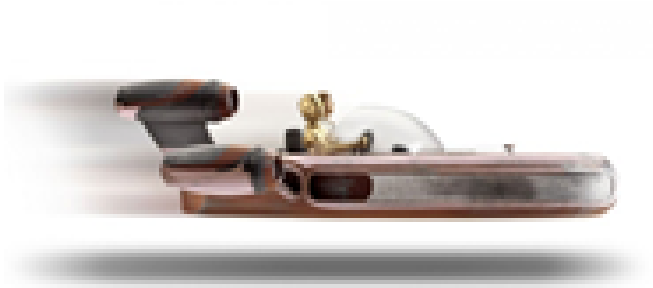


AI Meets ITS

Traffic Information in the Age of Robot-driven Vehicles

Michael L. Sena

December 2016

Beating Traffic

Time to Get Unstuck

YOU CAN BEAT THE TRAFFIC CONGESTION PROBLEM. Take back the week or two of time you lose each year being stuck in traffic, and spend that time on something much more useful and productive. This book is intended to get you off the traffic treadmill.

Michael L. Sena

14 November 2016
Volume 4, Issue 2

The Dispatcher

Special interest features covered in each issue:

- Autonomous and self-driving cars
- Map data and navigation
- Data privacy
- Third party automotive services
- Regulations and Standardisation

In This Issue:

If we really believe that robots make better drivers than humans, why not just let them drive our cars rather than making cars into robots?

Trusty robot C-3PO drives Master Luke in the Speeder

Telematics Industry Insights by Michael L. Sena

Report from Dispatch Central

BMW, AUDI AND MERCEDES-BENZ compete fiercely in all markets for top dog position in the volume luxury segment. In 2015, they had a combined sales of 6 million vehicles, with BMW in the number one spot with 2.3 million, MB in second with 1.9 million and Audi in third with 1.8 million. They are the undisputed leaders of this high-margin segment. Lexus had global sales of 652,000.

It wasn't always this way. In the 1960s, BMW was producing Chevy Corvair look-alikes. In the 80s, Audi had a near-death experience when U.S. owners accused its automatics transmission cars of unintentionally accelerating when the ignition was turned on. In 1998, MB parent, Daimler, in a "What were they thinking?" moment paired the brand with Chrysler. It took nine years for everyone to come to their senses.

During the past few years, slowly, quietly and resolutely the three competitors have forged a partnership. Although they compete, they are pulling in the same direction in a number of important areas, including with HERE and 5GAA. They have shown that they have the financial resources, the will and the capabilities to take on the task of leading the automotive industry into the next generation of mobility.

1964 Chevrolet Corvair

1964 BMW 1800

Autonomous Driving News

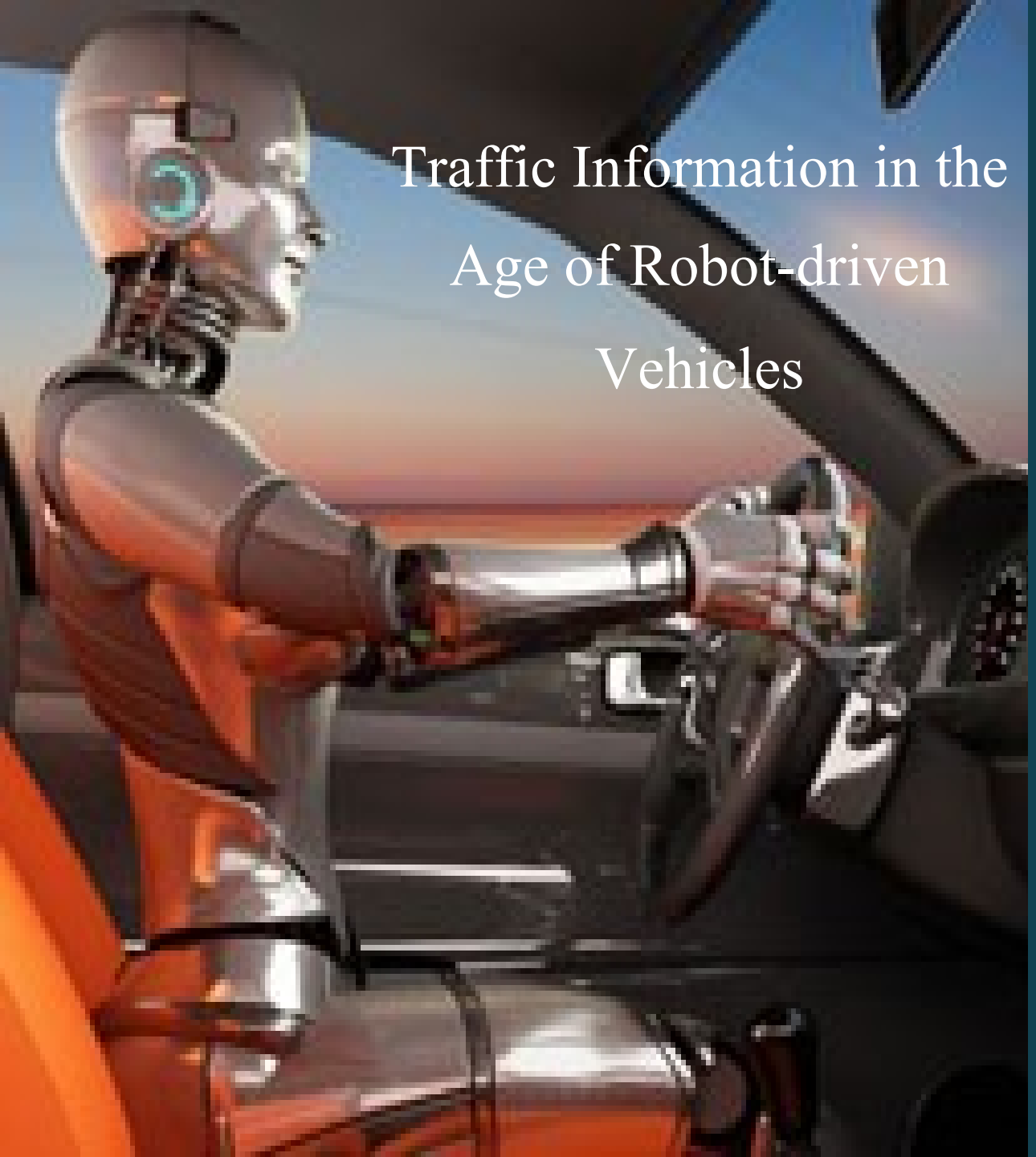
HUMAN ERROR IS THE CAUSE of 95% of all vehicle-related accidents; robots are not humans; therefore, cars driven by robots will not have accidents caused by human error. According to Merriam-Webster, a robot is "a real or imaginary machine that is controlled by a computer and is often made to look like a human or animal." Even if you believe that robots will not make errors of their own—which I do not—at least those 38% misjudgment errors (lane keeping, static vehicle, preceding car) could be eliminated. We are left with 11% of the 95% caused by unexpected behavior, which is the really difficult nut to crack. That is where human judgment, or lack thereof, determines the vehicle's occupants' fate.

So, let us assume that at some point in the future, all the tests have been made the public have been prepared to accept their new role as passengers. What then? A billion non-robotic cars will be running around the streets of the world and a few million new robotic-controlled cars will be doing their best to avoid them. I, for one, do not believe that is a particularly good approach to the problem of reducing traffic-related fatalities.

Governments and the ve-

Enables VCC & Dealers to use the data provided by cars to enhance offers and give better service to customers =
BUSINESS OPORTUNITIES

The data will be brought in from Wireless Car to internal VCC central databases. This data is today not available for analysis and dealers.



Artificial Intelligence Meets Intelligent Transport Systems

- Where we are
- How we got to where we are
- What problems are we trying to solve, really?
- Where we might be going with the help of AI and what that means for the future of traffic information

AI

Merriam-Webster defines 'artificial intelligence' as a branch of computer science dealing with the simulation of intelligent behavior in computers; and, the capability of a machine to imitate intelligent human behavior.

The Internet Encyclopedia of Philosophy states: Artificial intelligence (AI) is the possession of intelligence, or the exercise of thought, by machines such as computers."

ITS

Intelligent Transport Systems (ITS), according to EU Directive 2010/40/EU (7 July 2010) defines ITS as systems in which information and communication technologies are applied in the field of road transport, including infrastructure, vehicles and users, and in traffic management and mobility management, as well as for interfaces with other modes of transport.

"Can a machine think?" asked Alan Turing.

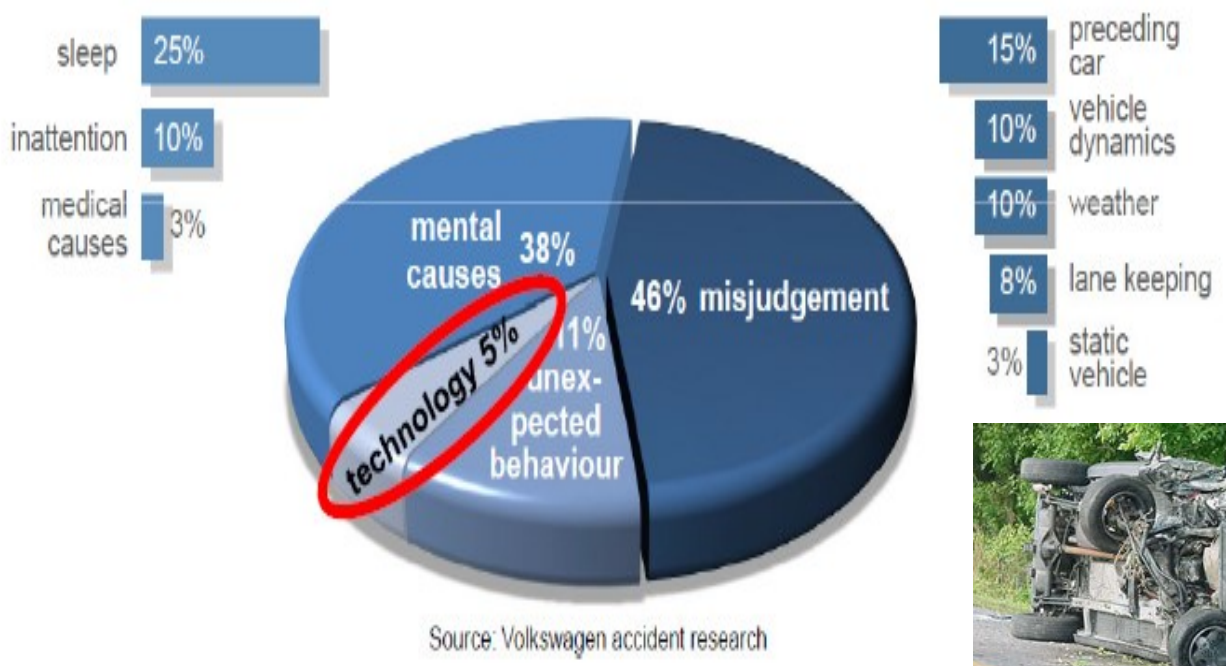
1956: Artificial intelligence
Arthur L. Samuel of IBM's Poughkeepsie, New York, laboratory programs an IBM 704 to play checkers (English draughts) using a method in which the machine can “learn” from its own experience. It is believed to be the first “self-learning” program, a demonstration of the concept of artificial intelligence.

2016: DeepMind’s AlphaGo beats human at Go.

Where we are today: the context

Where we are is a result of enabling technology and public policies (good and bad)

- Sprawl – Cars and Roads
- Global production - Containers
- Shopping malls - Refrigeration
- Independent mobility (cars) – More people have more money
- …and people keep being injured and dying in vehicular accidents



Source: Volkswagen accident research

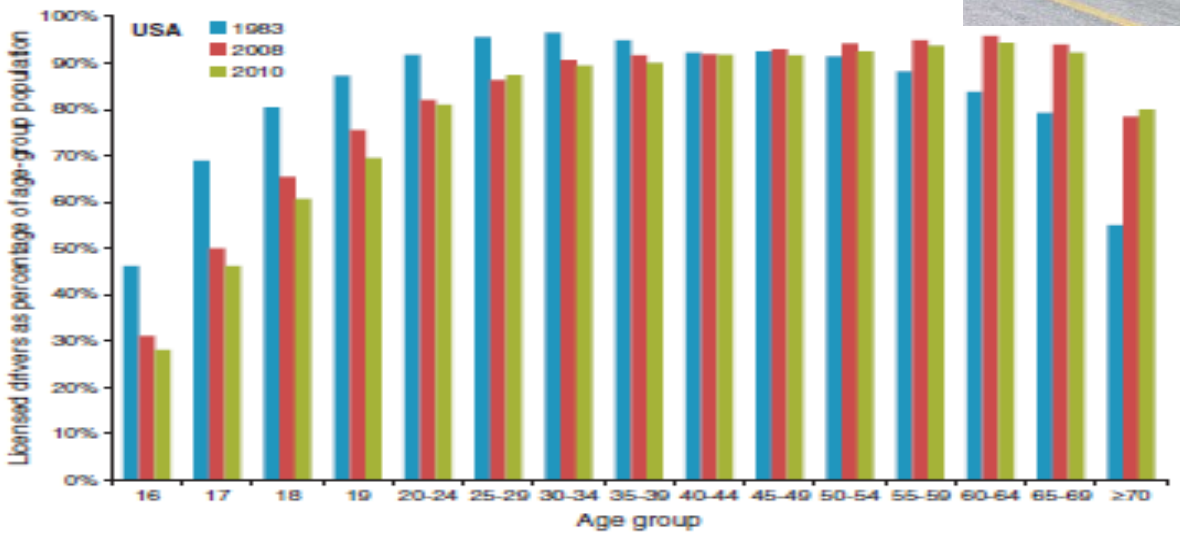
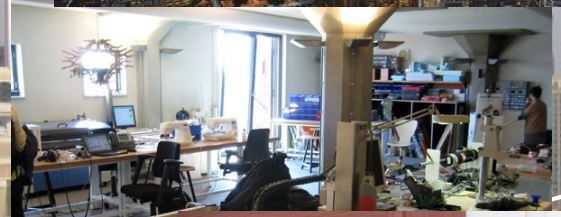


Figure 1 Licensed drivers as a percentage of their age-group population (color figure available online).

What is happening

- People continue to crash their vehicles into each other.
- Traffic congestion keeps growing
- The environment is getting more attention
- Younger generation got used to being chauffeured
- More connectivity brings more distractions into the vehicle
- Governments want to do something, but are not sure what. Reducing driving has become their target.

More Urban Living



Distributed Offices and Manufacturing

Local Viewing/Pick-up and Return Centers

Personal Rapid Transit

Where some people believe we are going

- Concentration in cities
- Local production
- Delivery to our home or to wherever we want things delivered
- Ubiquitous mobility
  - Ride sharing
  - Car sharing
  - Chauffeured rides
  - Driverless vehicles
  - Personal rapid transit

Reality does not support this view, at least not yet

Today, around 2.4 billion people in the world spend an average of 20 minutes on line every day. That is 800 million hours. That same amount of time is spent driving cars each day: 800 million cars with an average driving time per day of one hour. Imagine if they could be on line instead of driving and still get to where the car would take them.

Apple
Google
Micosoft
Facebook
Baidu
Amazon

Why driverless vehicles seem to be inevitable

- Forces are working for zero traffic deaths. 95% of accidents caused by human error. We have reached the limit with passive safety; the next step is to take over the driving.
- People want to use social media all the time, don't they, even when they have to be in their cars?
- Commercial transport companies' major costs for operations are drivers and fuel.
- The defense industry is pushing for robotic vehicles.

Promises, promises

Intelligent Transport Systems

- *ITS has been promising increased safety and reduced congestion with less investment in physical infrastructure. So far, it has not delivered on that promise.*

Artificial Intelligence

- *AI with Big Data, Cloud Computing, Neural Networks and Driverless Vehicles are promising fewer accidents and more efficient use of the passengers' time, rather than wasting time driving vehicles. So far, it is just promises.*

ITS with AI promises to reduce traffic congestion with machine-to-machine messaging

Major causes of traffic congestion

- *Highways are operating at certain times at over demand with under capacity*
- *Accidents cause road blockage*
- *Traffic signals are out of sync*
- *Weather-related problems*
- *Too many trucks on the road*
- *Double parking*
- *Road work and work-related lane closures*
- *Lane reductions*
- *Too many pedestrians crossing not permitting cars to turn*
- *Overdevelopment in areas where the mass transit system is already overcrowded and the road system is inadequate*

How AI and ITS mitigate congestion

- *Reduce safe distance between vehicles with convoying increasing capacity*
- *Connected, driverless cars have fewer accidents*
- *Real-time feedback from vehicles spots malfunctions quickly*
- *Real-time sensor feedback provides immediate local weather conditions.*
- *Autonomous vehicle technology enables platooning and convoying allowing trucks to be more tightly spaced but still allowing for cars to exit highways.*

The problem we are still not really solving—either with government involvement or automotive developments—is the one **need** that is most important to drivers:

Traffic information tells us how much additional buffer time we should allow, or when to take an alternative route, but does not guarantee that we arrive on time.

"I need to get to where I need to go when I need to be there. Not an hour earlier to beat the traffic, or an hour later because the traffic beat me."

Current Collective Transport

- ETA based on a schedule that is set by the operators
- Conditions vary by mode – less variable for rail; more variable for bus
- Fixed pick-up locations, not at your doorstep
- Pay-per-use or pre-pay per month

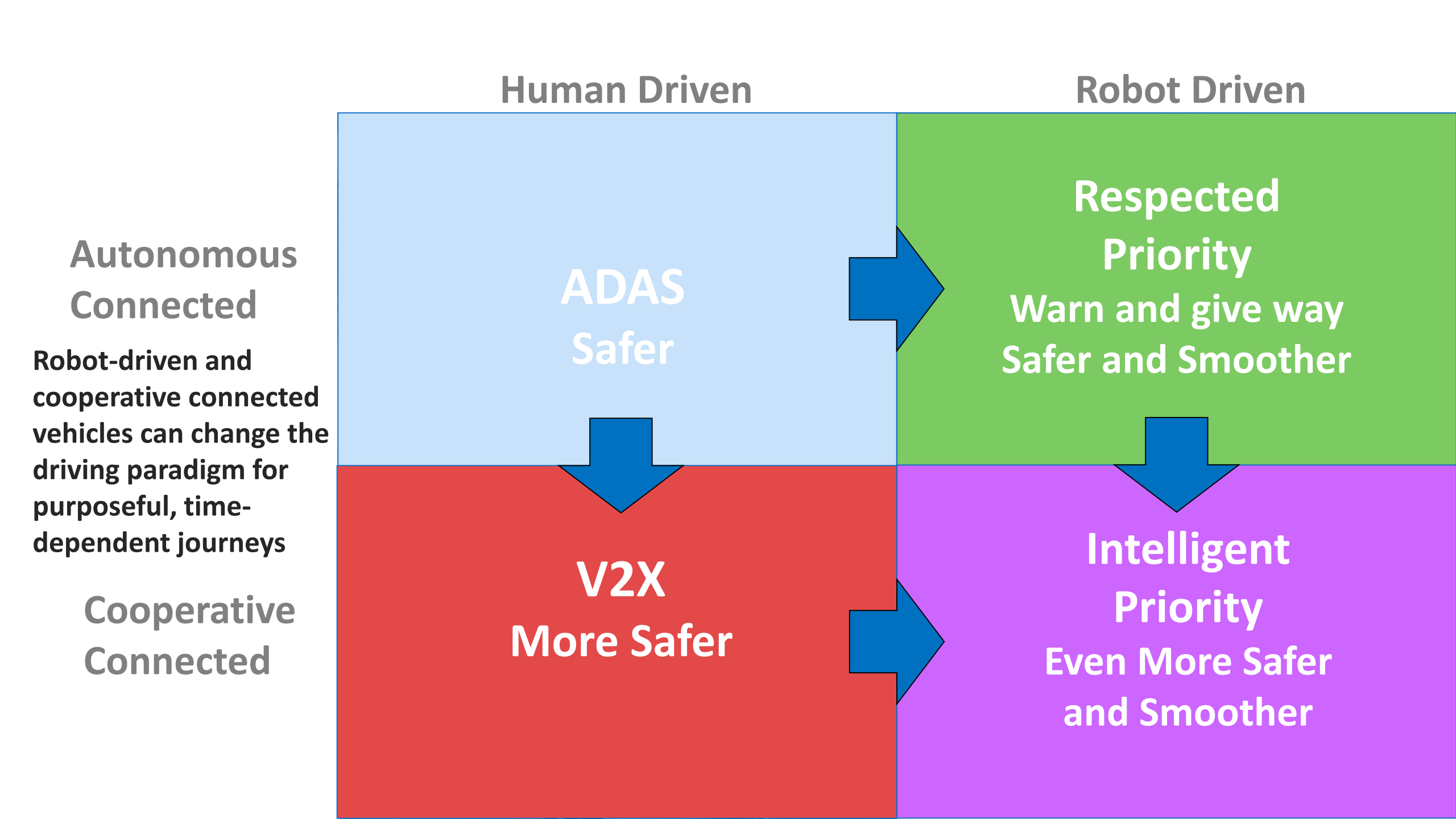
Current Cars and Trucks

- ETA based on conditions on that particular day at that particular time
- Add more buffer time at the start and end of every journey to account for traffic congestion
- Parking place to parking place
- Pre-pay for vehicle

This is where AI and ITS can truly make a difference to drivers

Desired Mobility

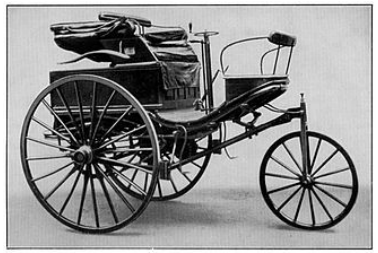
- ETA based on pre-booked priority
- Minimize the buffer
- Conditions controlled through intelligent intervention
- Door-to-door
- Pay-per-use

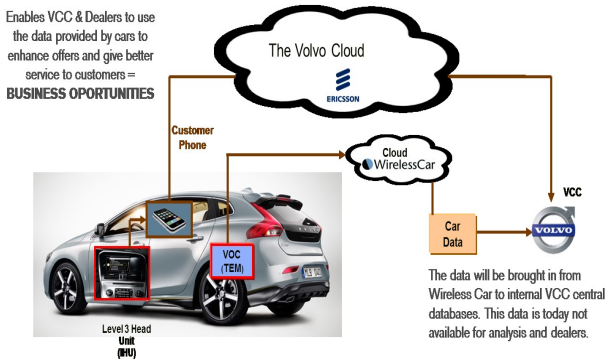

Human Driven
Robot Driven
Autonomous Connected
Robot-driven and cooperative connected vehicles can change the driving paradigm for purposeful, time-dependent journeys
Cooperative Connected
ADAS
Safer
Respected Priority
Warn and give way
Safer and Smoother
V2X
More Safer
Intelligent Priority
Even More Safer and Smoother

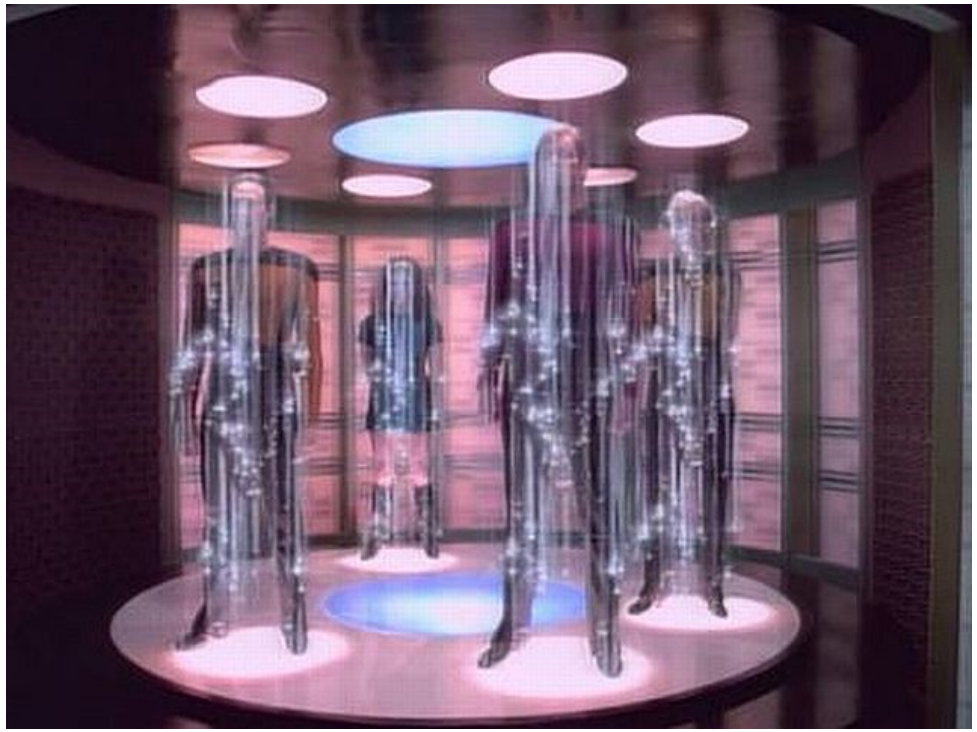
With robot-driven cars that can execute commands instantaneously, every vehicle can in theory be assigned a priority relationship to every other vehicle, giving way or proceeding based on the pre-determined priority.

Intelligent Priority

More Safer and Even More Smoother and Guaranteed Arrival Time







One day we may not need vehicles at all.

Questions?

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Michael L. Sena
ml.sena@mlscab.se