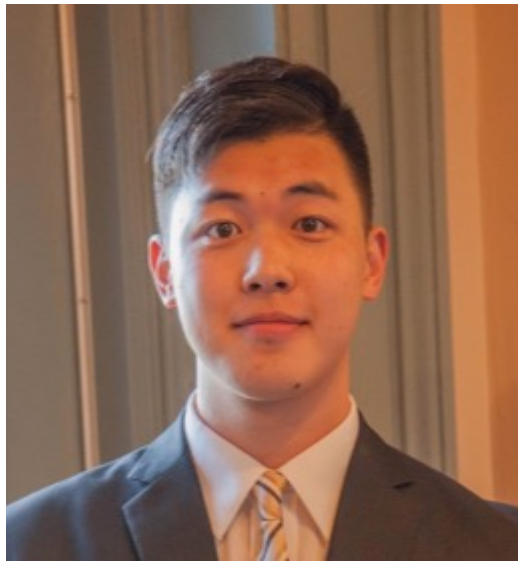
Illinois Code a Car Summer Camp
Day 1: ECEB 5072

August 1-5 2022

Welcome from Code a Car Camp People!



Coordinator
Yan Miao
Graduate student in ECE
yanmiao2@illinois.edu

Coordinator
Raj Joshi
Undergraduate ECE
rajj3@illinois.edu

Professor
Sayan Mitra
ECE, CS
mitras@illinois.edu

Icebreaker:
Two Truths One Lie

Acknowledgements

The Grainger College of Engineering
Center for Autonomy

National Security Agency's
Science of Security Program

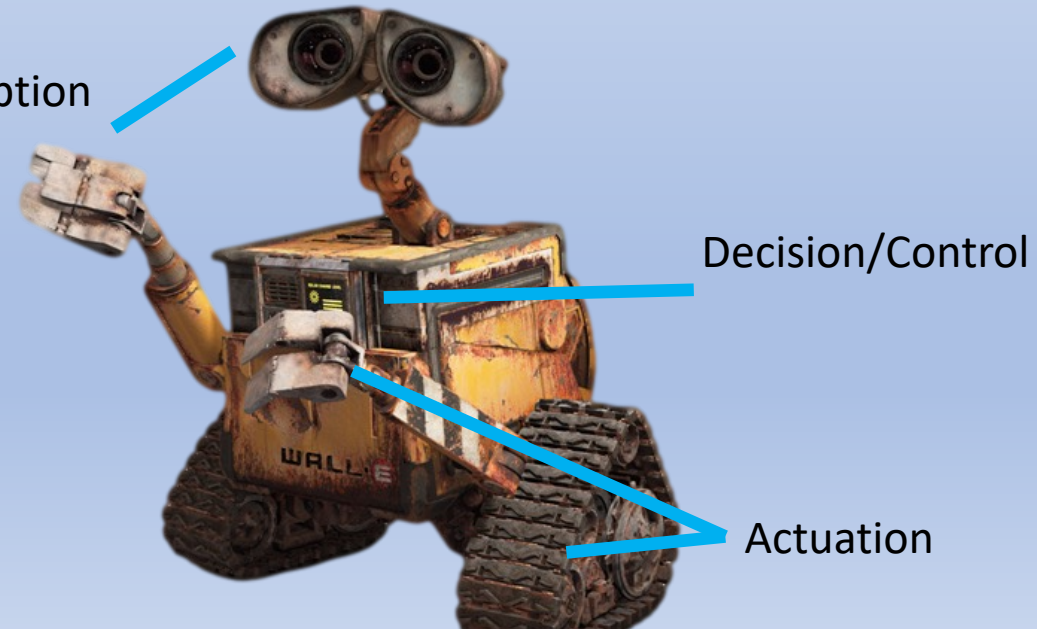
The Grainger College of Engineering
Worldwide Youth in Science and Engineering Program

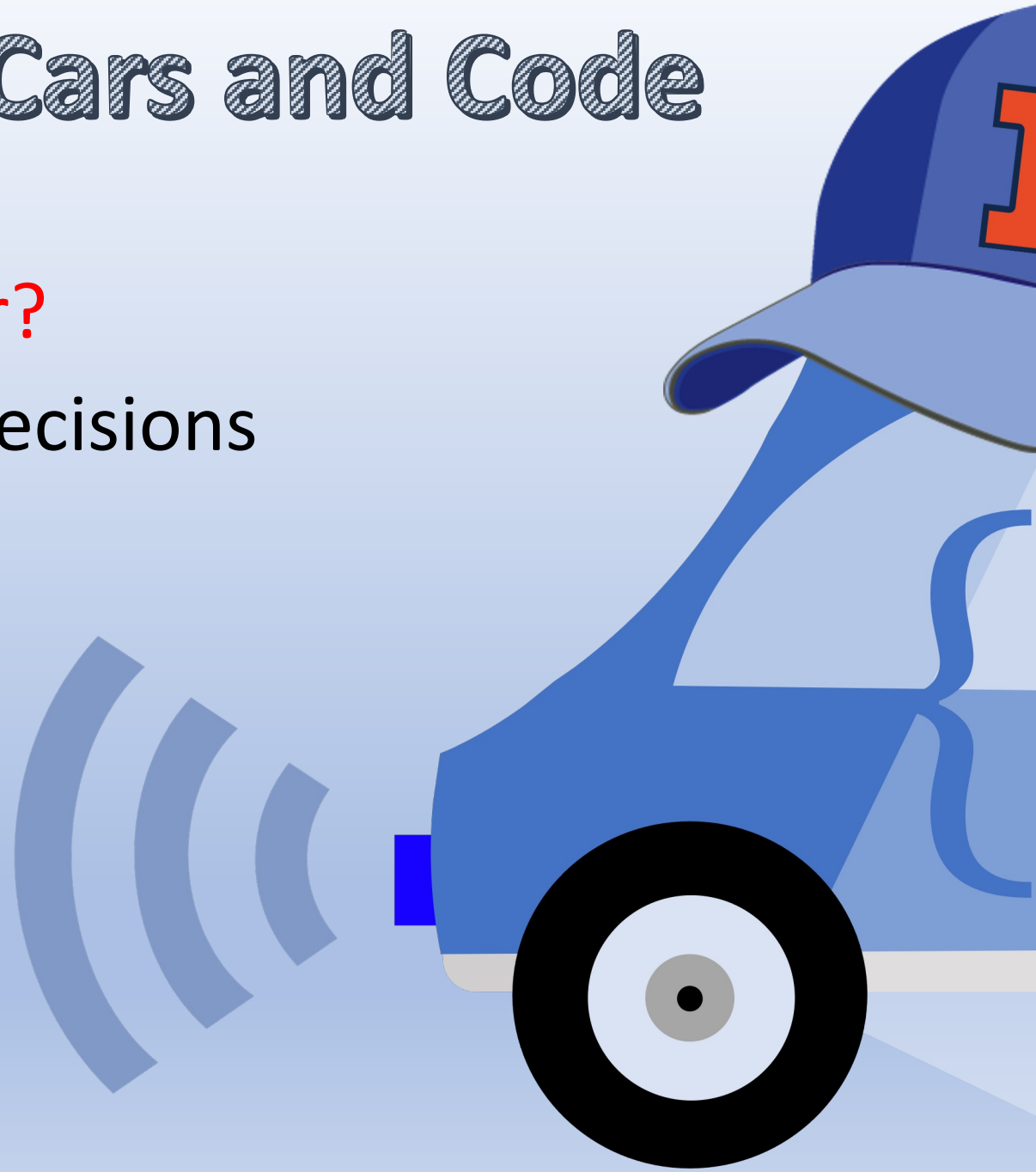
Introduction to Cars and Code

What goes into a driverless car?

Ability to make independent decisions

See → Think → React





Robotaxis will be awesome

They will make us more productive

- Average American drives 300 hrs per year

Cities will be greener

- 40% of city surface is parking

Travel and deliveries will be safer

- 32K+ fatalities and 3M+ injuries every year

Robotaxis harder than the moonlander

Science

Google
all with
New Cali
By Iain Thoms

The Atlantic

TECHNOLOGY

Google's Self-Driving Cars: 300,000 Miles Logged, Not a Single Accident Under Computer Control

REBECCA J. ROSEN AUG 9, 2012

The automated cars are slowly building a driving record that's better than that of your average American.

MORE STORIES

The Quiet Ways Automation Is Remaking Service Work
SIDNEY FUSSELL

The Instagram-Husband Revolution
TAYLOR LORENZ

WIRED

12.19.17

After Peak Hype, Self-Drivi
Enter the Trough of Disillus

ars TECHNICA

BIZ & IT TECH SCIENCE POLICY CARS GAMING & CUL

HYPE CYCLE —

The hype around driverless cars came crashing down in 2018

arch

Bloomberg Businessweek

December 31, 2018, 6:08 AM CST

Self-Driving Cars Keep Tapping the Brakes

● CES is more driverless-centric than ever this year, but the payoff remains well down the road.

By Keith Naughton

Some of you will be working on this problem for decades!

What can we learn from history of flight?

TheFilmGate@aol.com

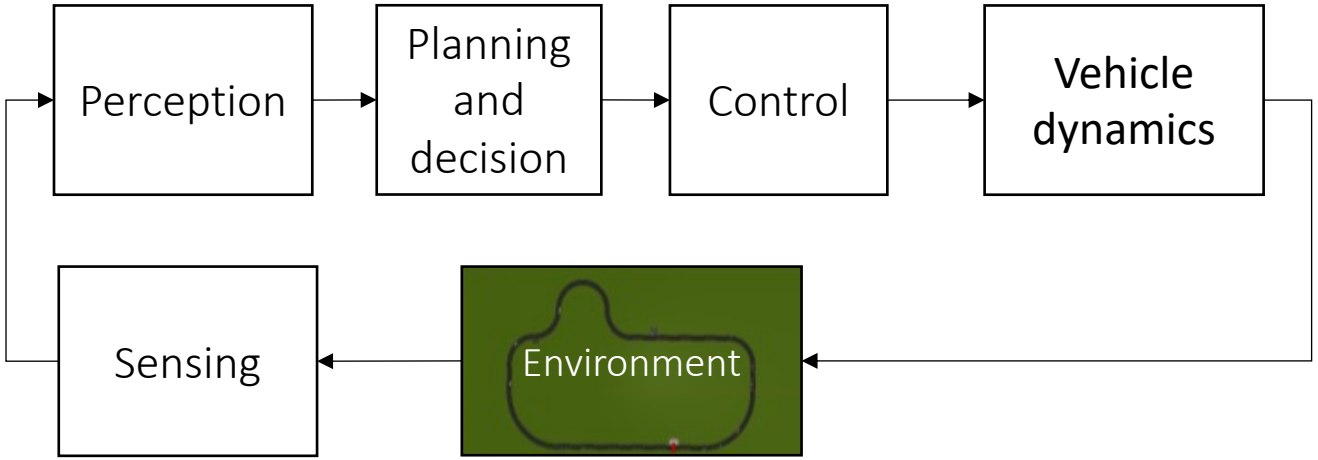
02:47:16:22

1902: after thousands of tests Oliver and Wilbur Wright had acquired the knowledge and the skill to fly. *They could soar, float, dive, circle and land, all with assurance*. Now they had only to build a motor. - David McCullough

Code for correct decision making in uncertain environments

Anatomy of a robotaxi

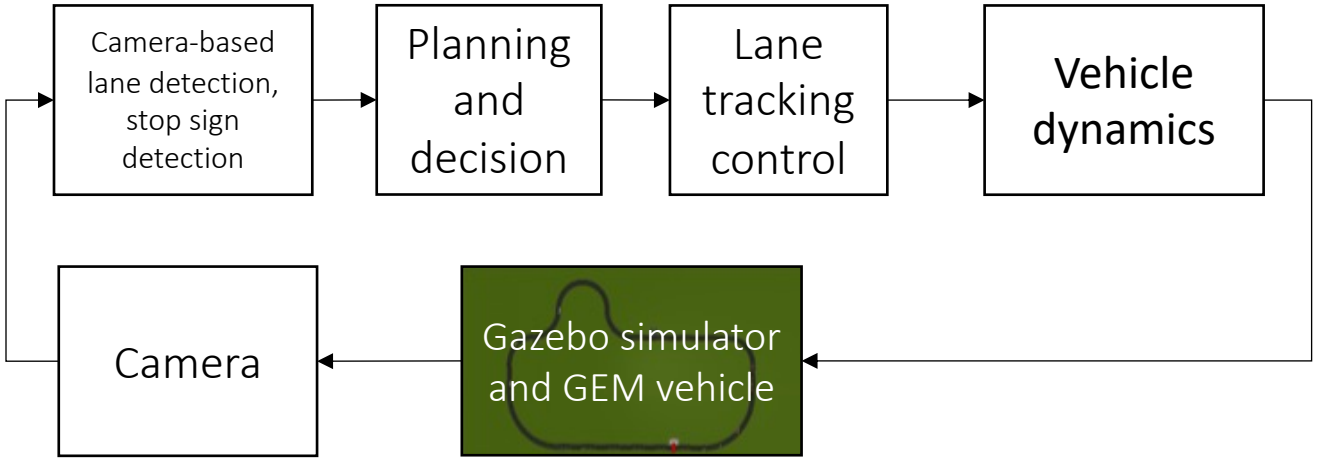
Sensing	Perception	Decisions and planning	Control
Physics-based models of cameras, LIDAR, radar, GPS, and so on.	Programs for object tracking, scene understanding, and so on.	Programs and multi-agent models of pedestrians, cars, and so on.	Dynamical models of vehicle engine, powertrain, steering, tires, and so on.

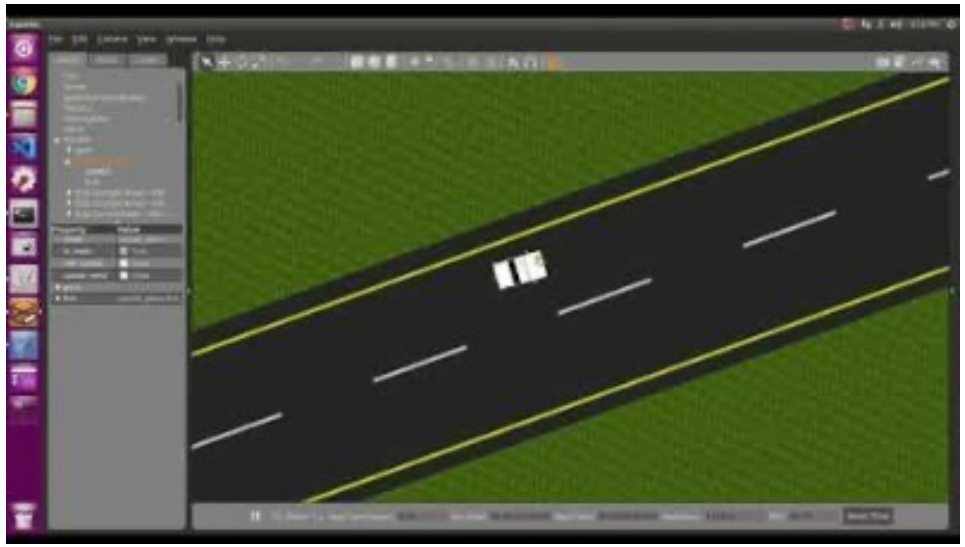


env: Lidar / vision

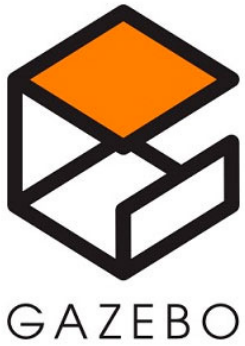
What you will build

Goal. Vision-based lane tracking controller ("Autosteer") plus traffic planner, tested in simulation and deployed on a real car.





Technologies used in AV



Simulators

Communication Protocol

Linux OS

Python Language

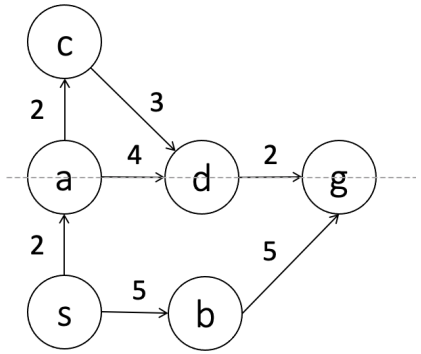
Mathematics in AV

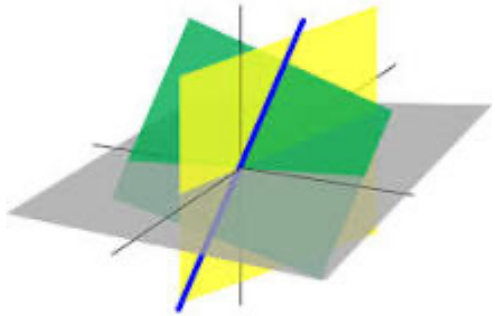
Linear algebra (matrices, vectors)

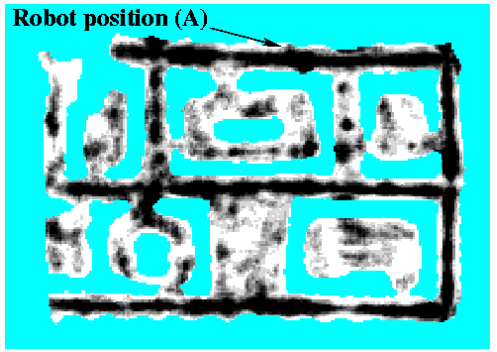
Logic, discrete match, and algorithms

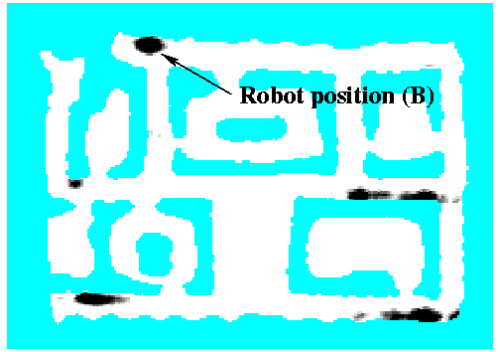
Probability and statistics

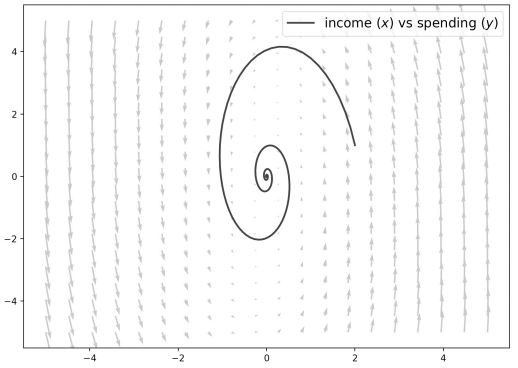
Calculus, differential equations

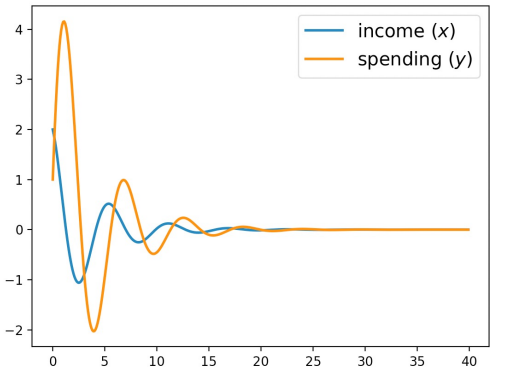




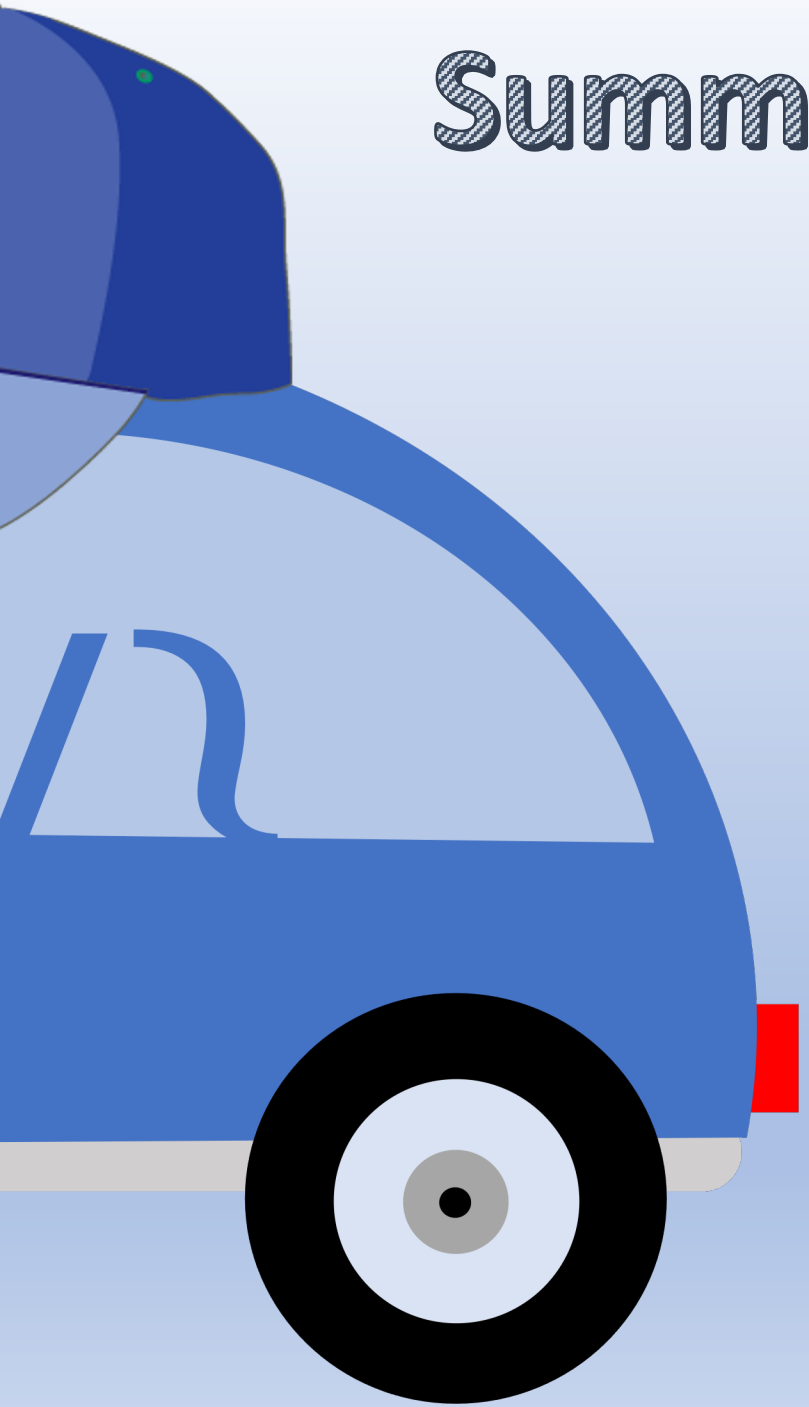








Summary: Plan for the camp



1. Learn tech and concepts used to develop AVs
2. Develop modules for vision-based lane tracking control
3. Deploy code on GEM vehicle
4. Learn about autonomy, engineering, UofI, have fun!