Safe Intersection Monitoring - Taking off the Blinders

By Douglas Gubbe, Vice President, Novax Industries Corporation

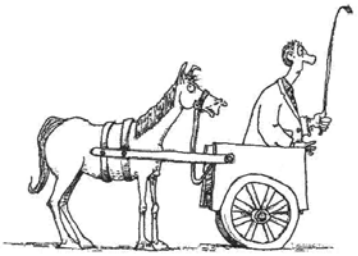
Is your MMU or CMU blind?

As intelligent street technology is becoming increasingly deployed, the current paradigm, which has been held for many decades, is being challenged. The paradigm being that a "smart" device in the traffic signal controller will adequately manage the "not so smart" devices on the street is obsolete.

The development of safety standards is lagging behind fast paced emerging technologies and the interests of municipal and state agencies are eager to embrace them.

Two of the cornerstones of the transportation industry are reliability and safety. When it comes to installation of signals to assist pedestrians with crossing an intersection, there are no greater needs than reliability and safety.

Since the first traffic signal was installed (~1912), in Salt Lake City Utah where policeman Lester Wire invented the first red-green electric traffic lights[1], the driving force behind the evolution of signaling devices has been predicated on improving safety and efficiency for both vehicular and pedestrian traffic. The first electromechanical traffic controllers used basic switches for controlling traffic lights through an automated motor and switch assembly (you may remember



the Type F electromechanical controller) and had no conflict monitoring capability. In time, a secondary device, a watchdog that could monitor the automated controller, evolved. The "watchdog" had the intervening authority of switching the whole system into a safer flash condition should an unsafe traffic signal condition be present.

Accountability

Who is responsible for ensuring the holy grail of general standards of safety and reliability are being adhered to? Is it the certification bodies? USDOT, FHWA, AASHTO, ITE, NHTSA? Manufacturers:, or, all of the above?

The question doesn't seem to be quite bright enough on the radar. And, as we speak, thousands of intelligent devices are being installed on street with unbridled fervor. For example;

- smart vehicle or pedestrian detection devices
- smart accessible (audible) pedestrian signals
- smart pedestrian countdown signals

The challenges of keeping safety standards in line with emerging technologies are deep without a clear path to the goal of alignment.

Focusing on just one of these aspects, pedestrian signals: "Although there are reports of audible pedestrian signals in the U.S. as early as 1920, they were not included in U.S. standards and regulations until MUTCD 2000"[2]. These devices originally showed up in the 1960's (more commonly known as audible pedestrian signals or "APS"). They were analog circuits with only one sound and connected to the Walk signal. When the walk signal had power, a single sound would play. Conflict monitoring needs were simple and were generally satisfied by the conflict monitor in the traffic cabinet i.e., no power on the walk signal = no sound.

Current variations on this theme of providing pedestrians with an audible cue of when to cross can be seen today in many cities. However, in stark comparison, many of these devices have a multitude of sounds and derive power from both the walk and don't walk signal or from the cabinet power.

The conflict monitor (or MMU) may have a good handle on the safe operation of the signals going out to the pedestrian signals, but what about the sounds that are being played (or similarly, the count that may be shown if a countdown timer is used). The Conflict Monitor (or MMU) is the final authority on "acceptable information" to;

- Motorists,
- Cyclists, and
- Pedestrians.

Again, is our CMU or MMU blind … or, are we just turning a blind eye to the problem?

Taking Responsibility for the Seeds that we Sow

We have already made the choice to embrace technology, with open arms, into our infrastructure. We now need to make the same commitment to ensure its safe operation. This means taking the responsibility of ensuring, within the best of our abilities, that our systems are delivering the safest and most reliable service.

One example is from a long-standing IMSA member, Brian Olsen, in a previous article in IMSA stating, "How strict is your agency about having all signal outputs including audible pedestrian indications and countdown timer indications monitored by the CMU or MMU in the cabinet? … a failure in the circuitry of the audible or countdown unit could cause it to output a conflicting signal that the CMU or MMU would never see".[3]

Only by directly monitoring the signals presented to the pedestrian, whether audible or visual in nature, can we provide a truly safe environment.

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Another Perspective on Pedestrian Safety

Pedestrian signals are traditionally a line-of-sight type of design. From the pedestrian perspective, while waiting on the street corner, for the momentary glimpse of freedom...my Walk signal. I am far too busy watching vehicles pass by, other people and probably texting on my iPhone. I look up and see a flashing hand and a count: I can make it if I run, I think?

We often think about audible signals as devices just for the blind. It is true, audible signals do benefit the visually impaired and blind in telling them when the walk signal is on. This is usually about 2 to 3 seconds before they would otherwise realize if the signal was on if

they were to use the sounds of revving car engines. However, the sounds that we originally thought benefited only the blind or visually impaired are providing significant benefits to our high-tech pedestrians who have a myriad of distractions such as; cell phones and texting.

According to one study, "Children who talk on cell phones while crossing streets are at a higher risk for injuries or death in a pedestrian accident," said psychologists at the University of Alabama at Birmingham (UAB) in a new study that will appear in the February issue of *Pediatrics*. "Specifically, it took the children who were on a cell phone 20 percent longer to begin crossing the street, and they were 43 percent more likely to be hit by a vehicle or have a close call in the virtual environment. In addition, the children looked both ways 20 percent fewer times before crossing the street and gave themselves 8 percent less time to cross safely in front of oncoming traffic when they were on the cell phone." Cell phones are quickly becoming ubiquitous among American schoolchildren, the UAB psychologists wrote. "Commercial interests actively market cell phones for children, and marketing research firms estimate that 54 percent of children 8-12 will have cell phones by the end of [this year,] double the 2006 rate."[4]

Another study from the University of Alabama indicated that children are not only the ones at risk. "Two new studies of pedestrian safety found that using a cell phone while hoofing it can endanger one's health. Older pedestrians, in particular, are impaired when crossing a busy (simulated) street while speaking on a mobile phone, the researchers found."[5]

"The first study, in the journal *Accident Analysis and Prevention*, found that college-age adults who were talking on a cell phone took 25 percent longer to cross the street than their peers who were not on the phone. They were also more likely to fail to cross the street in the 30 seconds allotted for the task, even though their peers were able to do so. "[5]

Is there anyone that is not affected by cell phones or other distractions? Perhaps cell phones should be banned all together? Not likely in our lifetime. As the keepers of safety on our streets what can we do?

To address the issue of people not recognizing their time to cross (not paying attention to the pedestrian signal), a case could be made to have audible cues at all pedestrian crossings to alert the pedestrian to pay attention to the signal. This would at least help to get pedestrians started and be able to take full advantage of the time provided. It would also provide a safer environment in that there would be less guessing as whether the pedestrian thought they have enough time to cross, even if a count is provided.

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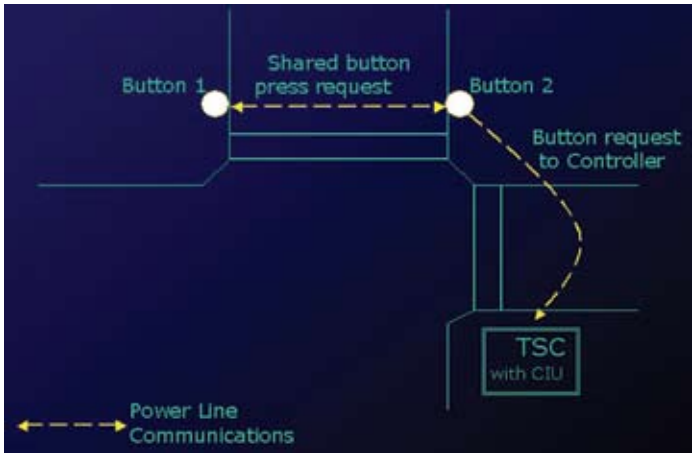
While involved in an APS installation in Cottage Grove Oregon a sighted pedestrian stopped me and said, "these audible alarms are great (letting me know when the walk signal is on). The walk signal is so short that I often miss it."

Upgrading your more Experienced Intersections

Many municipalities have older intersections designed at a time before there was a mandate for pedestrian signals or pedestrian actuation. Likely these same intersections do not have wiring for pedestrian buttons. Even if there is interest to improve intersection efficiency, the lack of wiring introduces costs and challenges. For example, directional boring under roadways is costly and time consuming.

Older intersections are likely located in areas where pedestrian traffic is high. We might ask ourselves: What steps can we take to improve these intersections making them as safe and accessible as possible for all pedestrians? Adding countdown timers may not be an issue if existing pedestrian signals exist. However, for accessibility, the reality is that we don't really want audile devices playing 24/7 in urban centers.

I would like to bring to your attention that there are other alternatives to providing pedestrian actuation and accessible sounds that don't require ripping up cities streets and don't require buckets of money to deploy. Much of this can be done through the magic of power line communications along existing wiring. Smart buttons can communicate with each other, share information on button presses and share button press information with the traffic controller, all without adding any wiring to the street.



Conclusions

We are the keepers of our brothers and share the responsibility of ensuring that we are making our environment safe for everyone. We are in an ever-changing world with technology not only driving many of those changes but also how we perceive the world around us. Technology impacts how we live, how we travel and our safety in ways both positive and negative. It is up to us to ensure we use technology to the best of our ability to keep our streets safe in the most cost effective and reliable manner.

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SoundSafe Advanced Pedestrian System
http://www.novax.com/products/aps.html

References:
1. Wikipedia "Traffic light"
2. http://www.walkinginfo.org/aps/chapter1_history.cfm
3. IMSA Publication 2008 Q1
4. University of Alabama at Birmingham (2009, January 27). Cell Phones Dangerous For Child Pedestrians, Study Finds. Science Daily. Retrieved March 2, 2010, from http://www.sciencedaily.com /releases/2009/01/090126112429.htm
5. University of Illinois at Urbana-Champaign (2009, November 18). Walking hazard: Cell-phone use -- but not music -- reduces pedestrian safety. ScienceDaily. Retrieved March 2, 2010, from http://www.sciencedaily.com/releases/2009/11/091116114532.htm

Photo's courtesy of:
http://maxgrace.files.wordpress.com (horse&cart)
Credit: iStockphoto/Skip Odonnell (man on cell phone)
Novax Industries (button and wireless)

Definitions:
MMU – Malfunction Management Unit
CMU – Conflict Monitor Unit
Both MMU and CMU monitor for conflicting traffic lights
FHWA – Federal Highway Administration
AASHTO - American Association of State Highway and Transportation Officials
ITE – Institute of Transportation Engineers
NHTSA – National Highway Traffic Safety Administration
USDOT – US Department of Transportation

IMSA