Mixed Emotions about Self-Driving Vehicles

John Leonard

Massachusetts Institute of Technology
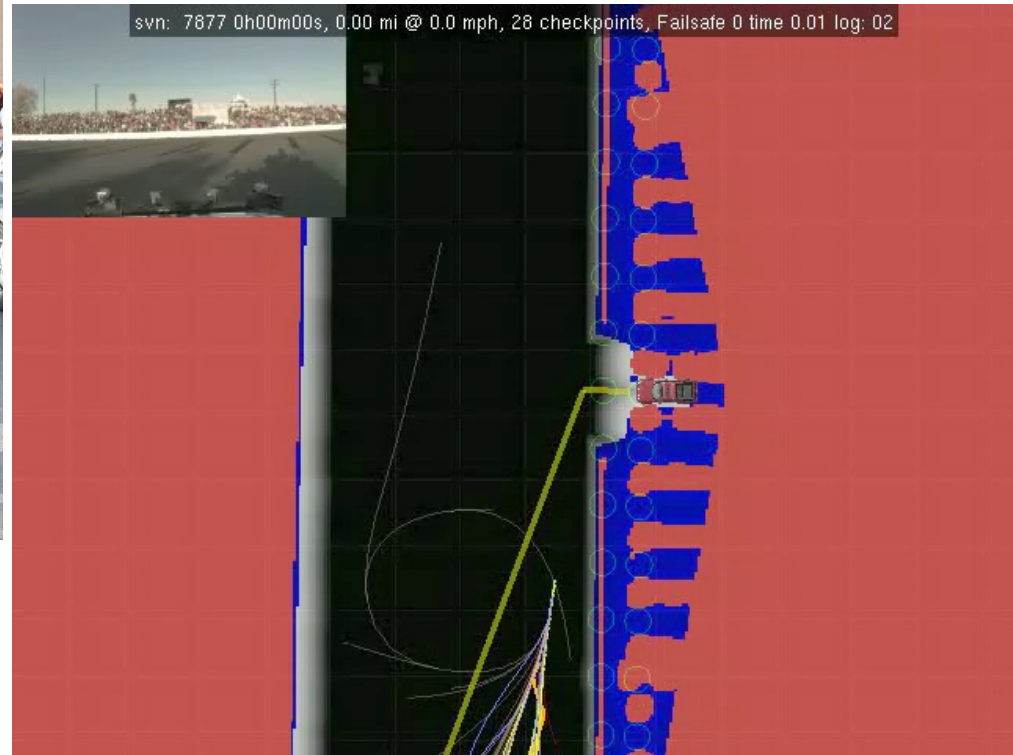
Department of Mechanical Engineering

Computer Science and Artificial Intelligence Laboratory
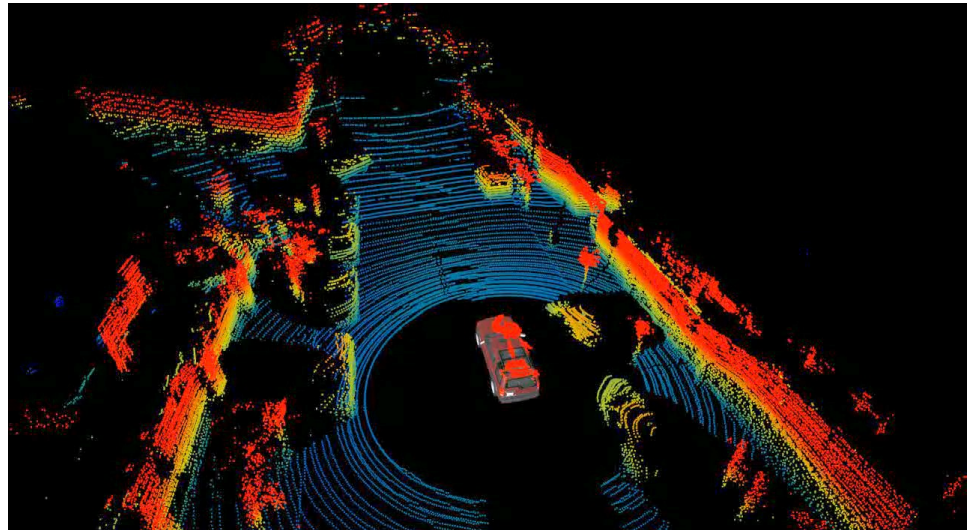
Questions for Self-Driving Vehicles

- Technological
- Economic
- Employment
- Ethical
- Legal
- Security
- Energy and the environment

MIT DARPA Urban Challenge Team (2006-2007)

MIT Land Rover LR3 (Talos)

- Blade cluster
  - 40 cores
  - 3.5 kW for full power

- A **lot** of sensors
  - Applanix IMU/GPS
  - 12 SICK Lidars
  - Velodyne (~64 Lidars)
  - 15 radars
  - 5 cameras

Joint with Seth Teller, Jon How, David Barrett, Troy Jones, and an amazing team of students, postdocs & collaborators

2007 Urban Challenge Results

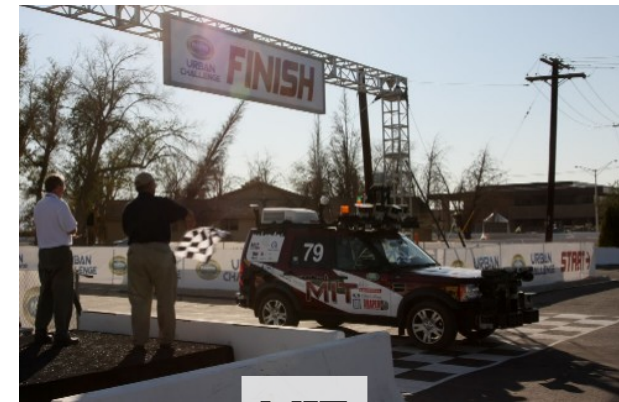|	
Initially	89
Site Visit	53
Invited to NQE	35
Qualified	11
Finished	6

CMU

1st place

Stanford
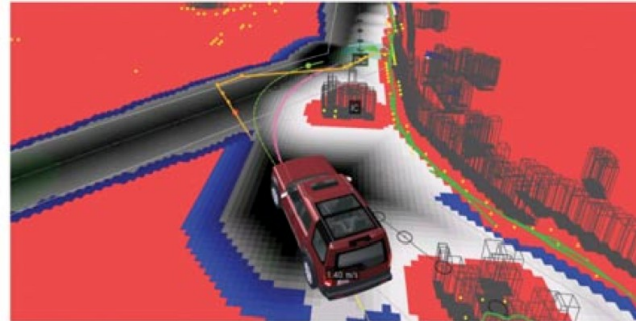
2nd place

Virginia Tech

3rd place

MIT

4th place

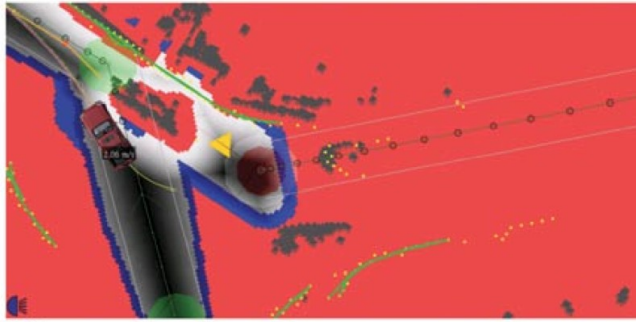# Second robot-to-robot car accident in history (MIT and Cornell)

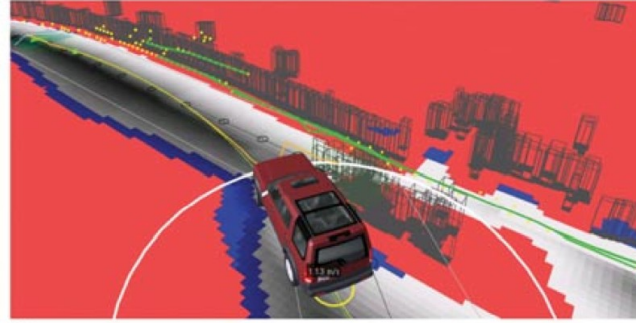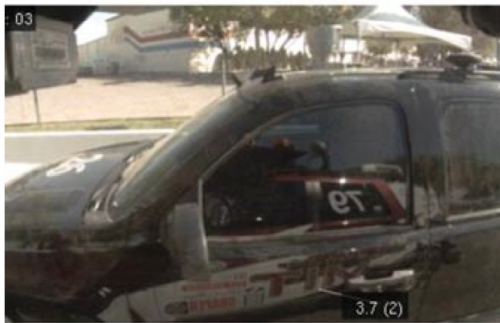# Second robot-to-robot car accident in history (MIT and Cornell)

Second robot-to-robot car accident in history (MIT and Co.....)

L. Fletcher, S. Teller, E. Olson, D. Moore, Y. Kuwata, J. How, J. Leonard, I. Miller, M. Campbell, D. Huttenlocher, and others, "The MIT–Cornell collision and why it happened." In Journal of Field Robotics, 25(10), pages 775-807. 2008.
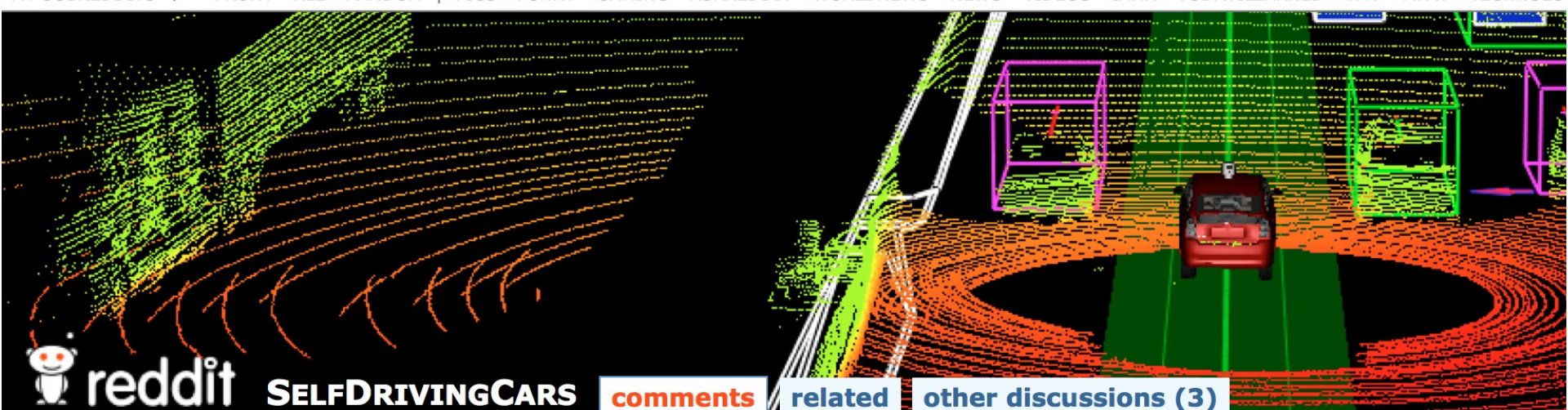
FEATURED STORY

Driverless Cars Are Further Away Than You Think

By Will Knight on October 22, 2013

46 COMMENTS

Before traveling to Germany, I visited John Leonard, an MIT professor who works on robot navigation, to find out more about the limits of vehicle automation. Leonard led one of the teams involved in the DARPA Urban Challenge, an event in 2007 that saw autonomous vehicles race across mocked-up city streets, complete with stop-sign intersections and moving traffic. The challenge inspired new research and new interest in autonomous driving, but Leonard is restrained in his enthusiasm for the commercial trajectory that autonomous driving has taken since then. "Some of these fundamental questions, about representing the world and being able to predict what might happen – we might still be decades behind humans with our machine technology," he told me. "There are major, unsolved, difficult issues here. We have to be careful that we don't overhype how well it works."

http://www.technologyreview.com/featuredstory/520431/driverless-cars-are-further-away-than-you-think/

October, 2013

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A Test Drive of the Most Advanced Driverless Cars (technologyreview.com)
submitted 14 days ago by walky22talky
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  MIT's John Leonard, for one, does not believe total autonomy is imminent. "I do not expect there to be taxis in
  Manhattan with no drivers in my lifetime,"

  Talk about a Debby downer. He is not even 50 years old.

  permalink

    ▲ [−] **ShadowRam** 6 points 14 days ago
    ▼
      MIT's Leonard, for one, does not believe total autonomy is imminent. "I do not expect there to be taxis in
      Manhattan with no drivers in my lifetime," he said, before quickly adding, "And I don't want to see taxi drivers out
      of business. They know where they're going, and—at least in Europe—they're courteous and safe, and they get
      you where you need to be. That's a very valuable societal role."

    Sounds more like someone that is afraid of the technology and has trust issues with machines.

    permalink   parent   http://www.reddit.com/r/SelfDrivingCars/

Difficult Situations for Self-Driving Vehicles

Left turn across traffic

Changes to road surface markings

Traffic cops, crossing guards, police/fire/ambulance

Adverse weather

Conclusion – I have "Mixed Emotions" about SDVs

Transformative technology that can/will change the world, but many open questions

- Hope for reducing accidents and saving lives
- Admiration for Google's audacious vision and amazing progress
- Impressed by recent efforts by auto manufacturers
- Pride for the robotics community's contributions
- Fear that the technology is being over-hyped
- Uncertainty about open technological challenges, such as:
  - left-turn across high-speed traffic onto busy roads
  - Interpretation of gestures by traffic cops, crossing guards etc
  - Effect of changes in road surface appearance on map-based localization
  - Capability to "predict what will happen next" in demanding