

BEST PRACTICES FOR REPURPOSING ROADWAY SPACES

Technical Project

CHANGING TRAFFIC SIGNALING PRACTICES TO INCREASE PEDESTRIAN SAFETY

STS Project

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On my honor as a University student, I have neither given nor received
unauthorized aid
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INTRODCUTION

Standards for traffic signals and signs across the country are more homogenized than ever before. While this provides an unprecedented potential for truly systematic changes, the larger influence base makes such changes more difficult to achieve. One of the most successfully widespread new practices of the 21st century was the flashing yellow arrow for left turn signals, introduced into the Manual of Uniform Traffic Control Devices (MUTCD) in 2009.[1] While this did nothing to change the fundamental principles of yielding during permissive turning, the current widespread use (and misuse) of the flashing yellow arrow shines a light on numerous shortcomings and outdated practices that are prevalent in modern traffic control, particularly relating to pedestrians.

The concept of pedestrian signaling is fairly straightforward - one faces the direction they would like to cross, and follows the instructions presented by the signal facing them. Traffic signaling is slightly more complicated due to the need for turns, but the red-yellow-green control system is a near universal understanding. The individual signal systems still both have their shortcomings, but it is where the two signal systems overlap that the most significant ambiguity can arise. Despite being theoretically part of one overarching system, the traffic signals and pedestrian signals for the same approach to an intersection often operate totally irrespective of each other - that is to say, there is no change in the traffic signal operation whether or not the pedestrian signal is activated, and vice versa - even when the capability for coordination is fully possible simply through programming alterations. Signalized pedestrian crosswalks at intersections are also frequently placed based on the idea of minimal disruption to vehicular traffic flow rather than with regards to the greatest utility to pedestrians. It becomes plainly

apparent when analyzing average intersections that pedestrian signalization is more often an afterthought than an equal priority.

Change, however, is on the minds of everyone in the midst of the COVID-19 pandemic. Many fundamental aspects of life have seen significant shifts over the past several years - and with regards to traffic systems, perhaps the most widespread change that has occurred as a direct result of the pandemic is the repurposing of roadway spaces exclusively for pedestrian use. From street parking to entire streets, what started as a haphazard way to keep restaurants open has since evolved into much more, as inner city citizens have realized the value of reclaiming outdoor space. While these spaces are used for more than just travel, some of the same principles to consider are present as with pedestrian signals. Other more minor roadway reclamations, such as extending curbs to reduce crosswalk distances, have been successful at increasing pedestrian safety over the past few decades. The control signals themselves, however, have barely progressed at all in that time, and needlessly inadequate signaling practices are still prevalent everywhere. And in the spirit of change, particularly with the pandemic-induced focus on pedestrian priority, there are a number of conceptually simple yet potentially wonderfully effective shifts the signal industry can undertake in order to maximize pedestrian safety.

TECHNICAL TOPIC

Repurposing Roadway Spaces for Pedestrians

Pedestrian reclamation of road space is not a new concept. On January 1st, 1975, nine blocks of East Main Street in Charlottesville were permanently closed to vehicular traffic to become a pedestrian mall, today among the oldest surviving examples in the country. This was a large-scale project that completely transformed the city's centuries-old downtown. At first, there was strong opposition to the project - today, it is among the city's most notable attractions.[2] Charlottesville's Downtown Mall, however, is an extreme example of roadway repurposing. Smaller-scale temporary street closures are not uncommon for recurring events in urban environments, such as farmers markets. But since the start of the COVID-19 pandemic, these street closures have taken on an entirely new form. Namely, they are a lot more widespread and not quite as temporary.

The future of these newly de-vehicled areas is uncertain in many cases. They were born out of necessity, and like the coronavirus itself, have evolved over time with no set end date. COVID restrictions resulted in many restaurants having to close off their interiors to patrons, due to tight indoor seating proximities and the impossibility of wearing masks while eating. As a result, they were left with the options of providing takeout orders only, which could significantly reduce their business, and having outdoor seating - which, in dense urban areas where space is at its highest premium, is not an easy task. In addition to restaurant restrictions, government-mandated social distancing protocols were nearly impossible to achieve on crowded sidewalks, and left people desiring more room to walk. City governments stepped in to provide extra space for diners and pedestrians, which meant expanding into the only possible neighboring space, the

roadway. This involved removing parking lanes, reducing the number of travel lanes, and closing off streets entirely. Sometimes just for a block, sometimes for several. Among many who were newly working at home, or looking for new jobs amongst the shutdowns, an unprecedented number of people were stuck at home, meaning an unprecedented number of people were also looking for any way to safely get fresh air. These outdoor spaces have increased in popularity as a result, with many advocating to keep them for good, as well as to expand them further. In the words of former New York City traffic commissioner Samuel Schwartz, “Cities are now dedicating 30 to 40 percent of their land areas to cars. This could be a welcomed reclamation movement.”[3]

Unlike the decade-plus of planning around the creation of the Charlottesville Downtown Mall, many of these new pedestrian spaces were implemented out of abrupt necessity with minimal planning and no set end date. Rarely have government projects regarding the use of public space become so prevalent with so little preparation and red tape setbacks. In addition, these have been instituted in countless cities across the country simultaneously. And as a result of these factors, a wealth of untapped data is available to be gathered directly from the sources. This technical project aims to gather data about the important aspects and impacts of repurposed roadway areas - the optimal locations, scale, physical changes, and space allocation among businesses, as well as vehicular traffic disruption, public opinion of residents and visitors, and other factors. This is to be accomplished through surveying city project managers directly responsible for the transitions from wheel space to foot space, and generating a report about the benefits, concerns, and best practices for balancing the two surrounding roadway repurposing. These contacts will be found through a database of hundreds of localities that have engaged in relevant projects.[4] In addition, eye tracking technology will be used to gather data regarding

how pedestrians interact with their environment both before and after a street repurposing that is to be conducted in Culpeper this year.

Because many of these spaces are of uncertain permanence, this information is important to compile in order to promote the best practices and resulting benefits regarding these repurposed areas. This will increase their likelihood for success and longevity, and be a useful guide for future projects, as this COVID-spurred trend expands in popularity.

STS TOPIC

Changing Signaling Standards for Pedestrian Safety

The best measure of success of a system of rules is the rate of informed compliance. If you know that everyone following the same rules will result in benefits for you enough of the time, you are likely to obey them even when others benefit over you. This concept of mutual respect for mutual chance at benefits is present in most aspects of society - fouls in sports, lines at checkouts, personal property laws - and stoplights are no exception.

Numerous studies in multiple states measuring vehicular compliance to red lights all found compliance to be around 99.5% or higher.[5][6] While anything less than 100% is still too low, this shows a general propensity for vehicle drivers to obey the directions of traffic signals. These statistics can demonstrate the same principles that were previously mentioned - drivers are willing to wait at a red light because they know others will similarly wait for them when they have the green light. Through the systematic compliance shown in these studies, the public interest demonstrates that the rules instituted through traffic lights are successful. Measuring vehicular signal compliance is made easier through red light camera data. While pedestrian signal compliance data is more difficult to find in bulk, a study conducted in Connecticut in 2015 found that the average pedestrian signal compliance rate is approximately 35%.[7] The discrepancy between these percentages is staggering. Nearly all drivers obey their signals, yet nearly two-thirds of pedestrians do the opposite.

Over 6,000 pedestrians were killed on public roads in 2019, making up 17% of all traffic deaths, and over 25% of those deaths occurred at intersections[cite][9]. It is a reasonable assumption to make that many of these deaths are a result of pedestrian signal non-compliance.

That is not, however, to place blame on the pedestrians; this is indicative rather of a seriously flawed system that they are forced to act within. If two-thirds of pedestrians find that there is no redeeming factor to make pedestrian signals worth obeying in the same way that a driver finds traffic signals worth obeying, then significant systemic changes need to be implemented to make up for this discrepancy.

It should be noted that the rate of pedestrian signal compliance can never be expected to reach the level of traffic signal compliance. Due to the much higher flexibility of instantaneous movements and direction change one can achieve on foot relative to in a car, restricting pedestrian movements is inherently more difficult than restricting vehicle movements. This concept itself makes it difficult to induce change; it is hard to convince people to invest in something that is so heavily overlooked by all parties. If one simply observes the low compliance rate and assumes it is a result of their greater flexibility, it can seem that having pedestrian signals at all is trivial, and therefore it is of no use to change anything. In reality, though, pedestrian signals cannot be observed on their own. The concept of pedestrians would not exist without vehicles, and similarly pedestrian signals would not exist without traffic signals. The interconnectedness of traffic and pedestrian signals is the true root of the problem, and is exactly what needs to be addressed.

This paper does not have the capacity for detailing all of the potential solutions that will be investigated; that will be what makes up the first half of the upcoming STS research report. It will require much more technical background information relating to signals, delving into more specific problem definitions, and analyzing numerous real-world examples. Many factors that will be analyzed relate heavily to the interaction of right-turning traffic and pedestrians, which is the most frequently overlooked conflict point. The widespread upgrading of permissive left turn

signals to flashing yellow arrows, and the subsequent lack of similar changes occurring in permissive right turn signals, is highly indicative of that. Other factors include phasing and placement of pedestrian signals, as well as the different functions of pedestrian pushbuttons. Some of these issues will also branch out into other aspects of traffic control not directly related to pedestrians, but which face the same principal issues. The second half of the report will be analyzing the results of tests conducted regarding the effectiveness of the solutions proposed in the first half of the report. The main challenge of this research will be the method of gathering data. The most accurate test results would obviously be achieved by altering actual signalized intersections and studying the before-and-after results; however, it would be implausible to get any traffic agency to agree to that without prior testing. Another potential method would be immersive simulations, where participants show how they would react to different signals displays; while this would be the second most realistic way to collect data, adequate technology may not be available, and obtaining large-scale data this way would be much more difficult. In the end, the most likely method of testing will be a simple survey, asking participants to choose an action based on an animation and/or worded description of a situation they are theoretically facing at an intersection. Distributed to a wide enough assortment of people, the results could be illuminating.

CONCLUSION

Due to the large-scale and public nature of traffic and pedestrian facilities, little physical experimentation is likely to be possible for either the technical or STS research. The final deliverable for these projects will be reports compiled using collected data and subsequent analysis. The objective of these reports will be first to define the parameters being evaluated, and second to recommend the best practices for success moving forward.

Regarding roadway repurposing, the destabilizing condition lies in the rapid implementation and lack of planning surrounding these initial spatial transitions that have occurred during COVID. While their impact has been mostly positive, the consequences of their abrupt nature is a lack of permanence and lost potential for constructive changes. By defining parameters for future stable and productive repurposing efforts using lessons learned from these earlier experimentations, this research will hopefully promote healthier and more abundant pedestrian-based urban environments.

Regarding pedestrian signals, the destabilizing conditions lie in the poor coordination between traffic and pedestrian signals, poor overall pedestrian signaling practices in vehicle-centric environments, and a lack of progress towards these ends despite advancements in technology. The cost of these issues is pedestrian comfort, safety, and even lives, and the consequences are self-sustaining of the poor conditions. By testing the effectiveness of innovative signal design alterations, this research can hopefully lead to changes in MUTCD signal design standards that will improve pedestrian safety moving forward.

CITATIONS

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