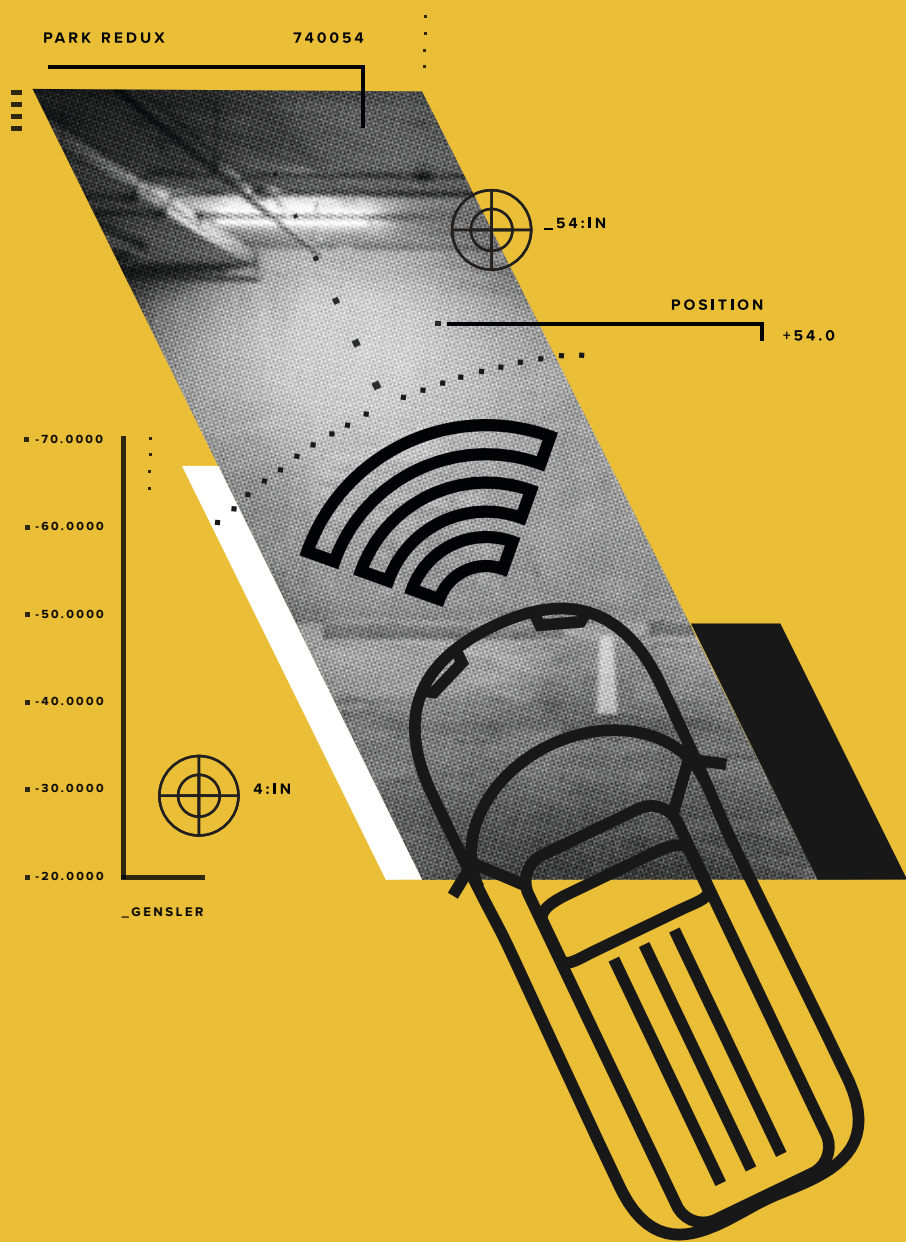


The State of Parking: Our Progression Towards Automation



The State of Parking: Our Progression Towards Automation

An investigation into how best to optimize parking in today's and tomorrow's built environment

WHAT WE DID

We collaborated with engineers, parking designers, and urban planners to review secondary research and achieve a holistic understanding of what tools we have to tackle our present and future parking needs.

After gathering and analyzing this information, we documented present trends in technology and design that are molding how and where we park, and emerging technologies that are poised to have significant effects on parking in the future. The goal of our research was to discover ways in which innovative designs, and new technologies, will drive change, and speculate on how we can best design buildings and cities today to accommodate potential changes in the future.

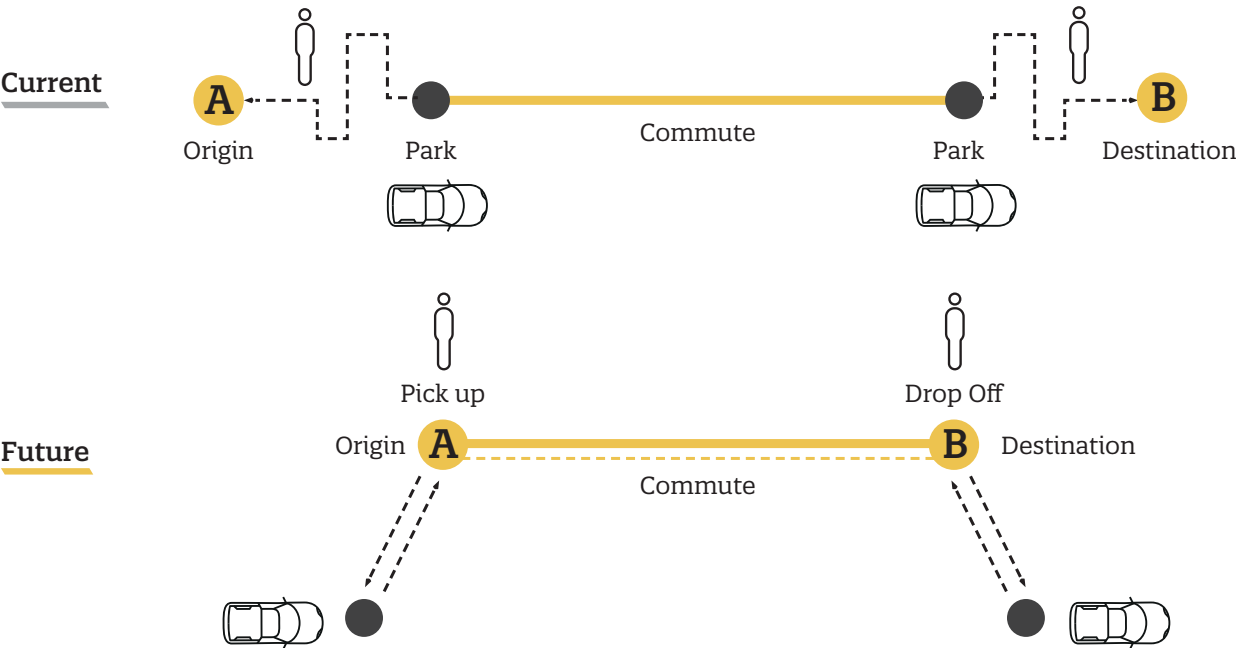
THE CONTEXT

Since the advent of Ford's Model T, cars have played a central, and often dominant, role in urban design and planning. And while cities will not shrug off parking concerns any time soon, new urban designs solutions are emerging that trend away from traditional

parking arrangements. Why? Our needs are changing and we are met with competing demands: increase parking capacity and lower congestion, while not sacrificing prime real estate.

Our current model for parking isn't working—the need to appease parking has grown out of control. Parking provisions can command up to 50% of programmed space in buildings today. Increased demand for parking is therefore putting how we park under increased scrutiny. Finding new solutions to parking can help address this demand without increasing space allocated to parking—and ideally, even help free up current parking space(s) for other uses.

One third of the typical American city is asphalt, but this may change as new technologies continue their drive toward dynamic mobility and streamlined methods getting from Point A to Point B. As we look to the future, our design logic needs to follow the principle of maximizing mobility rather than simply creating, or allocating, more space to parking.



Driverless cars are capable of sensing the environment and navigating without human input.

- Forward
- Rear
- Side

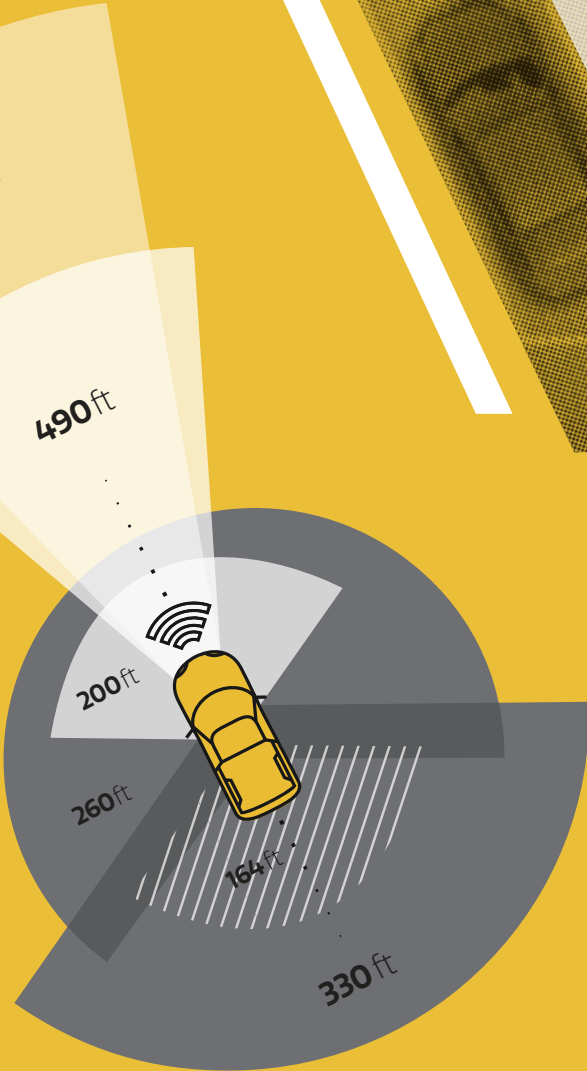
THE RESULTS

Our research began focused on parking, but evolved toward the adaptation of our design processes and solutions for evolving mobility patterns rather than simply rendering less parking. Undoubtedly, it is important to modify existing inventory to maximize usage, but we found that newer technologies that address how we travel rather than just the end point, or the parking space, are our areas with greatest potential.

In the near-term, solutions from city policies and start-ups are already pointing the way toward more efficient parking. Something as simple as managing parking costs can make a big impact—studies have shown that free parking creates induced demand and exacerbates the parking problem by oversupplying needed spaces. In San Francisco under the project title, SFPark, the city installed sensors and variable meters to detect parking space occupancy rates, and adjusts prices in real time.

Reducing time spent looking for parking can also have a big impact on overall traffic congestion and reduce latent capacity. ParkiFi, a Denver-based mobile application, allows users to find available parking spaces in Denver's Downtown area. The company has been implanting sensors, and coordinating a cloud-based system, to discern when and where parking spots are vacated or occupied. The app elaborates on existing apps that help drivers find parking garages based upon price and location.

Technology innovation will push us well beyond these solutions, however. Autonomous vehicles (AVs) and automated garages are the end game. By fully automating parking, the typical garage floor plan would be able to accommodate over 50% more cars. Because of the costs and pragmatic considerations, the most optimistic forecasts do not call for full implementation of automated parking any time soon. AVs are also slated for an exponential increase in use. Looking ahead, AVs could relieve up to 90% of parking demand—meaning the solutions we design today need to not only be more efficient in their capacity, but plan for a future in which current parking needs are dramatically reduced.



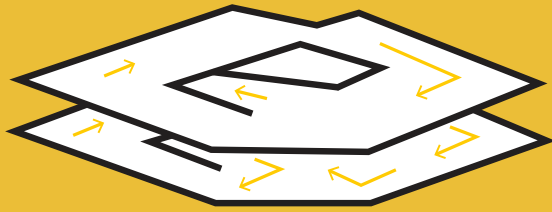
230,000
Self-Driving Cars
2020

5030%↑

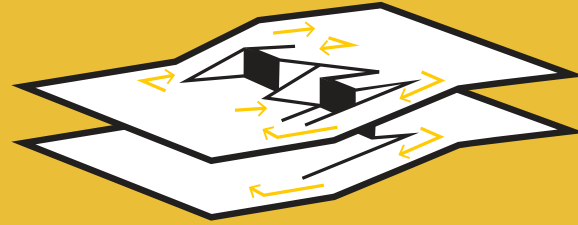
11.8 million
Self-Driving Cars
2030

Optimization of Parking Structure Design

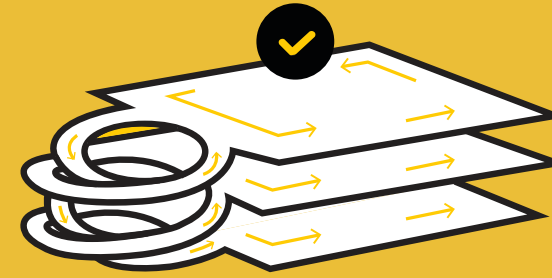
To future-proof development, parking structures with flat floors and higher floor to floor distances are recommended—these layouts allow for more flexibility and adaptability to a wider range of future potential uses.



Sloping Floors: Parking structures with sloped floors are incredibly hard to retrofit.



Staggered Floors: Staggered floors offer limited opportunities to repurpose.



Flat Floors (helical): Helical ramps can be designed to be removed in the future to support other uses.



Flat Floors (one way ramps): Structures with flat floors and one-way ramps minimize sloped floor space to maximize future re-use.

DESIGN IMPLICATIONS

Parking design and infrastructure should be designed to accommodate emerging technologies. There is a growing need for new infrastructure and property designs to better accommodate innovations in parking and transport, while planning for a future with much less parking need. Creative floor plate design should not be inhibitive to robotic parking, full automation, or shrinking parking space requirements.

We must identify and anticipate future infrastructural needs in our design process and show how these are possible in our projects. New technologies such as increased use of AV will decrease parking footprints, but the implications remain largely unknown. What would we do with all that space? Although the typical parking garage may be on a path towards obsolescence, we do not expect that this space will be supplanted with only city amenities, or green space. For instance, if we move in the direction of 'smart cities', we will have a greater need for support infrastructure and services. In short, instead of restricting parking garages to their definition, consider them to be 'empty shells' with numerable purposes—and design them accordingly.

We may know tomorrow's technologies, but we need to figure out the nuts and bolts. Future research needs to create effective trajectories to transport consecutive passengers. If an AV reaches a destination with a first passenger just to commute all the way back to its initial starting point to retrieve a second passenger, there is a 'doubling effect' on infrastructure. The scope of this research spans algorithms to better understanding behavioral patterns when it comes to commuting.

Finally, any modifications to parking habits and physical space will reshape how we interact with the built environment.

Cities will have to create designated pick up/drop off spaces, reconfigured building entrances, loading zones, and other new features to accommodate new technologies and designs. Now consider a cityscape once these modifications are made. Although small in scale, reclaiming street parking spaces for green space, pedestrian traffic, or pick up/drop off spaces would abridge a city's aesthetic.

“Parking needs (of today) will take on a smaller ration in future development—through phasing, infrastructure adaptability must be strategized within the framework to accommodate the next user generation and the 68% increase in mobility demand by 2050.”

Arup, Intelligent Connectivity for Seamless Urban Mobility, 2015

WHAT'S NEXT

Parking is part of a broader discussion on mobility and transportation. And put into an even broader context—there will be a long and unpredictable series of consequences following any technological or behavioral change. For example, on a pro forma basis, incorporating new technologies could lower the footprint of parking spaces while requiring greater resources and money. How can we adapt to new parking typologies that command higher investments and rents.

Conversely, how will we adapt to stubborn populations and policymakers? If policymakers alleviate parking requirements from new buildings, as they have been doing any many cities across the US, how will designers and urban planners accommodate? We need to be practical with change. Even though we can design new typologies that automate garages, if future technology renders automation obsolete, our investments are squandered.

The Gensler Research Institute

The Gensler Research Institute is a collaborative network of researchers focused on a common goal: to generate new knowledge and develop a deeper understanding of the connection between design, business, and the human experience. Through a combination of global and local research grants, and external partnerships, we seek insights focused on solving the world’s most pressing challenges. We are committed to unlocking new solutions and strategies that will define the future of design.

Research Team

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