

VIP: Low Cost Aerial Autonomy

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Instructors:

Dr. Anirban Mazumdar

Membership

Participation in this course is restricted to US Citizens Only

Scope:

To examine how small, low cost unmanned aerial vehicles can be used to deliver items, operate in constrained environments, and maximize efficiency. To achieve this, we will develop electromechanical designs, avionics, and algorithms for small, low cost, aerial vehicles.

Issues Involved or Addressed

Designing small unmanned aerial vehicles. Achieving actuation, sensing, and computation with a small size, weight, and power footprint. Performing path-planning in advance and potentially in real time. Navigation using way-points or onboard sensors. Physically interacting with the environment for landing in constrained spaces or delivering items. Perceiving potential obstacles or risks of collisions. Reacting to un-modeled effects or disturbances.

Developing VR and software environments for testing algorithms.

Team Meeting:

W 2:00-2:50, GTMI (Callaway Building) 401

Grading Policy:

The premise of VIP is teams working on projects. Much like a real-world engineering team, individual members work on different aspects of the project. Team members range from sophomores through graduate students, from first-time participants to students who have been involved for four or more semesters. Some students take the course for one credit, and others take it for two credits. Your grade is based on three areas, along with three requirements. Although each student may work on different areas and contribute differently, you must show achievements in all three areas below.

1. Documentation and records (33%)

a. VIP Notebook (Powerpoint Slide Deck);

b. VIP Wiki/blog documentation;

c. Code (via GT GitHub) if team is developing software.

2. Personal accomplishments and contributions to your team's goals (33%)

a. Quizzes, learning modules, essays, reports required by your adviser(s);

b. Engagement in project;

c. Pursuit of knowledge necessary for project;

d. Contributions to the technical progress of the team;

e. For more experienced members of the team, contributions to the management of the project may be expected.

3. Teamwork and interaction (33%)

- a. Peer Evaluations;
- b. On-time attendance in meetings;
- c. Actively contributes to overall team goals;
- d. Coordinates activities with other team members;
- e. Assists other team members;
- f. Team presentation(s).

4. As part of the assessment of the above, each student is required to:

- a. Maintain a VIP notebook. Scans of well-maintained VIP notebooks are available at:
<http://www.vip.gatech.edu/vip-notebooks>

(Links to an external site.)

- b. Complete the mid-term peer evaluation. This is a web-based form, and links are available at <http://vip.gatech.edu>. Failure to complete the peer evaluation will result in a full letter grade deduction. Late submissions are not accepted.

c. Complete the final peer evaluation, which will be available for one week during Dead Week. Failure to complete the peer evaluation will result in a full letter grade deduction. Late submissions are not accepted.

Grade breakdown:

90%-100%: A

80%-90%: B

70%-80% : C

60%-70%: D

0-60%: F

Subteam 1) AI and Autonomy Development

Graduate Student: Alexander Gross and Lee Gibson

This subteam will focus on developing new algorithms for enabling aerial vehicles to sense, plan, and act. This work will mainly be in the Unity gaming engine and Python. Members of this

subteam can work on sensor modeling, perception, motion planning, feedback controls, and flight mechanics. This will be an opportunity to apply AI/ML techniques to an interesting physical system.

Subteam 2) Virtual Reality

Graduate Student: Ryan Casey

This subteam will focus on designing virtual reality Unity games for testing in experiments.

Subteam 3) Autonomous Systems for Disaster Response

Graduate Student: Joshua Woodford, Trevor Matteson

This subteam will focus on developing models and algorithms for robots operating in challenging environments such as fires.

Notes on Documentation

Notebook Maintenance

- The notebook does not have removable pages.
- Your name, your project's name, your contact info and your team members' contact info are recorded on the cover or inside of the cover.
- Each page is numbered, dated and signed.

To-Do List Maintenance

- Maintain check-boxes for items to be done.

- Check-off and dated items when done.

Meeting Notes

- Detailed meeting notes that include check-boxes for items for which you are responsible and deadlines for your sub team and the overall team.

Usability

- Will your VIP notebook be of use to people who join the team later and need to refer to it? This includes legibility, intelligible technical and meeting notes, and overall organization.

Overall

- An overall rating of your notebook. (Detailed design notes, design decisions, copies of or pointers to code that you wrote, records of important websites, etc.)

Wiki content

- Wiki content refers to documentation produced online, either through the VIP wiki site, T-square, or other team-approved site.

GT GitHub

- GitHub code refers to code produced and checked into the GT GitHub. The frequency, quantity, and quality of contributions are evaluated.

Academic Honesty

The main principle in VIP academic honesty is that you will not present someone else's work as your own. Tests and specific assignments (homework, lab assignments, etc.) must be your own work. For other work you are encouraged to consult whatever sources are helpful in learning and understanding the issues associated with the material, but you should always provide appropriate references and citations where such material is included in your VIP notebook, programming code, presentations, etc.

Additionally, to provide a good working environment for all students, you're expected to adhere to rules given here, posted, or disseminated in class. Academic Honesty is taken seriously and failure to follow these principles will result in disciplinary actions as given in the Student/Faculty Handbook