



LIGHTING THE WAY

Connected Streetlights to Assist Emergency Responders

Connected streetlights add an extra dimension of communication between the street grid and the drivers on the road by communicating road events ahead, or signaling approaching vehicles. With their aid, emergency responders (ie police, fire, EMT) can quickly navigate Singapore's street network, to improve response times and decrease congestion.

In 2016, Singapore reported a total of 8,277 road accidents resulting in injuries. These accidents require dispatches of law enforcement and medical personnel to ensure safety, clear the incident area, and restore the flow of traffic.

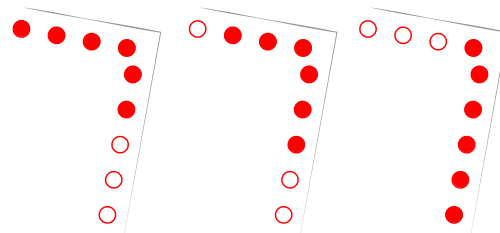
While emergency vehicles are equipped with sirens to alert traffic of their impending arrival, lane changing maneuvers to clear a path in the congested roadway takes time, and the range of sirens are limited to the immediate proximity of the fast approaching vehicle.

Connected streetlights act as guiding signals to alert traffic a distance away, providing ample time to clear a path to the scene of the accident.

It is common practice to manage traffic flows with the aid of lighting patterns; cross junction traffic lights are the most typical examples on city streets today. Using connected streetlights to decrease congestion is a natural progression for Intelligent Transportation Systems.

As written in Singapore's Road Traffic Act statute 12, all vehicles must "draw close to the edge of the roadway and be brought to a standstill to allow a clear passage for [emergency vehicles]." Connected streetlights aid implementation of this law and will not require amendments to legislation.

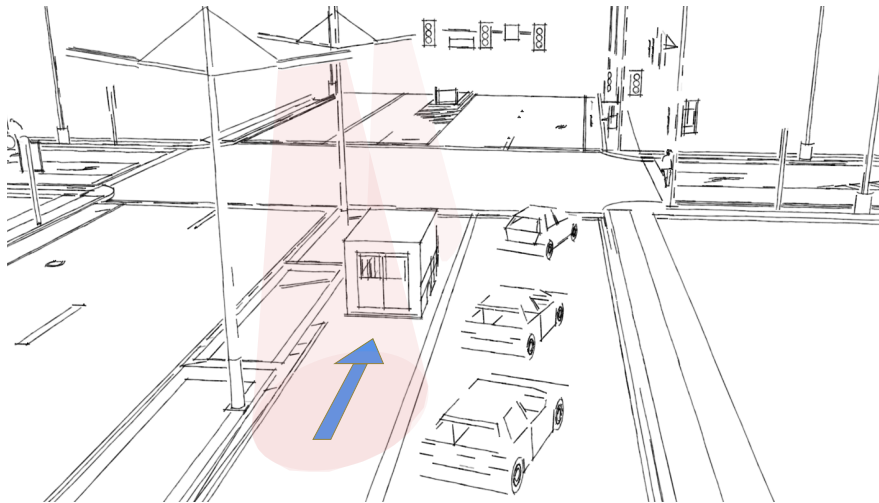
In our example, routing and GPS information from emergency vehicles will interface with streetlights which activate on the route as the vehicle approaches



Alerting vehicles around the corner



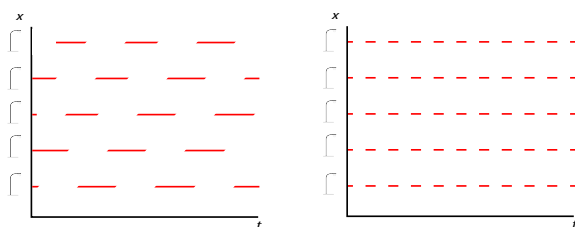
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Flashing patterns from the color LED streetlights will inform drivers of the incoming ambulance

System design is separated into user experience and technical considerations. The project can utilize statistical surveying methods and A/B testing to evaluate user receptiveness and fine tune parameters for lighting patterns and timing.

Technical staff will evaluate the protocols including whether streetlights directly connect to emergency vehicles or are instead tethered to a central server that manages the system. Connected devices create an avenue for denial of service attacks or for the prospect of unauthorized controllers. These possibilities are unavoidable, and should be addressed systematically by evaluating the cost and benefits of current technologies. They should not impede technological progress.



A/B testing of lighting patterns

The key metric to evaluate the project's success is the effect to emergency response times. Additional metrics include vehicular flow at the point of the bottleneck and the time required to return to free flow traffic after the accident.



Signs in corridors alert drivers

Preliminary pilots should focus rollout on select strategic corridors. Singapore is in a unique position to implement connected streetlights at scale as a means to communicate with their citizens. If successful, this project will serve as a model for future initiatives, including guiding pedestrian evacuations or routing during flooding events. By allowing citizens to become active participants of technology, Singapore can redefine a more humanizing smart city.