EXECUTIVE SUMMARY

While in crosswalks, pedestrians are exposed to an increased risk of being involved in life threatening collisions with motor vehicles. Despite the elevated risks associated with using crosswalks, they have remained relatively unchanged for decades. In order to help combat collisions between pedestrians and motor vehicles in crosswalks, the Smart Crosswalk Dynamic Lighting System (SCDLS) was developed. SCDLS consists of modules attached to a crosswalk, as shown in Figure 1. These modules illuminate the crosswalk when a pedestrian enters the crosswalk, thus dynamically alerting drivers to the presence of the pedestrian. They also collect vehicle traffic metrics for analysis by the system's owner.

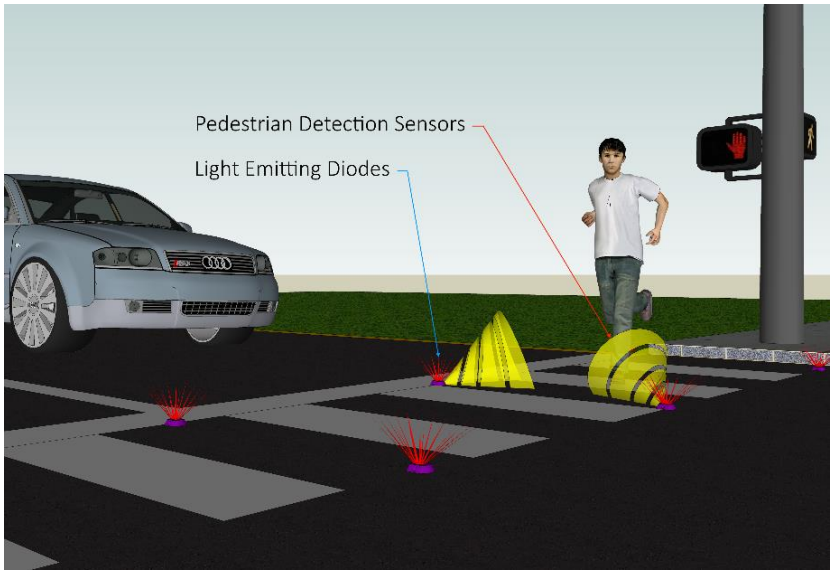

Figure 1: SCDLS System Overview

The main constraints in the design of SCDLS were ease-of-use and power consumption. The modules must be able to be mounted to the surface of a road without the need for modifications to the road aside from drilling mounting holes. The modules must also be able to be powered by only solar energy for up to five years. Since the modules will be installed on a roadway, they must withstand the compressive load of an automobile while remaining waterproof. Lastly, since the modules communicate wirelessly, they must be able to send and receive wireless communications at a range of at least 10 meters.

Each module consists of a microcontroller, sensors, a battery, a solar panel, wireless modules, and light emitting diodes (LEDs) encased in an aluminum housing. A large solar panel was chosen in order to sustain the modules for a minimum of five years. The system makes use of passive infrared sensors to detect pedestrians. The sensors were chosen for their accuracy and low power consumption. A magnetometer is used to detect vehicles so that municipalities can analyze traffic patterns. Two wireless radios provide Wi-Fi (to upload traffic statistics to an Internet server) and low-power wireless communication (to allow individual nodes to communicate). Finally, multicolor LEDs were chosen for use in the modules because they allow the devices to display multicolor patterns, improving their visibility.

SCDLS improves on other similar products by making installation and maintenance simple while also adding capabilities that no other similar product offers. Future iterations of SCDLS will reduce the modules' footprint and power consumption. Widespread adoption of SCDLS should reduce the number of collisions between motor vehicles and pedestrians in crosswalks, while also giving municipalities improved information about road usage.