Smart Driving Cars: 
Looking Back to Princeton’s participation in the DARPA Challenges

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Evolution of SmartDrivingCars Concept

2004

DARPA GRAND CHALLENGE

2005

DARPA GRAND CHALLENGE

2007

URBAN CHALLENGE

PAVE PRINCETON AUTONOMOUS VEHICLE ENGINEERING
The DARPA Grand Challenges

Defense Advanced Research Projects Agency

- **DARPA Grand Challenge**
  Created in response to a Congressional and DoD mandate: a field test intended to accelerate research and development in autonomous ground vehicles that will help save American lives on the battlefield. The Grand Challenge brings together individuals and organizations from industry, the R&D community, government, the armed services, academia, students, backyard inventors, and automotive enthusiasts in the pursuit of a technological challenge.

- **The First Grand Challenge: Across the Mojave, March 2004**
  Across the Mojave from Barstow, California to Primm, Nevada: $1 million prize. From the qualifying round at the California Speedway, 15 finalists emerged to attempt the Grand Challenge. The prize went unclaimed as no vehicles were able to complete more than 7.4 miles.

- **The 2005 Grand Challenge**
  Multi-step qualification process: Site Visits, NQE – Semifinals, GC final event 132 miles through the Nevada desert. Course supplied as list of GPS waypoints. October 8, 2005 in the desert near Primm, NV. Prize $2 million.

- **The 2007 Urban Challenge**
  Nov. 2007; 60 miles in an urban environment. Lane keeping, passing, stop-signs, K-turns “driving down Nassau Street”. Range of Prizes
Prospect Eleven & 2005 Competition
the making of a monster
2005 Grand Challenge
Objective

- Enrich the academic experience of the students

Constraints

- Very little budget

Guiding Principles

- Simplicity
Homemade

“Unlike the fancy “drive by wire” system employed by Stanford and VW, Princeton’s students built a homemade set of gears to drive their pickup. I could see from the electronics textbook they were using that they were learning as they went.”

http://www.pcmag.com/slideshow_viewer/0,1205,l=&s=1489&a=161569&po=2,00.asp
Fall 2004
It wasn’t so easy...
Pimp My Ride

(a video presentation)
Achievements in the 2005 DARPA Grand Challenge
Participation in the 2007 URBAN CHALLENGE
Today..

• Continuing to work on Prospect 12
• Vision remains our focus for depth mapping, object recognition and tracking
• Objective is to pass NJ Driver’s Test.
SmartDrivingCars: Post-DARPA Challenges
(2010-today)

• Google Self-Driving Car
  – Adopted Sebastian Thrun from Stanford DARPA Team
  – “Standard Lexus” with:
    • “strapped on” sensors
      – LIDAR’s “depth point cloud”, radars & cameras
    • “strapped on” computer
    • communications to access 3D digital map
Synthesizing Individual Travel Demand in New Jersey

Trips everyone in NJ wants/needs to make on a typical day

Philip Acciarito ’12
Luis Quintero ’12
Spencer Stroebel ’12
Natalie Webb ’12
Heber Delgado-Medrano *12
Talal Mufti *12
Bharath Alamanda ’13

Christopher Brownell ’13
Blake Clemens ’13
Charles Fox ’13
Sarah Germain ’13
Akshay Kumar ’13
Michael Markiewicz ’13
Tim Wenzlau ’13

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January, 2012
Uncongested Mobility for All
New Jersey's Area-wide aTaxi System

ORF 467
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Iris Chang ’13
Christina Clark ’13
Jing Kang Gao ’13
Damjan Korac ’13
Brett Leibowitz ’13
Philip Oasis ’13
Zhid Xu ’13
Jaison Zachariah ’13
Natasha Harpalani ’14
Eileen Lee ’14
Alice Lin ’14

Aria Miles ’14
Hannah Rajeshwar ’14
Lucia Wang ’14
Charquia Wright ’14
Kristin Bergeson ’15
Franklyn Darnis ’15
Matthew Shackleford ’15
Sonia Skoulakis ’15
Roger Sperry ’15
Andrew Swoboda ’15

Operations Research and Financial Engineering
Princeton University
Fall 2012 - 2013
Thank You