Smart Street
Autonomous Street Light

Goal

- Design and build model of an energy efficient alternative to illuminate rural, low traffic volume roads.
- Implement inductive sensor technology and state machine methods to automate outdoor luminaires based on the passage of vehicles.
- State machine methodology will be controlled by Arduino software.
- Improve energy usage, cost and maintenance of luminaires through automation.

Motivations and Objectives

- World technology is advancing towards energy efficiency and automation. Cars are evolving to become more autonomous and soon enough become fully electric, eliminating gas emissions. Roadway and traffic technology have not been given the same attention.

- We propose a method to improve street light technology. Street lights are one of the biggest source of energy consumption, their constant operation can be wasteful if the road is not used by any cars. Therefore, our solution will automate street lights to make them “smarter” to save energy and cost for cities and local governments.

Research Challenges

- Finding which type of oscillator will work best for our design.
- State machine implementation on Arduino Uno.
- Mapping out real world costs versus model performance.

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Methodology

- Assemble an oscillator that will operate at a stable frequency with an air core inductor that will work as the inductive sensor.
- Analyze the frequency change as ferrous material (model car) passes by inductor. Use an Arduino Uno to convert signals to discrete values.
- Build additional sensors to incorporate a state machine method to automate the street light.
- Customize state machine modes to adapt to different roadway structure, for example one-way roads, two way single lane road, two way two lane road, etc.
- Optimize efficiency through hardware bulk and software runtime.

Current & Ongoing Results

- Successfully built an oscillator that operates at a range of 9.8kHz - 10kHz.
- Handmade inductors from magnet wire operate as sensors that will change frequency when ferrous objects (model car) passes over coil. Change of frequency increase about 200Hz - 1000Hz depending on distance from coil.
- Arduino successfully monitors change in frequency and signals lights to operate appropriately.
- Implement user input to dictate custom road operation using state machine methodology.

References