CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

Memorandum

TO: HONORABLE MAYOR AND CITY COUNCIL

FROM: John Ristow

SUBJECT: **SHARED MICRO-MOBILITY REPORT**

DATE: June 30, 2020

Approved /s/ Jim Ortbal

Date 6/30/2020

INFORMATION

The Department of Transportation (DOT) regularly reports to the City Council's Transportation & Environment (T&E) Committee on the status of the Shared Micro-Mobility Program. This memorandum supplants the June 2020 report to the T&E Committee that was cancelled due to COVID-19.

BACKGROUND

In December 2018, City Council approved the regulatory framework for the Shared Micro-Mobility Permit Program, commonly referred to as the e-scooter permit program. From June 2019 through January 2020, DOT issued six shared micro-mobility permits to e-scooter companies for a total of 5,850 e-scooters.

In June 2019, the DOT released guidelines for a "Sidewalk Technology Pilot" to test and evaluate technologies that could prevent the use of e-scooters on public sidewalks in a designated area of Downtown San José. This memorandum provides information about the pilot that concluded in January 2020, recent planning efforts to address sidewalk riding, e-scooter parking, the procurement of data for the real-time management of permit requirements, and the status of e-scooter operations in San José under COVID-19.

Per the City's Shared Micro-Mobility Permit Administrative Regulations, e-scooter operators are required to develop technology applications that can prevent e-scooter riding on public sidewalks. The goal of the *Sidewalk Technology Requirement* is to ensure a safe walking environment in the City of San José while supporting e-scooter operations.

In the absence of a readily available technology solution capable of preventing e-scooter sidewalk use, DOT developed pilot guidelines to facilitate the testing and assessment of sidewalk

technology developments. These guidelines have been available to the public from the onset of the pilot through the City's Shared Micro-Mobility Vendor Page.[1]

To further address pedestrian safety concerns and minimize e-scooter clutter, DOT has been working on the development of shared micro-mobility parking corrals and e-scooter designated parking areas, initially focusing on Downtown San José.

The implementation and assessment of these planning efforts and the enforcement of most permit regulations depend on the City's ability to analyze vehicle data. In July 2019, DOT issued a Request for Quotes (RFQ) to obtain software and data analytic services to safely consume and analyze vehicle data reported by operators. The contract was awarded in February 2020 to the company Blue Systems. Since March 2020, DOT has been working with Blue Systems to obtain data from operators in the Micro Mobility Data Specification (MDS) format and develop the City's shared micro-mobility data dashboard.

COVID-19 has significantly affected e-scooter operations in San José and other communities throughout the world. In response, DOT is adapting its permit administration to the evolving situation, de-emphasizing permit conditions like minimum device deployments, while emphasizing permit conditions intended to maintain public safety, like real-time data sharing.

ANALYSIS

A. Sidewalk Technology Pilot

To safely prevent the use of e-scooters on sidewalks, e-scooter operators are required to develop or acquire technologies capable of: (1) detecting sidewalk use, and (2) reducing the speed of e-scooters to 5 mph when sidewalk riding is detected. DOT asked e-scooter operators to engage in a technology pilot to test the effectiveness of these technologies, and more specifically, to:

- Identify a suitable technology approach for detecting sidewalk use and evaluate its effectiveness in the Designated Area (see Attachment A- Designated Area Map).
- Evaluate the reliability of the selected sidewalk detection approach for safely reducing e-scooter speeds to 5 mph when sidewalk riding was detected.
- Assess the long-term feasibility and scalability of the proposed solution to other areas of the City, and its effectiveness on larger scale e-scooter operations.

Additionally, DOT encouraged e-scooter operators to incorporate other methodologies that can help curb sidewalk riding to compliment technology approaches, including, but not limited to, education, outreach, and user accountability.

[1] Sidewalk Riding Prohibition Technology, https://www.sanjoseca.gov/your-government/departments-offices/transportation/micro-mobility/sidewalk-riding-prohibition-technology

The e-scooter operators that participated in the pilot included Lime, Lyft, CLEVR, Spin, and Bird. Operators provided regular updates to DOT about the methodologies applied, the data collected, and the results of various experiments, mostly in the form of videos, presentations, and demonstrations. From January 15 to January 30, 2020, DOT held final field technology demonstrations with each e-scooter operator. The purpose of these demonstrations was to assess the overall effectiveness of the proposed solutions in preventing sidewalk use, and to appraise potential challenges for future implementation of the proposed technologies.

Assessment of Technology Solution

Proposed technology solutions to address e-scooter sidewalk riding were assessed based on progress toward performance benchmarks that reflect the early stages of development for all operators, and the pilot's set objectives and evaluation criteria. Considering information provided by e-scooter operators as of January 31, 2020, DOT identified different stages of technology development, as detailed in Table 1.

Table 1. Stages of Sidewalk Technology Developments

Stage	Definition
Unavailable	Operator has not presented record of development, or partial development of a proposed solution
Conceptual Design	Operator is in the process of prototype building. At this stage, operator has not been able to assess scalability, viability, and/or optimal levels of performance. Operator may need to re-define the methodology proposed.
Prototype	Operator has developed a preliminary model based on scalable and viable technology and has determined optimal levels of performance for implementation. At this stage, additional lab testing may be needed.
Deployment	Operator is testing a viable and scalable solution aimed at measuring impact on real users within the Designated Area.
Re-evaluation	Operator's testing of proposed solution did not yield optimal results, and alternative or complementary approaches are needed.
Implementation	Operator successfully deployed a viable and scalable solution in the entire Designated Area.

To facilitate the analysis and assess the effectiveness of a variety of technology solutions with multiple components, DOT also developed expected performance metrics, as highlighted in Table 2. This table summarizes the requirement's objectives and the benchmarks used for assessing these objectives. The table also provides an overview of future metrics that may be used in further assessments as these technologies become more robust and reliable.

As operators continue working on scalability and implementation of sidewalk riding prevention technologies, DOT will refine performance benchmarks and metrics to further evaluate the impact of these technology solutions on sidewalk riding and pedestrian safety.

Table 2. Expected Performance, Sidewalk Riding Prevention Technology

Objective	Definition	Benchmark (expected performance, current stage)	Metric (Future stages)
Sidewalk riding detection	Scalable methodology to identify or detect when users travel on sidewalks in Designated Area	Moving from prototype to implementation	Significant percentage of rides detected; and minimum number of false positives
Sidewalk speed reduction	Scalable technology capable of safely reducing e-scooter speeds to 5 mph when sidewalks are used in Designated Area	Pending status of sidewalk detection, research alternatives for safely reducing speeds	Significant percentage of scooters slowed down safely
Supporting measures to curb sidewalk riding	Education and outreach efforts that have proven efficient in curbing sidewalk riding	Messaging that has proven effective to curb sidewalk riding as reported by operators and/or other cities or agencies	Fewer number of resident complaints, and percentage of sidewalk rides detected
User accountability	Develop policies to identify users that ride on sidewalks within the Designated Area, and hold recurring offending users accountable (warnings, fines, or suspensions)	Proactively identify and communicate with users about sidewalk riding prohibition and take action for substantiated violations	Number of users warned, fined, and/or suspended by operators

Key Findings

1. E-scooter operators engaged in this pilot made great efforts to develop sidewalk detection technologies, mostly based on geo-fencing[2] and Intelligent Transportation System (ITS)[3] applications, machine learning algorithms, and onboard camera technologies. All proposed solutions are promising. Nevertheless, because of the complexity of the requirement and the resources needed to develop these applications, no operator has fully met this permit requirement. Most technologies proposed by operators are at a design iteration, or prototype stage of development.

[2] A virtual perimeter or set boundaries based on geographic information
[3] United States Department of Transportation, https://www.its.dot.gov/about.htm

2. To date, no operator has developed a scalable and reliable technology solution to detect sidewalk riding in real time. One operator, Lime, has demonstrated a scalable partial solution, but Lime is not yet able to detect sidewalk riding in real time nor slow e-scooter speeds on sidewalks. Furthermore, the effect of Lime's proposed approach on sidewalk riding and pedestrian safety is unknown at this time.

3. To date, no operator has developed a scalable and reliable technology solution to reduce e-scooter speeds to 5 mph when sidewalk use is detected.

4. Since companies are at early stages of development, DOT staff has not been able to assess the impact of these technologies on sidewalk riding or pedestrian safety. All technology approaches presented (or bundles of technologies) have advantages and disadvantages in terms of scalability and reliability.

5. For reducing e-scooter speeds, operators are focusing on solutions that would result in a negligible margin of error to minimize potential risks for e-scooter riders and other street users. False positives that cause e-scooters to slow down erroneously while travelling on roadways could be very dangerous for e-scooter users and drivers.

6. To date, DOT is not aware of any third-party vendor that could provide a scalable, universal, short-term technology solution to prevent e-scooter sidewalk riding.

Based on established performance benchmarks (Table 2), DOT determined the status of development of solutions proposed by each company, as highlighted in Table 3. Attachment C summarizes the results of the sidewalk technology demonstrations held in January 2020.

Table 3. Status of Sidewalk Technology Developments, All Operators

Operator	*Requirement Objectives*			
	Sidewalk Riding Detection	**Sidewalk Speed Reduction**	**Supporting Measures**	**User Accountability**
Lime	Implementation	Unavailable	Deployment	Prototype
Lyft	Prototype	Prototype	Conceptual Design	Unavailable
CLEVR	Prototype	Prototype	Conceptual Design	Conceptual Design
Spin	Re-evaluation	Re-evaluation	Conceptual Design	Conceptual Design
Bird	Conceptual Design	Conceptual Design	Conceptual Design	Unavailable

Next Steps

DOT is studying additional measures to prevent sidewalk riding and minimize sidewalk clutter in San José, including:

1. Install off-sidewalk e-scooter parking corrals
   Designated parking areas in downtown San José have been identified and initial plans for off-sidewalk e-scooter parking corrals have been developed, as described in the following section. These designated e-scooter parking areas are expected to minimize clutter on sidewalks and encourage on-street riding.

2. Enable citations for substantiated violations
   DOT is exploring options to monitor areas of concern and enable the issuance of citations to help companies hold users accountable for illegally riding or parking on public sidewalks.

3. Develop partnerships to deploy additional safety and rider education events
   DOT will continue to collaborate with operators, local businesses, schools, residents, and neighborhood/community organizations to facilitate safety and rider education events. These events are intended to inform potential users about e-scooter riding rules, and appropriate parking etiquette. Additionally, DOT will continue to facilitate operator development and testing of technology innovations to prevent sidewalk riding, while taking the necessary measures to minimize potential risks for pedestrians.

4. Support the development of new technologies to help manage shared micro-mobility
   Developing technology solutions to prevent sidewalk riding is a significant challenge that requires a large amount of resources and investment, therefore City goals to prevent sidewalk riding may not be fully achievable through technology solutions alone. Challenges for operators to achieve sidewalk riding prevention through technology include:

   - *Limitations of existing innovations*. Technologies that can support e-scooter operations are emerging. Currently, e-scooter operators do not have access to off-the-shelve technologies to prevent sidewalk riding.

   - *Amount and intensity of resources required*. In the absence of a third-party or widely known technology application available, operators must invest a significant amount of resources to develop sidewalk riding prevention applications.

   DOT is also studying other innovative approaches for preventing sidewalk riding and managing micro-mobility devices in the public right-of-way. One such technology being studied is remote e-scooter repositioning, which allows e-scooters to self-drive to an appropriate parking location through teleoperation.

5. Identify and support micro-mobility innovation zones

   Although sidewalk technology developments are focused on the established Designated Area, DOT will foster additional testing of technology approaches to help manage micro-mobility devices in other areas of the City, such as the recently established Innovation Zones in District 1 and District 6. DOT will provide general guidelines to operators to pilot innovative approaches that can help companies meet permit requirements, and/or exceed current operational standards.

6. Set deployment limits to manage sidewalk riding and clutter

   Public comments, operator input, and staff observations pointed to oversaturation of e-scooters in the downtown area. To minimize safety concerns while continuing to allow sidewalk technology development and testing, DOT will evaluate setting limits of deployment in the Designated Area once the COVID-19 public health concerns subsides, and operators are able to maintain pre-COVID vehicle fleets in San José.

7. Develop policy recommendations for managing micro-mobility

   DOT has provided assessment reports of sidewalk technology to each operator, including tailored recommendations for continued testing, and expected future benchmarks for ongoing assessments. Operators will have the opportunity to respond to these assessments with additional information, clarifications, and/or updates.

B. E-scooter Parking

To address issues of clutter and facilitate positive e-scooter parking etiquette, many U.S. cities have implemented demarcated parking zones known as e-scooter corrals. Cities that have reported positive impacts in parking and clutter after implementing parking treatments include Santa Monica, San Diego, Denver, and Portland.

To provide operators and users clear usable spaces to park e-scooters and minimize clutter in the public realm, DOT staff has been planning for a combination of designated parking areas and demarcated on/off street parking spaces (“parking corrals”).

Corral dimensions will depend on the location and local context, taking into consideration existing city policies and guidelines including the *San Jose Complete Street Design & Guidelines*, the *San Jose Downtown Guidelines & Design Standards*, *Fire Access Guidelines,* and other guidelines applicable to specific contexts. DOT staff developed design criteria for e-scooter parking treatments in San José, considering safety, visibility, accessibility, and ability to be used by multiple micro-mobility devices or bikes.

Figure 1. Micro-mobility corral on 2nd St. near E William St.

DOT is prioritizing placement of micro-mobility corrals near existing bike lockers and bike parking facilities when space is available. After implementation, DOT will continuously evaluate the effectiveness of corrals and designated parking areas for minimizing clutter and improving e-scooter parking etiquette.

C. Micro-Mobility Dashboard

Since March 2020, DOT has been working with Blue Systems to obtain historic and real time data from e-scooter operators in the MDS, to build the City's shared micro-mobility dashboard. Through this process, some e-scooter operators, including Lyft, Bird, and Lime, have raised significant data security concerns related to the implementation of the MDS.

Initially developed by the Los Angeles Department of Transportation, the MDS is an open source software designed to facilitate a safe, dynamic, and consistent transfer of vehicle data between operators and cities for planning and enforcement purposes. The development of the open source MDS is now guided by a municipality led non-profit organization known as the Open Mobility Foundation (OMF).[4] The City of San José is an active member of the OMF, contributing to the evolution of the MDS to help cities manage the public right of way, while addressing public concerns of data sharing and security.

[4] OMF, https://www.openmobilityfoundation.org/about/

To fully address operators' concerns related to data security, DOT is drafting data protection principles for the shared micro-mobility permit program, aligned with the permit's Administrative Regulations and the City's Digital Privacy Principles.[5] These principles are intended to ease concerns related to obtaining and analyzing MDS data through third party vendors like Blue Systems.

To this date, only Gruv, Bird, and Razor have provided MDS data to the City through Blue Systems. DOT expects to obtain data from other operators in the next two to four weeks to have a fully operational dashboard by July 2020. This dashboard will allow DOT to conduct essential planning and permit enforcement activities, including real time monitoring of vehicle status, complaints, geo-fences, geo-speeds, and vehicle deployments. The image on the right illustrates the reporting capabilities of the city's micro-mobility dashboard under development.

Figure 2. Trips per street segment for all operators

With improved data visibility, DOT expects to be able to consistently evaluate micro-mobility operations and facilitate data-driven recommendations to update or enhance current permit regulations.

D. E-scooter Operations Under COVID-19

Before the COVID-19 pandemic, most e-scooter operators in San José released less vehicles than permitted for several reasons, including device maintenance, scheduled upgrades, operational constraints, and most recently, reduced demand during the winter months when less people ride e-scooters. Additionally, most operators have reported that over-saturation of the market (too many scooters) made it difficult to maintain a profitable level of ridership. Since the current permit does not cap the number of devices and/or operators that can service San José, some companies have indicated this results in an uncomfortable level of regulatory uncertainty. In early March 2020, Spin suspended operations in San José citing concerns of oversaturation, regulatory uncertainty, and funding constraints.

Over the past several months, e-scooter companies have been severely affected by COVID-19. With the Santa Clara County Health Department Shelter in Place Order, most e-scooter operators in San José temporarily suspended their services due to safety concerns, except for Gruv, also

[5] San José Digital Privacy Principles, https://www.sanjoseca.gov/your-government/city-manager/civic-innovation-digital-strategy/digital-privacy

known as CLEVR. Gruv is also providing free e-scooter trips to essential medical and grocery staff workers for the entire time the shelter in place order has been in effect.

On April 24, 2020, Bird resumed operations, and on May 13, Razor followed suit. All companies that have resumed operations in San José have been working with DOT to provide e-scooter accessibility in areas of the City with transit route closures or transit frequency limitations. Additionally, companies are increasingly offering free rides to medical and/or emergency workers in San José to support essential travel.

Table 4. Permitted E-Scooter Operators and Devices Deployed (05/19/2020)

Operator	Date of Permit	Devices Permitted	Permit Status	Devices Deployed
Lyft	06/03/2010	900	Inactive	0
Bird	06/10/2019	1,200	Active	165
Lime	06/10/2019	2,300	Inactive	0
Spin	08/16/2019	1,000	Left Market	N/A
CLEVR	09/03/2019	200	Active	22
Razor	01/24/2020	250	Active	125
Total		5,850		**312**

Prior to the COVID-19 pandemic outbreak, e-scooter companies in San José expected an uptick in e-scooter demand typical of the spring and summer months. Instead, e-scooter ridership has dipped. As sheltering orders are expected to be adjusted in Santa Clara County in the coming months, e-scooter companies are quickly adapting to new operational challenges and reduced ridership expectations.

To help these mobility services overcome these challenges and continue to serve San José residents, DOT is also adapting its permit administration. In the following months, DOT will evaluate measures to support long-term partnerships with e-scooter operators under scenarios of reduced demand, as a result of decreased travel due to COVID-19.

/s/
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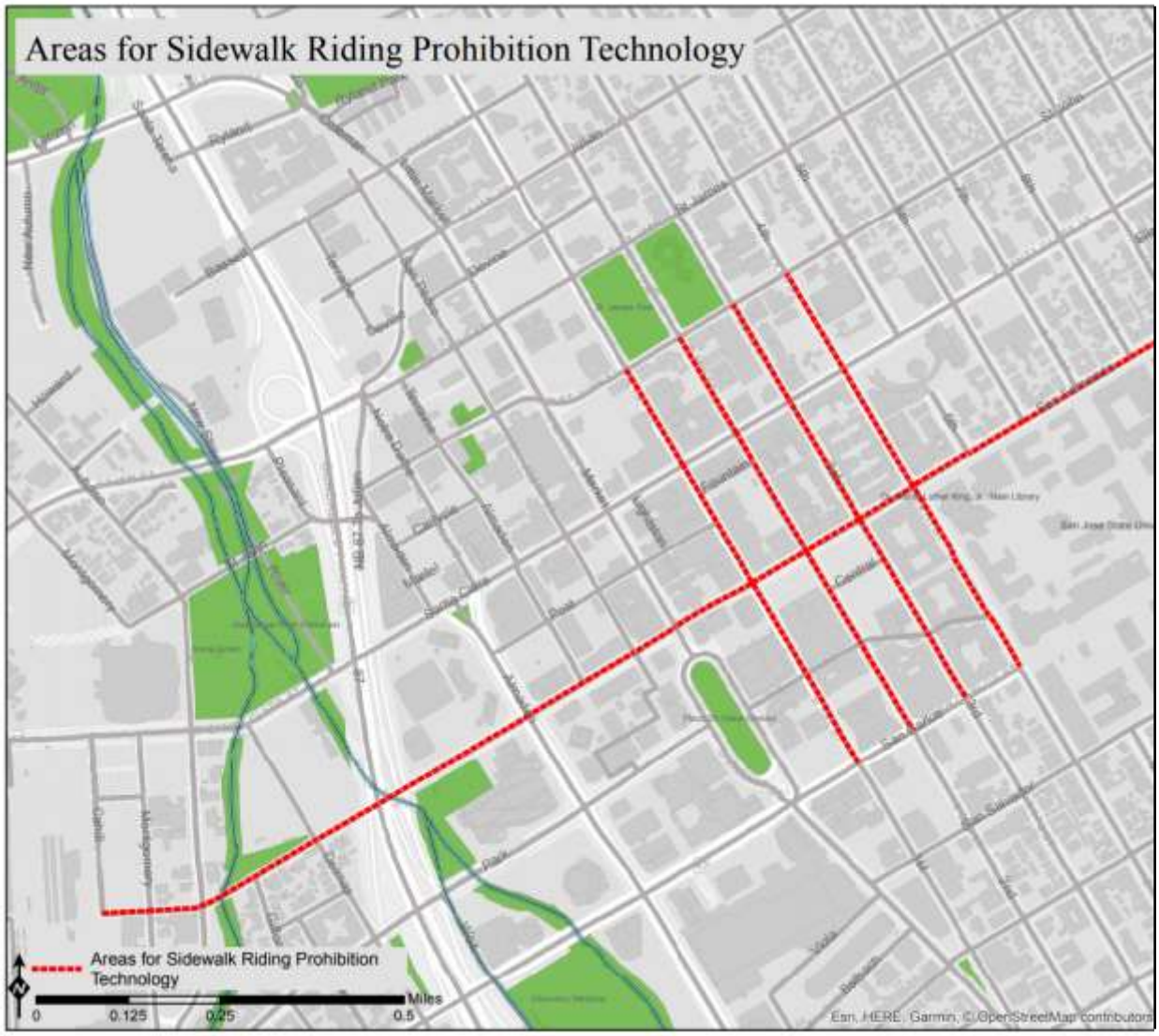
Director of Transportation

For questions, please contact Andrea Arjona Amador, DOT Shared Micro-Mobility Specialist, at (408) 975-3250.

Attachment A: Designated Area Map
Attachment B: Downtown Core Area Map
Attachment C: Sidewalk Technology Demonstrations

DESIGNATED AREA FOR TESTING SIDEWALK RIDING TECHNOLOGY



DOWNTOWN CORE BOUNDARY AREA

SIDEWALK TECHNOLOGY DEMONSTRATIONS

This sub-section summarizes DOT staff's observations of the pros and cons of each company's proposed solution; their current effect on sidewalk riding and pedestrian safety; and the commitments made by e-scooter companies to improve their technologies and measure their effect on e-scooter riding prevention and pedestrian safety.

Lime

Lime's sidewalk technology approach is based on a statistical model to discern when a user has completed a portion of a trip on a sidewalk, and then notifying the user. The current threshold for sidewalk riding detection is 50%, therefore users that complete up to 49% of a trip on a sidewalk will not be "flagged" as a sidewalk user. Nevertheless, this threshold can be adjusted as the solution improves. Lime has raised important safety concerns about users that may be wrongly flagged by the model as sidewalk riders. Due to current technology limitations, the proposed solution does not contemplate speed reductions.

Lime's Sidewalk Riding Prevention Technology Proposal

Solution	Advantages	Disadvantages	Impact on Sidewalk Riding/ Pedestrian Safety	Commitments
Sidewalk detection based on device data analysis, complemented by notification to users	• Scalable solution capable of detecting sidewalk riding when at least 50% of trips are completed on sidewalks, with 95% confidence • Model is adaptable to greater levels of confidence • Approach eliminates safety concerns for riders that may be slowed down when travelling with traffic	• Does not detect sidewalk riding in real time • Does not reduce e-scooter speeds, but notifies users about sidewalk riding seconds after trip completion • Unknown user response from new messaging experience	Unable to assess until company evaluates users' response to notifications and/or user accountability system	• Company making a significant investment in data processing costs to improve and maintain solution • Company will evaluate the impact of user notifications on sidewalk riding behavior, and will share aggregated data with the City • Company will share with City aggregated trip data on where sidewalk riding is most prevalent

Lyft

Lyft's sidewalk technology approach relies on device data collection enhanced by on-board camera technology. The combined methods seek to optimize machine learning algorithms that can detect sidewalk riding in real time and reduce e-scooter speeds when sidewalk riding is detected.

The current model is capable of detecting sidewalk riding with 90% confidence. The company is working on achieving greater levels of confidence to minimize or eliminate the risks related to slowing down e-scooter riders travelling with traffic.

Lyft's Sidewalk Riding Prevention Technology Proposal

Solution	Advantages	Disadvantages	Impact on Sidewalk Riding/ Pedestrian Safety	Commitment
Sidewalk riding detection based on device data + on-board camera data	Solution seeks to achieve most objectives of the requirement, including detecting sidewalk riding in real time and safely reducing e-scooter speeds	• Solution requires redundancy methods[1] to achieve higher accuracy and achieve optimal results in speed reduction • Costs of data processing and hardware components may limit scalability	Unable to asses due to early stage of development	• Company may be able to start collecting real user data on a limited number of retrofitted devices • To this date, company has made no indication to further invest on additional data processing to improve reliability of current model

[1] Perform the same operation via different methods to increase the reliability of the entire system.

CLEVR (Operating as Grüv)

Using prototype devices, CLEVR, has demonstrated accurate geo-fencing technology that can detect sidewalk riding and reduce e-scooter speeds in real time. However, CLEVR is not able to deploy proprietary devices enabled with this riding prevention technology. As an interim solution, the company is currently adapting its fleet with onboard, high precision 3D camera technology that can map and detect sidewalks. The company is relying on a third-party vendor to implement 3D camera mapping and positioning technology.

CLEVR's Sidewalk Riding Technology Proposal

Solution	Advantages	Disadvantages	Impact on Sidewalk Riding/ Pedestrian Safety	Commitment
Sidewalk riding detection based on 3D camera mapping and positioning technology from third-party vendor	CLEVR plans to combine this solution with their proprietary technology. This approach may increase the level of accuracy in detecting sidewalk riding in real time, enabling safe e-scooter speed reduction	• Requires retrofitting devices to adopt technology and prevent theft and vandalism • Implementation costs may increase for larger fleet sizes	Unable to asses due to early stage of development	• Installation and retrofit of part of current fleet with third party technology as interim solution • Integration of 3D camera mapping with CLEVR enhanced GPS technology • Future deployments of proprietary technology devices

Spin

Spin's sidewalk technology approach relies on geo-fencing technology. During their pilot, the company tested this solution in a section of the Designated Area to measure reliability on sidewalk riding detection. Additionally, Spin monitored and documented rider behavior when geo-fences were implemented, and scooters were slowed down.

The company found that the proposed solution did not yield optimal results due to significant inconsistences in speed reductions. In response, the company is forming a "Sidewalk Detection Task Force" to improve its current technology proposal.

Spin's Sidewalk Riding Prevention Technology Proposal

Solution	Advantages	Disadvantages	Impact on Sidewalk Riding/ Pedestrian Safety	Commitment
Sidewalk riding detection base on geo-fences	Field testing allowed the operator to identify optimal conditions for safely slowing down scooters on future technology developments	Proposed approach resulted in high probability of false positives (roadways identified as sidewalks), and negative user experience when users were slowed down erroneously	Unable to asses due to early stage of development	• Company is investing in a specialized *Sidewalk Detection Task Force* to channel more resources to develop an optimal solution • Company will implement additional educational and outreach resources

Bird

Bird's sidewalk technology approach relies on Intelligent Transportation System (ITS) technology applications, which requires the installation of supporting equipment in the public right-of-way. The company has already rejected an initial approach due to feasibility issues and is in the process of scaling a new prototype model.

Bird's Sidewalk Riding Prevention Technology Proposal

Solution	Advantages	Disadvantages	Impact on Sidewalk Riding/ Pedestrian Safety	Commitment
Identified sidewalk detection approach based on ITS application	If issues of viability are resolved, the proposed solution may be the most cost-effective in the long-term	• Unable to assess viability due to required installation of equipment • Requires coordination with other city staff, additional permitting, and/or building owner consent • Solution may require redundancy method to achieve reliability under variable circumstances	Unable to asses due to early stage of development	Operator will research viability of proposed solution and proactively seek complementary permits and agreements as needed