

FACULTY OF TRANSPORT AND ENGINEERING

SEMINAR PAPER

PEEK's SafeStreet Program

Automated Red Light Enforcement

Zvonimir Bužanić
1192 010 413 /FPZ
Cestovni smjer, VII. Stupanj

mentor:
viši predavač
Katja Bošković - Gazdović

1. Safety issues



The Problem:

The Insurance Institute for Highway Safety attributes 750 deaths and 260,000 injuries a year to crashes involving drivers running red lights. Red light running is a significant safety and financial Issue to communities! Enforcing red-light running using traditional methods has become increasingly more dangerous for both Police Officers and the general traveling public.

The Solution:

With PEEK’s SafeStreet System in place, a reduction of collisions and injuries is immediate - and with the high level of municipality and citizen approval, the automated red light enforcement camera system becomes the obvious choice. Several Federal Highway Administration studies have confirmed that automated enforcement is not only safer; it is an effective and efficient way to reduce red light violations throughout any community.

Safety

The traffic signal’s purpose is to regulate the flow of traffic for everyone’s safety. When drivers “push the yellow” or “run the red,” the impact of such an action can, and often does result in an accident, or worse, a fatality. Law enforcement cannot possibly monitor all traffic signals at all times, and municipalities are finding it necessary to look for alternate ways to solve the problem.



When an intersection proves to have a significant number of red light running incidents, traffic engineers can sometimes find solutions with improving the signal timing or other countermeasures (such as intersection design improvements). However, in most cases this will not solve the problem! The automated red light camera enforcement system is a simple and cost-effective solution that works! There are many traffic horror stories, and solutions are not always as accessible and readily

available as the “red light camera system” now being employed in hundreds of cities around the world. If the introduction of a red light system are handled responsibly, these systems are well received by the community and the benefits of safer streets is immediate.

The Benefits:

- Reallocation of Police Officers’ resources
- Increased compliance at un-enforced locations
- Reduced collision related fatalities
- Reduced pedestrian & motorist injuries

2. Safety related costs



Safety Related Costs

There are two ways to view the financial benefit of the installation of the red light camera system. The most obvious is that collisions are reduced and thereby lives are not endangered and emergency personnel are not called upon.

Communities have to deal with the "cost of the collision." The heaviest cost is that of life.

The cost of a collision, which involves a fatality, has an immeasurable cost. In this circumstance, the financial impact, although significant, should not be discussed. In a collision where a loss of life has occurred, **any** countermeasure costs would be considered reasonable, and therefore it would be inappropriate to examine the cost benefit under these circumstances. However, there are other costs associated with red light running accidents, involving Emergency Personnel (Police, EMS, Emergency Room Doctors & Nurses, and City Maintenance), and personal costs for vehicular damage/replacement and increased insurance costs.

According to one study a collision's comprehensive costs range is:

- \$ 3,000 for property damage only,
- \$300,000 for property damage with injuries



Although, not intended as such, a community will see an immediate financial benefit to the installation of an automated red light enforcement program from the citations issued. Most communities consider the citations issued from red light camera systems as a civil offense, and therefore the associated drawbacks of a moving violation (points and insurance costs) are not assessed. In general, citations behave similar to a parking ticket.

A community may choose a cost model which best suits its budget. There are purchase, lease, shared-revenue, or combination options for the installation of an automated red light enforcement camera system. There is also the citation processing office, which needs to be considered. Some communities would prefer to handle the citation processing themselves – PEEK's modular web enabled system is without restrictions – processing methods are almost limitless. Others prefer a complete "turn-key" solution, to offset the costs of additional personnel & overhead.

The Benefits:

- Reallocation of Police Officers resources
- Reduced motorists insurance costs
- Increase in city funds

Violations have declined 15% - 20% at adjacent unenforced signals.

3. SafeStreet Camera System



Digital Image Red Light Enforcement Technology

PEEK'S Camera System Uses Unique Camera Technology

PEEK is at the forefront of the growing market for automatic camera systems for the detection of speeding vehicles and red light violations. These systems have propelled the company into the area of high-resolution digital camera technology. Overall, PEEK has a unique mix of real transportation products, worldwide expertise providing the most sophisticated and innovative technology allowing us to provide the most flexible and cost-effective solution for this important application. PEEK has developed a range of camera-based enforcement products that address the market need for digital image capture and newly improved sensing, providing a high standard of operational efficiency. To-date, enforcement activities have been more costly than necessary through the use of conventional 35mm film-based cameras in which film needs to be loaded and retrieved from the site before processing. Market demand and state of the art technology have enabled the transmission of pictures using secure digital images to allow the system to be operated at significantly lower cost. In addition, enforcement authorities are seeking more flexible equipment in order to reduce capital costs in extending their activities and to use a variety of sensors including radar.

High Resolution Digital Red Light Enforcement Camera Features

- RADAR Doppler tracking sensor - Loop detection option available
- Fast unit installation and easy relocation
- Digital high resolution commercially rated digital camera (5.3 mega pixel)
- Multiple lane (1-4) enforcement with single unit
- Single small footprint for camera system unit
- Commercial PC 104 computer architecture with embedded operating system
- Remote citation image retrieval from camera system - encrypted security
- Three (3) all digital color images per violation with embedded violation data
- Remote-access networked camera system enabling 24/7 support
- Left turn enforcement
- WORM (Write Once Read Many) for secure evidential storage
- 128 bit Encryption of all communication and data transfers

How It Works

SafeStreet enforces traffic laws by automatically photographing vehicles whose drivers run red lights. The SafeStreet System senses the traffic signal and detects vehicle presence in motion. It continually monitors the traffic signal and is triggered if it detects a vehicle traveling above a pre-set minimum speed, at a specified time after the signal has turned red. A second image is taken, capturing the red light violator in the intersection, it records the date, time of day and the time elapsed since the beginning of the red signal, along with the speed of the vehicle. A third image of the license plate is generated using an embedded algorithm. The electronic flash produces clear images of vehicles under all light and weather conditions. Each image contains a Data Bar which displays key information regarding the violation, such as:

- A unique incident number
- Time the image was taken
- Time elapsed from the first image
- Duration of the red light
- Duration of the last yellow light
- Speed of the vehicle

4. Summary

Today, we are trying to make our work simple as possible and transfer it to some device so we could have much more free time, and to reduce many problems.

PEEK's project SafeStreet offer us that, safety at every single step.

Hi-technology device that will do all the work for us. This system is available for everyone since you have many ways to pay it off, but also, price is one of the factors that should be ignored since there is no price for life.

Community will be much more safer, even on places where red light enforcement is not installed. Instalation procedure is very short and it's possible to translocate the device on some other location very fast.

It's possible to monitor four lanes with only one device in all weather conditions with digital colour images, and you can operate it remotely from office.

PEEK is the leader for red light detection systems, and those systems have pushed the company to create innovative and sophisticated devices wich are totaly flexible and cost-effective for such traffic situations.

PEEK-ov Program "Sigurnaulica"

Automatizirano kažnjavanje prolaska kroz crveno

1. Sigurnosni problemi

Problem:

Institut osiguranja za sigurnost autocesti bilježi 750 poginulih i 260,000 ozlijeđenih na godinu zbog prolaska vozača kroz crveno. Prolazak kroz crveno je značajan sigurnosni i financijski problem građana. Kažnjavanje prolaska kroz crveno koristeći tradicionalne metode je postalo puno opasnije kako za policiju tako i za ostale prometne sudionike.

Solucija:

Sa PEEK-ovim programom "Sigurnaulica", trenutno se smanjuju sudari i ozljede – i sa velikim odobrenjem gradske uprave i građana automatizirano kažnjavanje prolaska kroz crveno postaje jasan izbor. Više studija autocesti potvrdilo je da automatizirano kažnjavanje prolaska kroz crveno nije samo sigurnije, već je efikasan i dostatan način da se smanji broj prolaska kroz crveno u bilo kojem naselju.

Sigurnost

Svrha prometnog signala je da regulira protok prometa za sigurnost svih ljudi. Kada vozači prolaze kroz žuto ili crveno svjetlo, rezultat takvog postupka može, i često završava prometnom nezgodom, ili još gore, smrću. Provođenjem zakona ne može se pratiti sve prometne događaje odjednom, stoga gradska uprava traži alternativne načine da riješi problem.

Kada se na raskršću pokaže da postoji određeni broj prolaza kroz crveno svjetlo, postoji solucija po kojoj prometni inženjeri mogu popraviti tajming signala ili provesti druge protumjere (poput rekonstrukcije raskršća). Svejedno, u većini slučajeva to neće riješiti problem!

Automatizirani proces kažnjavanja prolaska kroz crveno je jednostavno i novčano efektivno rješenje koje radi! Ima mnogo stravičnih prometnih priča, i rješenja nisu uvijek dostupna kao što je "automatizirani sistem prolaska kroz crveno" u nekoliko stotina gradova širom svijeta. Ako se zorno prikaže sistem prolaska kroz crveno, taj sistem je vrlo dobro prihvaćen od građana i pogodnosti za sigurnu vožnju su trenutne.

Pogodnosti:

- Relokacija Policijskog osoblja
- Povećana sigurnost na nekažnjavanim mjestima
- Smanjena šteta uzrokovana sudarima
- Smanjene ozljede pješaka i vozača

2. Troškovi sigurnosti

Troškovi sigurnosti

Postoje dva načina da bi se vidjela financijska isplativost instalacije sistema prolaska kroz crveno. Očito je da su sudari smanjeni i time životi nisu ugroženi i hitne službe nisu aktivirane. Građani moraju razumjeti "cijenu prometnog sudara". Najskuplja cijena je cijena života. Cijena sudara, koja uključuje smrt, je neprocijenjiva. S takvim razumijevanjem, o financijskom problemu, iako značajanom, se ne raspravlja. U sudaru u kojem je izgubljen život, **bilo kakva** novčana protumjera je prihvatljiva, i stoga nije prikladno raspravljati o cijeni pod takvim uvjetima. Ipak, postoje troškovi prolaska kroz crveno koji uključuju hitne službe (Policiju, HAK, hitnu pomoć, doktore, medicinske sestre i gradsku upravu), i osobne troškove sudara za vozilo/dijelove te osiguranja.

Prema studijama cijena sudara je:

\$ 3,000 za oštećenje vozila,

\$300,000 za oštećenje sa ozljedama

Ipak, iako tako nije planirano, građani će vidjeti financijsku prednost instalacije automatskog sistema kažnjavanja prolaska kroz crveno preko izdanih kazni. Većina građana smatra da su kazne automatskog kažnjavanja napad na privatnost, i stoga se ne primjenjuju standardne kazne (kazneni bodovi i troškovi osiguranja). Kazne su slične onima za parkiranje. Građani biraju koji model najviše odgovara njihovom budžetu. Moguće je kupiti, iznajmiti, otplatiti kaznama, te ostale kombinacije za instalaciju automatskog sistema kažnjavanja prolaska kroz crveno. Postoji i ured za provođenje kazni, na koji treba obratiti pažnju. Neka naselja više vole sama provoditi kažnjavanje – PEEK-ov modularni web sistem bez ristrikcija – metode provođenja su gotovo bez granica. Dok drugi preferiraju potpuno obratnu situaciju, da smanje troškove dodatnog osoblja i računa.

Prednosti:

Relokacija Policijskog osoblja

Smanjeni troškovi osiguranja

Povećanje gradskog budžeta

Na nekažnjanim križanjima smanjeni su prijestupi za 15% - 20%.

3. Sistem kamere "Sigurnaulica"

Tehnologija digitalnog prikaza kažnjavanja kroz crveno svjetlo

PEEK-ov sistem koristi jedinstvenu tehnologiju kamere

PEEK je među vodećima u rastućem tržištu sistema automatskih kamera za detekciju brzih vozila i prolaska kroz crveno svjetlo. Ti sistemi su pogurnuli kompaniju u tehnologiju visoke rezolucije digitalnih kamera. Iznad svega, PEEK ima čitavu paletu pravih transportnih proizvoda, svjetski ekspert u posluživanju sofisticiranih i inovativnih tehnologija davajući nam vrlo fleksibilne i novčano isplative solucije za ovakve važne programe. PEEK je proizveo paletu uređaja baziranih na kamerama koji se ističu na tržištu digitalnih aparata i novom poboljšanom osjetljivošću, nudeći visoki standard efikasnosti. Do danas, kažnjavanje je bilo preskupo nego što je bilo potrebno koristeći kamera sa 35mm-kim filmom u kojima film treba biti pregledan i skinut sa uređaja prije procesiranja. Tržište zahtjeva i vrhunska tehnologija dopušta prikaz slika koristeći sigurne digitalne slike koje omogućuju upravljanje sistemom uz znatno manje troškove. Dodatno, odgovorni traže fleksibilniju opremu sa ciljem da smanje glavne troškove proširivajući aktivnosti i da koriste različite senzore uključujući radar.

Specifikacije visoko kvalitetnog uređaja za kažnjavanje prolaska kroz crveno

- RADAR Doppler prateći senzor – dodatna opcija kružne detekcije
- Brza instalacija uređaja i lagana relokacija
- Visoka digitalna rezolucija komercijalne digitalne kamere (5.3 mega pixela)
- Nadziranje više prometnih traka (1-4) samo jednim uređajem
- Jedan mali otisak za kameru u uređaju
- Komercijalni PC 104 kompjuter sa instaliranim operativnim sistemom
- Daljinsko upravljanje kaznama sa kamere na uređaju – zaštićeni podaci
- Tri (3) slike u boji sa otisnutim podacima o prekršaju
- Daljinska mrežna kontrola kamere omogućava podršku 24/7
- Kažnjavanje skretanja u lijevo
- WORM (Piši jednom čitaj više puta) za sigurniju pohranu
- 128 bitna enkripcija komunikacije i svih prijenosa podataka

Kako radi

"Sigurnaulica" provodi prometne zakone automatski slikajući vozila koja prolaze kroz crveno svjetlo. Sistem "Sigurnaulica" detektira prometni signal i detektira vozilo u pokretu. Neprekidno prati prometni signal i aktivira se ukoliko detektira vozilo iznad predefiniране minimalne brzine, u specifičnom vrijeme nakon što se prometni signal promjenio u crveno. Druga slika se uzima, kada se prekršitelj nalazi u križanju, i snima datum, vrijeme i vrijeme proteklo od aktiviranja crvenog signala, uključujući brzinu vozila. Treća slika prikazuje registarske tablice i generirana je integriranim algoritmom. Elektronički fleš stvara jasne slike vozila pod svim mogućim vremenskim uvjetima. Svaka slika sadrži podatkovni stupac koji prikazuje informacije o prekršaju:

- Unikatni broj prekršaja
- Vrijeme kada je vozilo slikano
- Vrijeme proteklo od prve slike
- Trajanje crvenog svjetla
- Trajanje zadnjeg žutog svjetla
- Brzinu vozila.

4. Sažetak

Većinu današnjih poslova pokušavamo pojednostaviti koliko god je moguće i prebaciti na uređaje kako bismo dobili više slobodnog vremena i smanjili moguće probleme.

PEEK-ov projekt "Sigurnaulica" nam nudi upravo to, sigurnost na svakom koraku. Vrhunski uređaj koji obavlja gotovo sav posao umjesto nas.

Uređaj je dostupan svima zbog mogućnosti njegove otplate, također cijena je jedan od faktora koji se u pravilu mora zanemariti s obzirom da život nema cijenu.

Sigurnost građana će znatno biti povećana čak i u onim dijelovima naselja gdje nema uređaja.

Procedura instalacije uređaja je brza i moguće je brzo ga premjestiti na neku drugu lokaciju.

Moguće je nadzirati četiri prometne trake pod svim vremenskim uvjetima pomoću digitalnih slika u boji, a uređajem se upravlja iz udaljenog ureda.

PEEK je jedna od vodećih kompanija u izradi sustava za detekciju prolaska kroz crveno, i rad na tim sustavima natjerali su kompaniju da stvori inovativne i sofisticirane uređaje koji su potpuno prilagodljivi i isplativi za takve prometne situacije.

Algorithm	[ˈælgəriðəm]	Algoritam
Architecture	[ˌɑːkiˈtektʃə]	Arhitektura
Assess	[əˈses]	Globa, nametnuti, procijeniti
Citation	[siˈteɪʃən]	Sudski poziv, kazna
Collision	[kəˈliʒən]	Sudar
Compliance	[kəmˈplaiəns]	Popuštanje, privola
Countermeasure	[ˈkauntəˈmeʒə]	Protumjera
Damage	[ˈdæmɪdʒ]	Šteta
Drawback	[ˈdrɔːbæk]	Povratiti
Driver	[ˈdraɪvə]	Tjerač, šofer, vozač
Emergency	[ɪˈmɛːdʒənsɪ]	Hitno
Encrypted	[mˈkriptɪd]	Enkriptirano, zaštićeno
Endanger	[ɪnˈdeɪndʒə]	Ugroziti, izvrgnuti opasnosti
Enforce	[ɪnˈfɔːs]	Provoditi, kazniti
Expertise	[ekspəˈtiːz]	Stručnost
Footprint	[ˈfʊtprɪnt]	Otisak, trag
Highway	[ˈhaɪwei]	(Glavna) Cesta, auto cesta
Immeasurable	[ɪˈmeʒərəbl]	Neizmjeriv, neizmjeran
Innovative	[ɪˈnoveɪtɪv]	Novotarski, novatarski
Insurance	[ɪnˈʃʊərəns]	Osiguranje
Intersection	[ɪntəˈsekʃən]	Raskršće, križanje
Lane	[leɪn]	Prometna traka
Lease	[liːs]	Najam, zakup
License plate	[ˈlaɪsəns pleɪt]	Registracijska tablica
Municipality	[mjuːnɪsɪˈpælɪti]	Gradska uprava
Offset	[ˈɒːfset]	Nadoknaditi
Parking ticket	[pɑːkɪŋ ˈtɪkɪt]	Kazna zbog nepropisnog parkiranja
Pedestrian	[piˈdestriən]	Pješak
Personnel	[pɜːsəˈnel]	Osoblje
Propelled	[prəˈpeled]	Tjerati, gurati
Purchase	[ˈpɜːtʃəs]	Kupnja
Radar	[ˈreɪdæ]	Radar
Relocation	[ˈriːləuˈkeɪʃən]	Relokacija, premještanje
Remote-access	[riˈmɔʊt-ˈæksɪs]	Udaljeni pristup
Sensitivity	[sensɪˈtɪvɪti]	Osjetljivost
Shared-revenue	[ʃʌd-revɪnjuː]	Podijeljeni prihod
Signal	[ˈsɪgnəl]	Signal, znak
Sophisticated	[səˈfɪstɪkeɪtɪd]	Kompliciran, na visokom tehničkom stupnju
Speed	[spiːd]	Brzina
Traffic	[ˈtræfɪk]	Promet
Turn-key	[ˈtɜːnkiː]	Obrat
Unique	[juːˈniːk]	Jedinstven
Violation	[vaɪəˈleɪʃən]	Prekršaj