CS491/691: Introduction to Aerial Robotics

Topic: Autopilot Study

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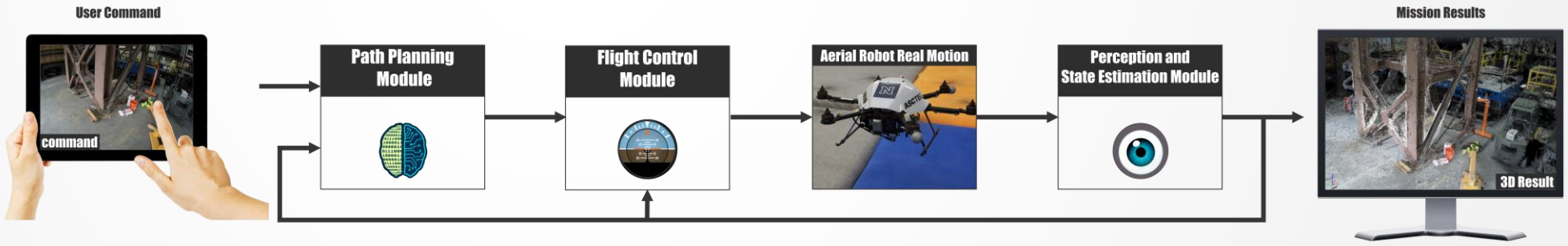
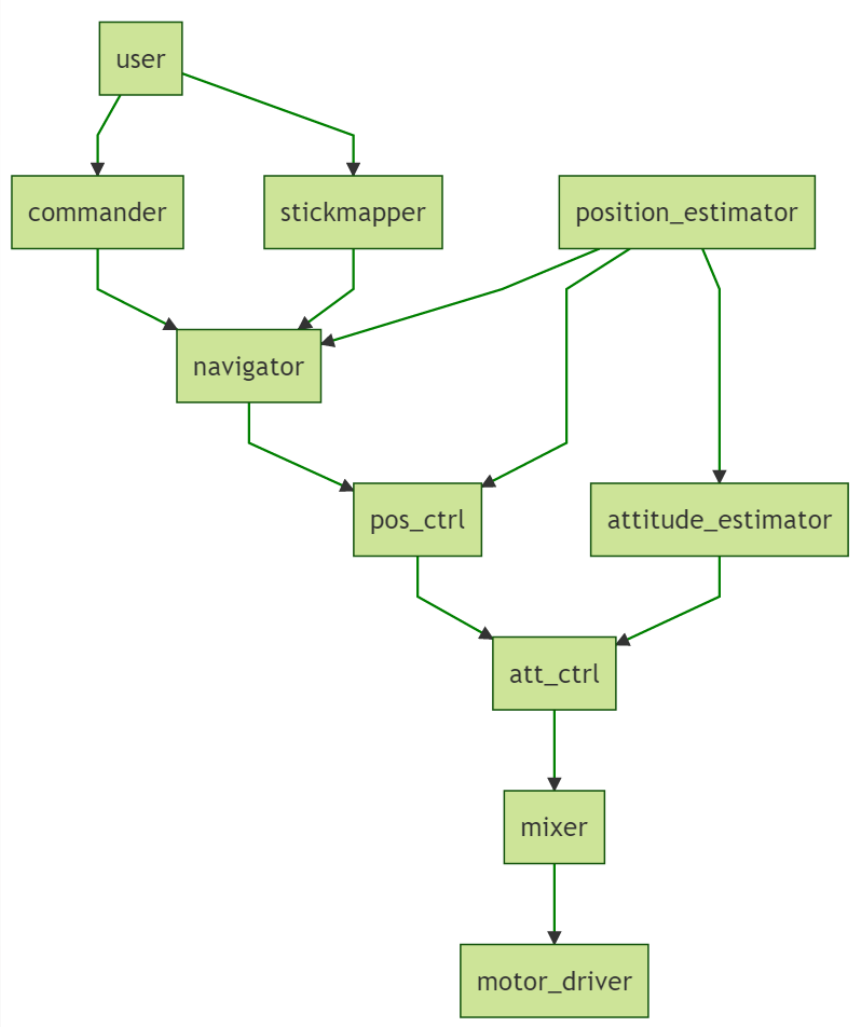
Areas of Focus

- Coordinate system transformations (CST)
- MAV Dynamics (MAVD)
- Navigation Sensors (NS)
- State Estimation (SE)



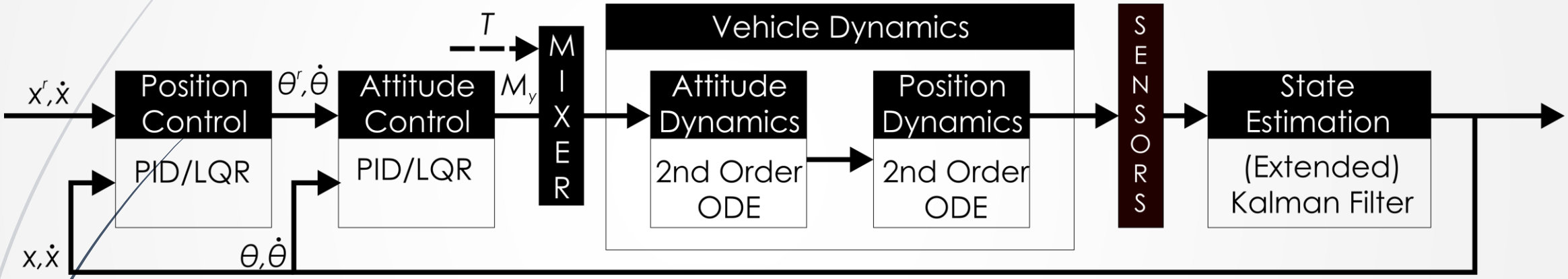
Autopilot Functionality Stack

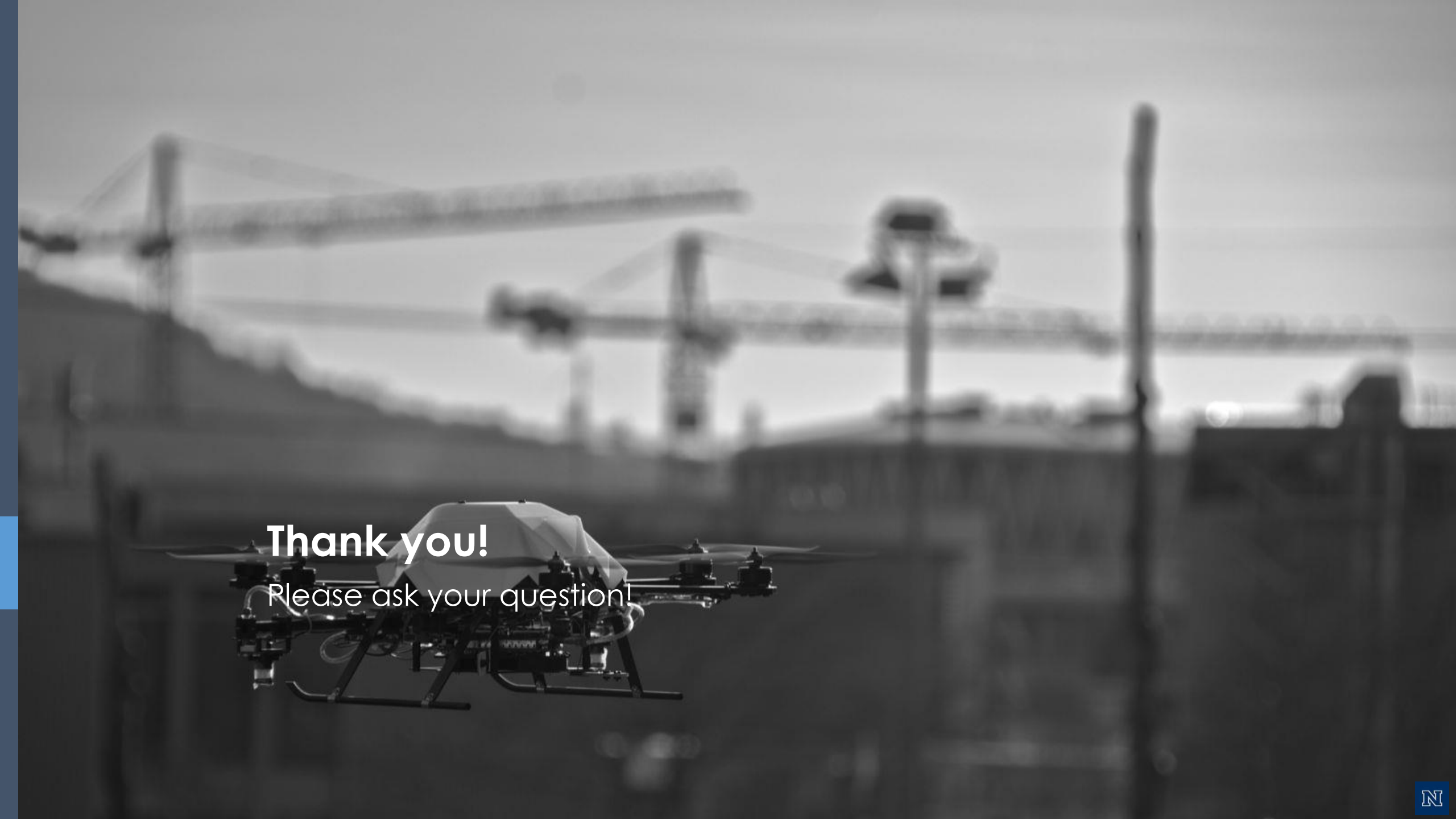
- From PX4.io
  - **User:** Provide reference commands (e.g. trajectory waypoints)
  - **Position Estimator:** Estimate the position and linear velocities of the aerial robot.
    - Extended Kalman Filter
  - **Attitude Estimator:** Estimate the orientation and angular rates of the aerial robot.
    - Extended Kalman Filter (the same)
  - **Position Control:** Feedback control loop ensuring that the position states track their references. Its outputs feed the throttle command and the references to the attitude control.
    - Proportional – Integral – Derivative control (or LQR, MPC, etc)
  - **Attitude Control:** Feedback control loop ensuring that the attitude states track their references. Its outputs directly feed the mixer of the control commands.
    - Proportional – Inegral – Derivative control (or LQR etc)
  - **Mixer:** Gets all the throttle, roll, pitch and yaw moment inputs and generates motor commands.
  - **Motor Driver:** Drives the motors to track the desired motor commands.



2D Case Study

- The rest in the blackboard…





Thank you!

Please ask your question!