

Will self-driving cars lead to grade-separated cities?

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Design / Urban Design
March 24, 2016

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via technology almanac/ Separated streets in Futurama


The usually sensible people at MIT's **Senseable City Lab** are looking at the future of the traffic light in the world of the self-driving car, and predict that its days are numbered. Instead, they propose a "slot-based intersections that could replace traditional traffic lights, significantly reducing delays, make traffic patterns more efficient, and lower fuel consumption."


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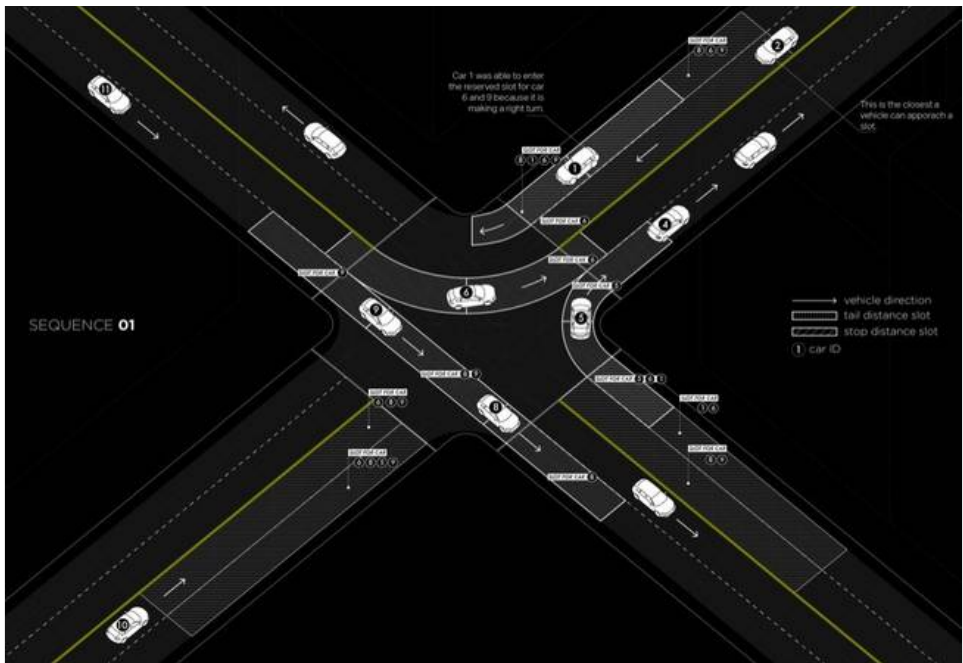
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It's based on the principle that if all the self-driving cars are communication with each other and know they all are, they can plan speeds and courses so that they essentially pass through each other. It's very much like air traffic control:

Light Traffic | MIT Senseable City Lab



Upon approaching an intersection, a vehicle automatically contacts a traffic management system to request access. Each self-driving vehicle is then assigned an individualized time or "slot" to enter the intersection. Stop and go is largely avoided, which has the effect of reducing pollutants and greenhouse gases caused by acceleration and deceleration cycles.



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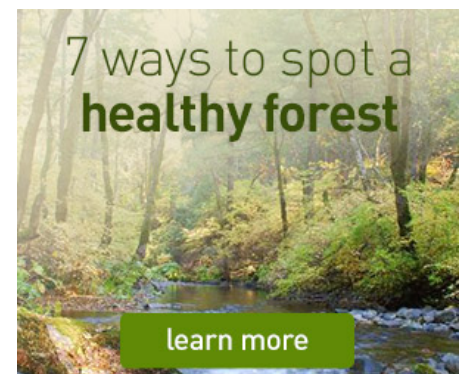
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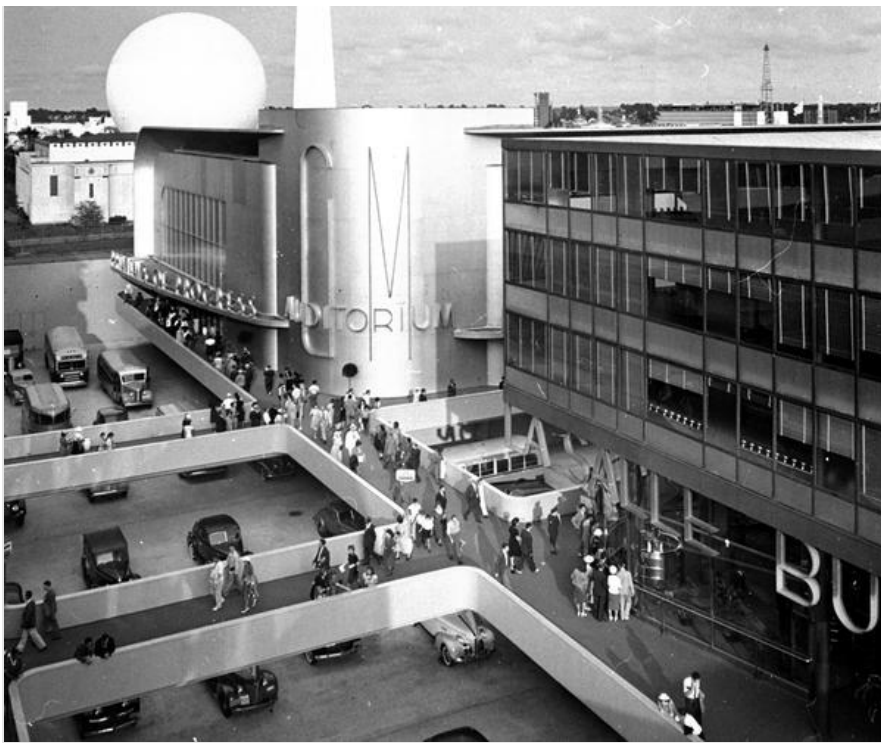
Untitled from [CityLab](#) on [Vimeo](#).

We [have seen this movie before](#), albeit a less sophisticated version, and [David Alpert of CityLab was not impressed](#), writing "But what's missing from this diagram? **How about... people?**"

The Senseable Lab people say otherwise, suggesting that "slot-based intersections are flexible and can easily accommodate pedestrian and bicycle crossing with vehicular traffic." But then they note:

"Traffic intersections are particularly complex spaces, because you have two flows of traffic competing for the same piece of real estate," says Professor Carlo Ratti, Director of the MIT Senseable City Lab, which initiated the study. "But a slot-based system moves the focus from the traffic flow level to the vehicle level. Ultimately, it's a much more efficient system, because vehicles will get to an intersection exactly when there is a slot available to them."

In fact, in cities you have a lot more than just two flows, you have as many as six or eight when you factor in cyclists, pedestrians, wheelchairs and delivery people riding the wrong way. And as David Alpert noted, people are strange. If the cars are so smart that they know to stop in time to avoid hitting someone, "we might see a small number of people taking advantage of that to cross through traffic, knowing the cars can't kill him. That will slow the cars down, and **their drivers will start lobbying for even greater restrictions on pedestrians, like fences preventing midblock crossings.**"



© GM Futurama 1939 World's Fair

I suspect it will be more likely that we get grade-separated walkways like Norman Bel Geddes designed for General Motors in their [Futurama at the 1939 World's Fair](#), and they have built in downtown Hong Kong.



Lloyd Alter/ walkway in Hong Kong/CC BY 2.0

Dr. Steven Fleming has written about how transportation affects urban form:

The end of the era of private car ownership occasions a genuine rethink of urban mobility and ways in which urban design has historically been used to optimise optimal modes. When trading vessels brought us great riches, we built canal cities like Amsterdam and Venice. When exchanging finance and thoughts was the aim, we built compact cities to shorten walking distances within various quarters, quarters for bankers, quarters for artisans, quarters for tailors, etc.



Lloyd Alter/ Calgary skywalk/CC BY 2.0

The self-driving car will probably cause yet another massive change in urban design; probably it will **enable a return to sprawl** by making commuting fun, **a ticket to Broadacre City**. Meanwhile, our cities may turn into Hong Kong or Calgary with pedestrians banned from the streets. Steven Fleming wants us to design our future cities around bikes, but worries that "I'm sure as I write executives from Google are wining and dining politicians, just like Henry Ford, convincing them streets should be given to driverless cars." I suspect he's right. Things to come:



W. H. Corbett 1913/Public Domain

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Ridaan · 31 minutes ago

While autonomous cars will likely encourage sprawl, it will be fundamentally different than the suburbs or the twentieth century. And would probably end up being more medium density.

1. Roads will be more safe to travel by bike or by foot so even people who live in a sprawly areas will be more encouraged to use these means of transportation when proximity allows, which is not the case now. Even if it is a 5 minute walk/bike, you often have no choice but to drive because it is unsafe.

2. Also, and I think this is a really important part, because there will be no need for parking, commercial areas will be reintegrated into residential areas. Malls and big box stores exist in far off locations because they require a lot of space for parking, and everyone has to drive to get to them because they are far off. But if there was no need for parking and still accesible by car, they could be more easily located near residences. Which would then also allow people to walk and bike more to places they work or shop.

So even though it is less dense I don't know if that is necessarily a problem if these new suburbs are more mixed use. It will still probably over all reduce the number of miles travelled. Plus existing suburbs could probably more easily be changed into this kind of arrangement than they could into a dense core area with good mass transit options. Furthermore suburban style development has probably the greatest potential for people to produce enough solar for net-zero homes, and also would allow them land to grow some food.

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Greenforce88 → [Ridaan](#) · 10 minutes ago

I agree. I think the suburbs have the potential to completely shed their reputations as energy hogs that are separated from cities.

^ | v · Reply · Share ›



lad76 · 9 hours ago

You aren't thinking far enough down the line; Futurists say there is no need to have cars, roads or parking lots in a city; that people and freight will be whisked to city entry hubs via hyperloops and within the city they will be transported via trams, electric walking platforms, scooters, etc.

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Roland Beinert · 14 hours ago

I suspect the driverless car will change urban design, but I'm not as pessimistic about what those changes might be. Driverless cars are coming about at a time when our thinking about streets is slowly but surely changing for the better. The idea of separated pedestrian and car areas is an old one that never really worked out. There was never enough money to really implement the idea in most places, anyway, so cars had to use the street mostly.

Now the dominant idea in street design is the complete street. The driverless car fits into the complete street idea far better than cars driven by people. They could more easily coexist with other transportation types. They won't disobey a low speed limit just because the passenger gets impatient. They won't threaten people just to get them out of their way.

Even in a bike friendly city, the car will continue to exist. There is never only one type of transportation, just a dominant one. Right now the car dominates through fear of driver error or aggression. You're told you shouldn't walk or play in the street, because a driver might not see you or might run you over just out of spite. When you put a computer in charge, the threat disappears and the street can be more flexible in its use. That would allow bikes or pedestrians to become the dominant form.

2 ^ | v · Reply · Share ›



Greenforce88 → Roland Beinert · 11 minutes ago

Agreed. And when people feel safe to ride their bikes, they start wanting more things closer to them. So we get an increase in density.

^ | v · Reply · Share ›



TorontoisRoy · 18 hours ago

There is very limited roadspace in cities, and they generally aren't making any more of it. Self-driving cars are a technology fetish that won't solve traffic, as in stop & go city traffic the maximum road space is already being used. Perhaps 5% more road space could be used by self-driving cars driving closer to the car in front. But the same parking problems. So self-driving cars are the techno-myth that hydrogen cells were.

^ | v · Reply · Share ›



Al Ian Travelle → TorontoisRoy · 5 hours ago

Although it might appear that the maximum road space is already being used, what isn't being used is the maximum flow rate. Stop and go is caused by a range of issues, but one factor is bad driving practices. On dense motorways, the stop and go effect is often caused by unnecessary braking or lane changing causing someone behind to brake. This then causes a car-braking wave to travel backwards through the traffic which causes the stop and go effect. This is why on heavy usage motorways slowing the vehicles down counter-intuitively causes the traffic to flow freely and increases the traffic flow. In effect, slowing the vehicles down eliminates the stop and go and causes the actual average speed to increase.

Similarly, where traffic lights or other merging of traffic flow occurs, slowing and stopping vehicles at intersections causes a similar build up of cars which results in queues. Correct intelligent car control as shown here in these videos eliminates or optimises these intersection issues, meaning cars aren't waiting e.g. when the other lanes are free but the lights are against you or slowing down to see if the intersection is clear. The flow in many streets is not limited by the ability of the street to move vehicles through it but by the intersections and stopping points.

Better vehicle control and management with intelligent vehicles also means that vehicles can be closer than is safe with human drivers and lanes can be narrower which also allows a greater throughput of the road system.

In addition, vehicles can be slower but journey times can be quicker by eliminating these bottleneck. This means that there are actually less vehicles on

the road for any particular flow rate which also results in less traffic. Effectively, the traffic is being used more efficiently.

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MrSteve007 → TorontoisRoy · 15 hours ago

What's interesting is that when you add up areas of pavement within a city: the roads & parking lots, most North American cities dedicate just under 50% of urban land area to pavement. In cities like Detroit, that number reached as high as ~54%.

While I agree that it isn't likely that we're going to add more roadspace within urban areas, I'd phrase it that we have limited humanspace (houses, workplaces, schools or parks) in cities, since the #1 largest area is already dedicated to roadspace.

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