CS-598 MAAV

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Class and constraints

- Primary goal:
  - project groups build and execute applications controlling a real AGV
  - all learn some technologies for sensing, planning, mapping and control
    - with emphasis on visual and lidar sensing
- Key issues:
  - keeping safe from COVID
  - not getting hurt by the vehicle
  - you NEED to be registered
- Format:
  - for the first weeks, lecture only
    - lectures mostly in person, but I'll use a lot of legacy video
  - after a bit, lecture and lab
    - more use of video, more time on car

Topics

- Mainly sensing, some control, some planning
  - for autonomous vehicles
- Vehicles
  - we have access to a Polaris GEM
    - from AutonomousStuff
    - and a simulator for this vehicle
- Structure (!?!)
  - mainly lecture
  - some paper presentations
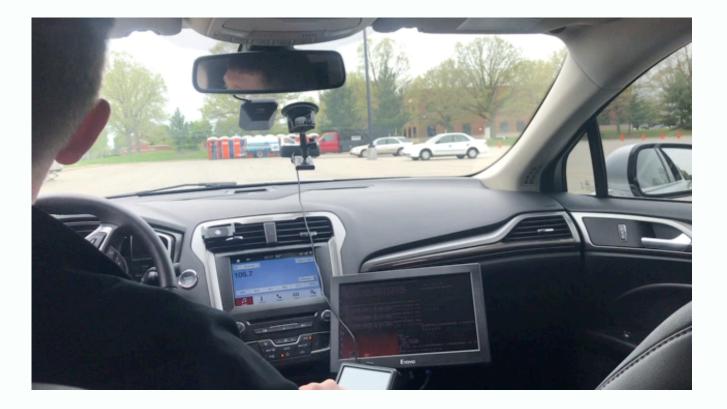 - some project practicals

CS 598 MAAV Outline

- Suitable for:
  - CS/ECE Grad students; CS/ECE Undergrads (independent minded)
    - with some experience
      - (AML; Vision; Computational Photog.;etc)
    - independent minded
  - Others
    - won't get much support with minor programming problems
    - limited structure
    - great fun
- Generally, we'll go through a lot of material quite fast
  - and quite superficially

CS598 MAAV - is this for me?

- First homework should help with that!

CS 598 MAAV History

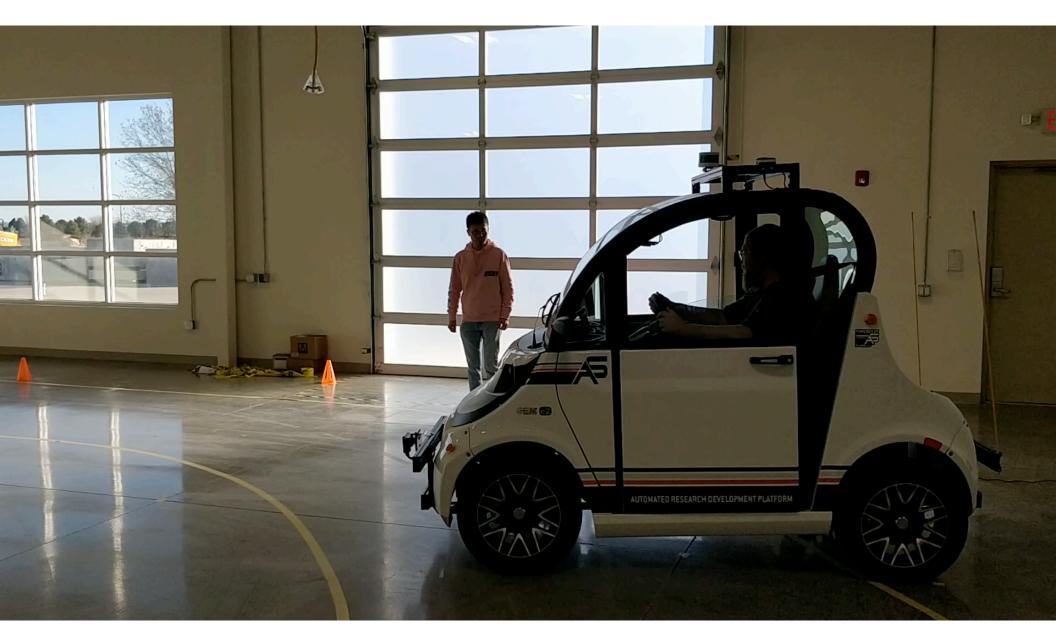# Features

- (We think) only autonomous vehicle courses in country with a physical vehicle
  - very big deal for CS students
    - often have no experience of dealing with physical objects
  - cover
    - detection, sensing, mapping, slam
    - some control
    - some path planning
    - big class projects on real vehicle

- No deaths or injuries to date
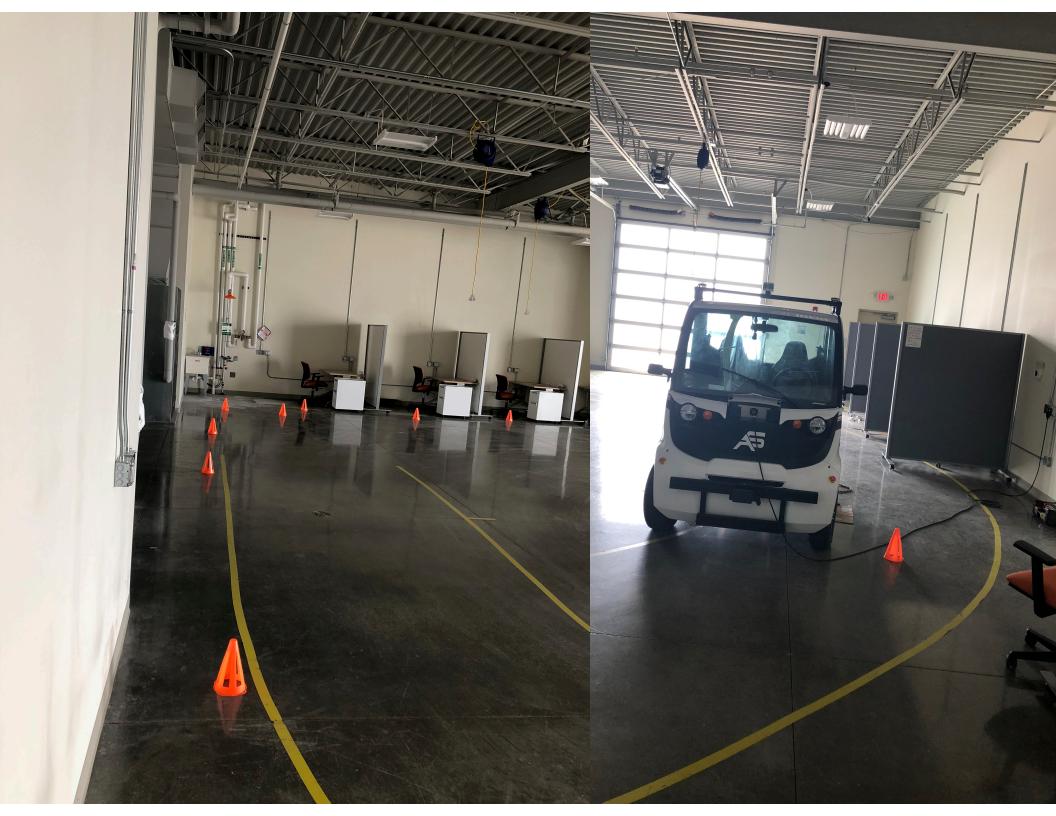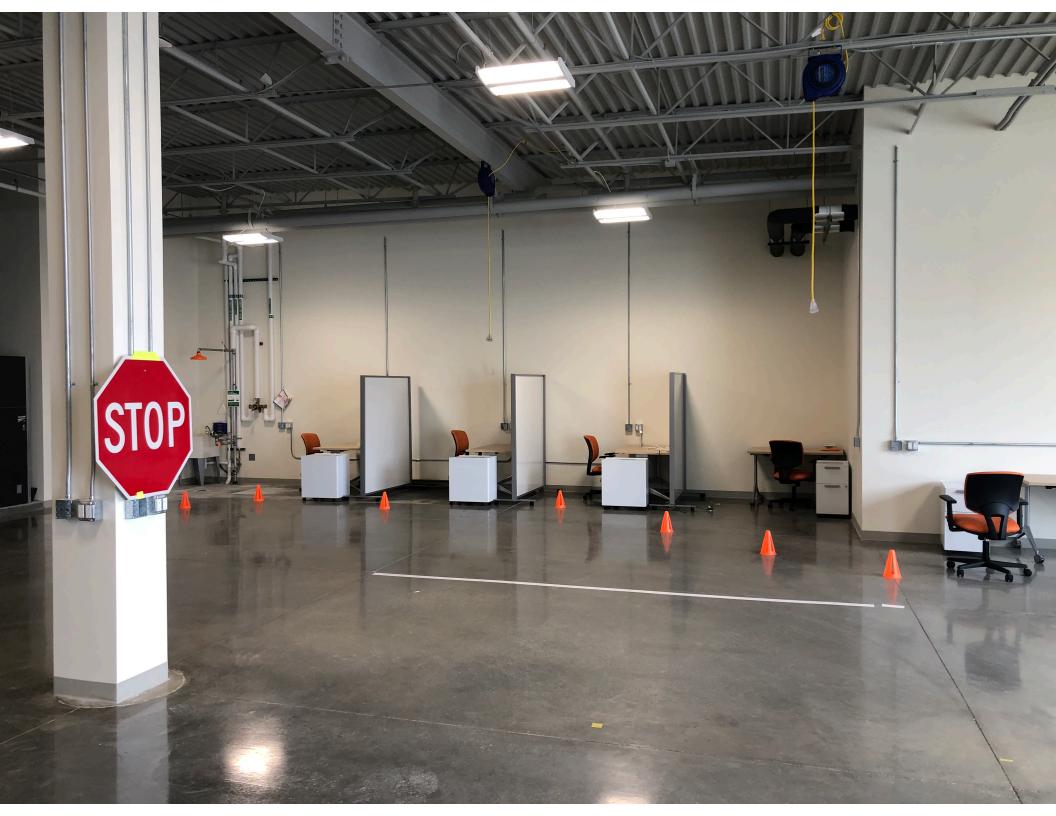 - we're going to be fussy about safety!

Examples

Moving autonomously - MAAV course

- Autonomous car replans its path around a moving obstacle
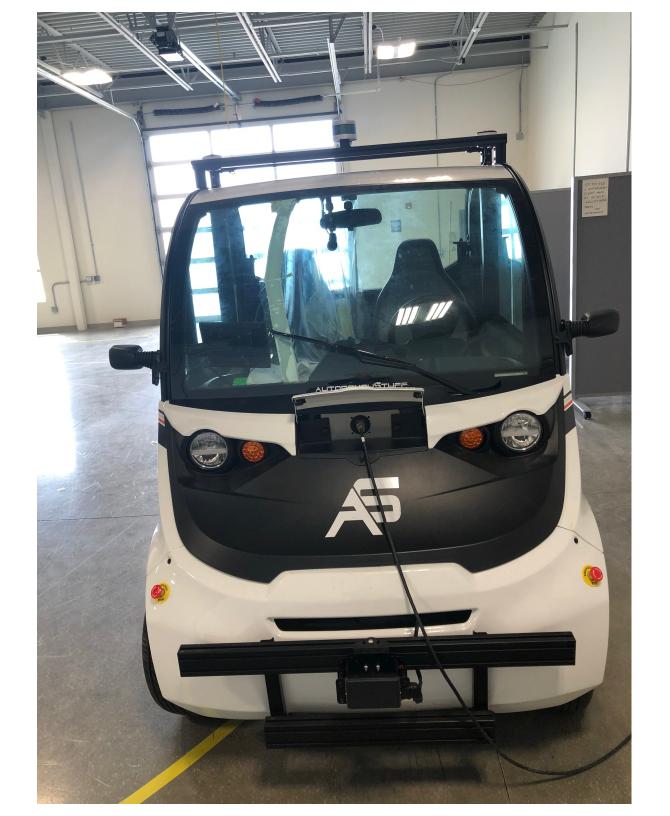 - https://www.youtube.com/watch?v=LBv49TwdY2o&feature=youtu.be

Signage visible in image: "CLOSED DO NOT ENTER"

"DO YOUR PART · DO NOT SIT HERE · 6 FEET APART"

VEHICLE
CABIN
DIVIDER
PROTOTYPE
DO NOT USE
WITH MORE
THAN ONE
PERSON YET
JOHN

GEM e2

POWERED BY
AB
BY-WIRE.com

AUTOMATED RESEARCH DEVELOPMENT PLATFORM

VEHICLE
CABIN
DIVIDER
PROTOTYPE
DO NOT USE
WITH MORE
THAN ONE
PERSON YET.
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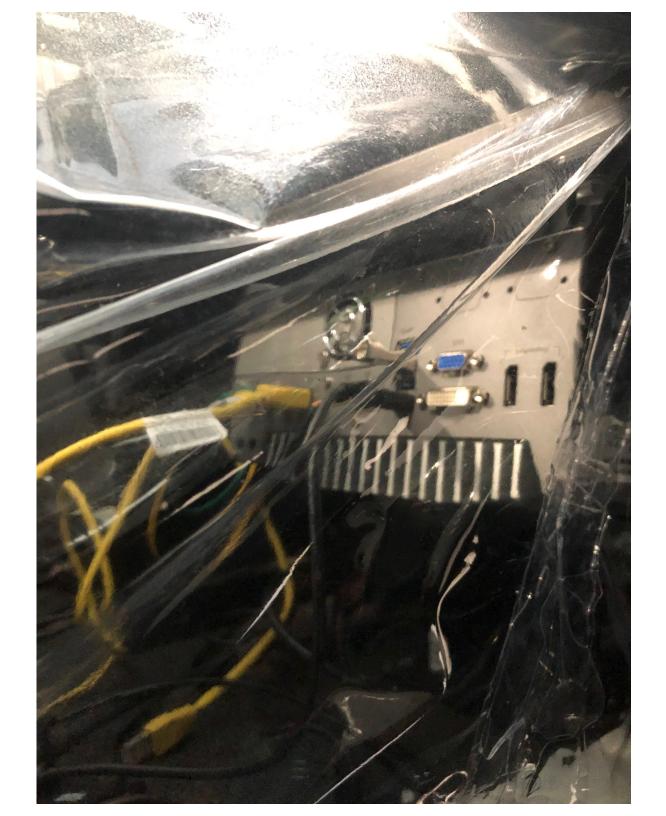EMERGENCY
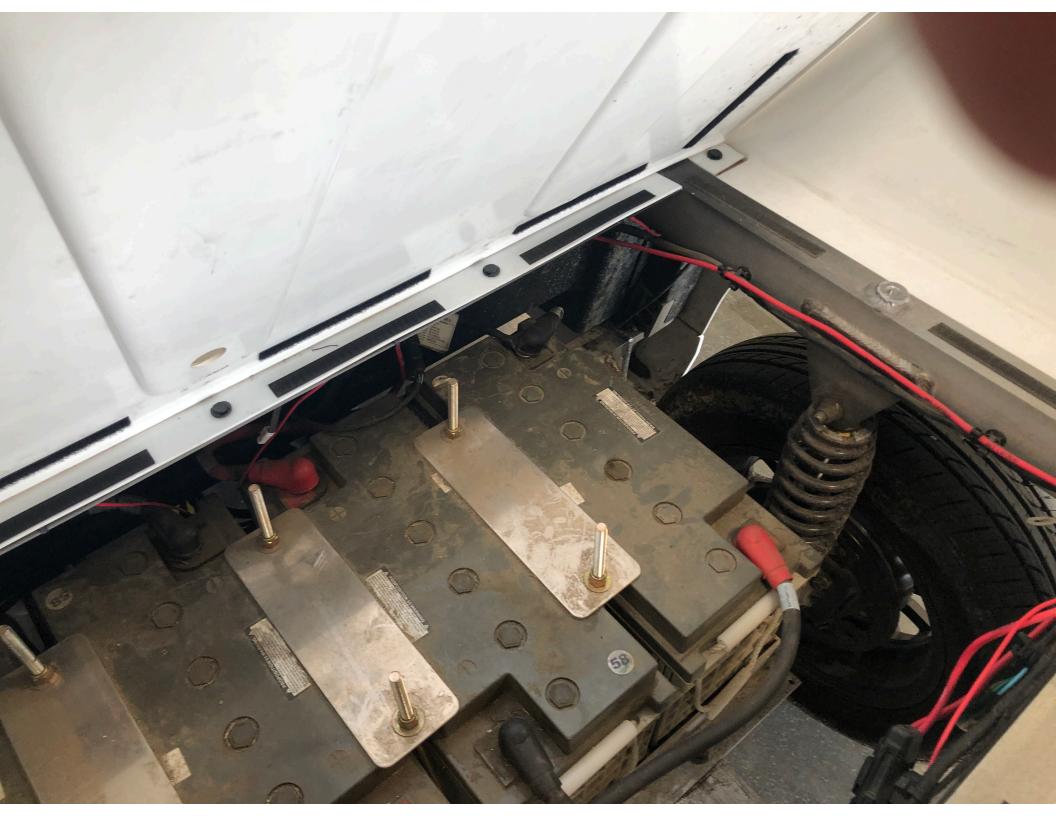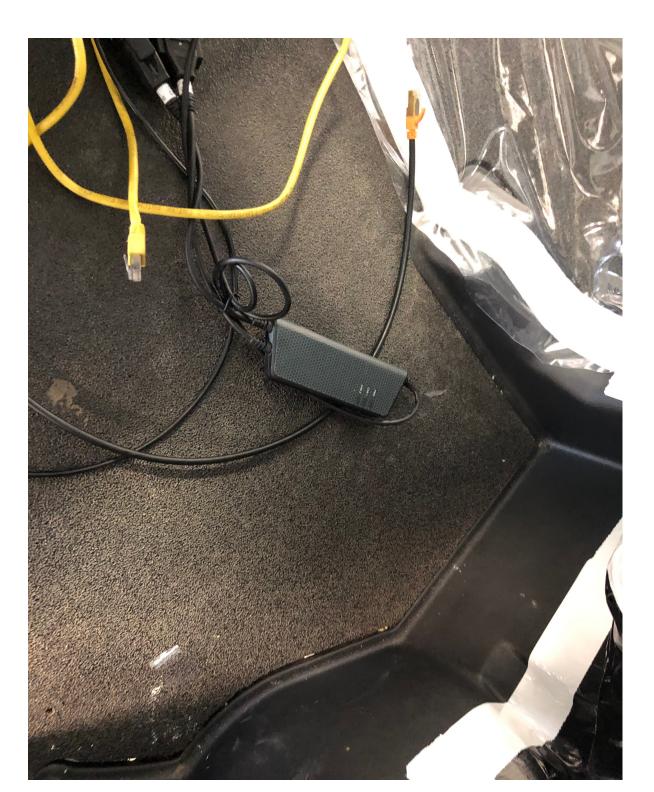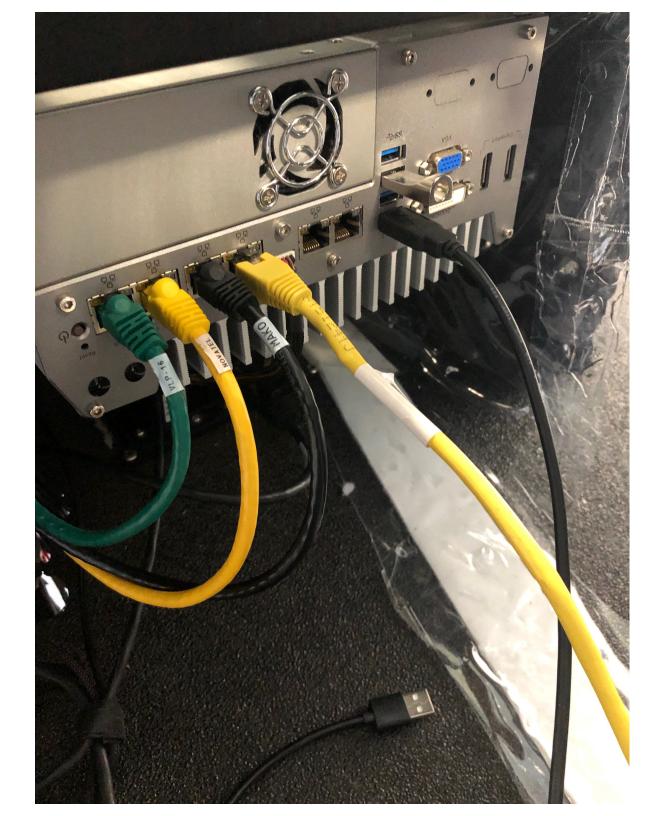
POWERED BY
BY-WIRE FEATURING PACMod

Vehicle dangers

- Heavy, but not particularly fast
  - it will hurt you if it hits you
  - ALWAYS a safety driver when moving
- It will hurt a lot if it goes over your foot!
  - this is the most likely accident
  - always use chocks on vehicle
    - either safety driver or chocks should be in
- Do not sit on the back
  - when it breaks, your rear end will land on high output battery connectors
- High center of gravity
  - turning while moving fast is scary
- Infection!

Safety roles

- ## Safety lookout
  - everyone - we'll train collectively
  - responsible for
    - watching when vehicle moves;
    - ensuring chocks are in;
    - general safety
- ## Safety driver
  - responsible for ensuring vehicle is safe when moving
    - when chocks are out, safety driver is in
  - some, ideally one per group
  - I'll train individually

The Chocks

Vehicle dangers

Vehicle dangers

Vehicle safety practices

- If the chocks are out, a safety driver MUST be in

- Roles
  - Safety driver
    - (inside vehicle) stop the vehicle from moving into wall, person, etc.
    - MAY NOT DO ANYTHING ELSE
  - Lookout
    - (outside vehicle) watch to ensure others are not in danger, esp feet!
  - Experimenter
    - (inside vehicle) complain at software, etc.

OLD Infection safety practices

- We will break up into project groups
  - I'd like about 5-7
- Only one person per group has access to the vehicle
  - the person could change from day to day, but only one per group at any time
- No more than four people in Highbay at any time
  - one of them is DAF
  - others are in stalls, one per stall
    - there is wifi access
- You can't get in to Highbay without DAF letting you in
  - and you have to show me evidence of recent clean test
- The vehicle has a divider
  - so two people can be in vehicle, but ideally doesn't happen often

This week…

- Friday is a mixture:
  - Technical topic: neural networks, mostly remedial
    - there are movies, etc. etc.
  - Safety lookout training (I'll need email confirmation from each)
- You should
  - get vaccinated OR get and keep tested if you want vehicle access
  - follow lectures and written material
  - be trained as a safety lookout
- If you want to be trained as a safety driver
  - Requirements: over 21; US drivers license; safety lookout
  - Contact me at with 384 2864 in email header
  - I'll set up training