

Faculty Advisor: **Dr. Rich Compeau**

Keysight Sponsors: **Mr. Lizotte & Ms. Malaspino**

Faculty: **Dr. William Stapleton**