Project and Diploma Thesis Topics in DAAS - 2018

Intermediate Project (P)
Engineering Diploma Thesis (E)
Master Diploma Thesis (M)

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Below there are areas of topics to be clarified according to student interest. All may be I, E, M

The area of navigation

1. Sensor fusion in navigation systems on-board of aircraft / spacecraft
2. Novel filtering algorithms for navigation sensor fusion

The area of aeronautical systems

1. Architecture of on – board systems for mobile platforms (spacecraft / land / water / air)

The area of dynamics modeling and simulation

1. Modelling of dynamics and control of mobile platforms

The area of unmanned aerial vehicles

1. Optimization of UAS formation flying.

The area of space technology

1. Various topics related to nanosatellite design, dynamics and control.
2. Spacecraft formation flying.

D.Sc., Ph.D., Professor Elżbieta Jarzębowska

The area of dynamics and control

1. Implementation of tracking and stabilization control algorithms at the kinematic level to a mobile robot Pioneer 3-DX. (work with ARIA software – the original robot software). (P,E)
2. Dynamics modeling and motion control of a wheeled mobile robot including wheel slipping. (Master)
3. Dynamics modeling and motion control of a multi-link manipulator model with flexible links. The manipulator model selection is up to a student (Master)
4. Dynamics modeling and motion control of a formation of objects (objects are due to a student, e.g. wheeled mobile robots (WMR), unmanned aerial vehicles (UAVs), underwater autonomous vehicles (UAV's), satellites formation, manipulators in duets, e.t.c). (Eng, Master)
5. Implementation of "model-based" tracking control algorithms to a mobile robot Pioneer 3-DX. (Master)
6. Dynamics modeling and motion control of underactuated system models, e.g. acrobot, pendubot, snake-like manipulator, space vehicles and manipulators, biomechanical system models and others (object selection is due to a student). (Eng, Master)
7. Dynamics modeling and maneuver control for underwater vehicles (gliders, ROVs, hybrid propelled vehicles. (Eng, Master)
8. Optimization of control maneuvers for underwater gliders (a glider propulsion way selection is due to a student). (Master)
9. Control design for servicing satellites and space robots (Eng, Master)
10. Tracking controller designs for servicing space missions (Eng, Master).
11. Control design for space missions for servicing satellites and space robots (Eng, Master)
12. Control design for servicing and docking maneuvers of satellites and space robots (Eng, Master)

The area of dynamics modeling and simulation

1. Modeling complex dynamical systems – constrained dynamics models including environmental constraints, friction, joint and motor dynamics. A system is due to a student. (P)
2. Dynamics modeling and simulation tests for motion of complex systems: (P)
   - multi-link ground, space and underwater manipulators,
   - wheleed mobile vehicles, mobile manipulators, car-like vehicles,
   - autonomous systems like UAV's.
3. Dynamics modeling and simulation tests for motion of systems with flexible parts and links: (P)
   - multi-link ground, space and underwater manipulators with flexible arms,
   - wheleed mobile vehicles and platforms with flexible parts and chassis.
4. Dynamics modeling and simulation tests for motion of a mobile robot including tire models and motor dynamics. (E)
5. Dynamics modeling and simulation tests for motion of a mobile robot including wheel slip models. (E)
6. Dynamics modeling and simulation tests for formation of ground autonomous vehicles motion and regrouping in surveillance and patrol missions (vehicles due to a student). (E)
7. Dynamics modeling and simulation tests for formation of UAV's. (E)
8. Dynamics, motion analysis of a car-like vehicle including wheel slip models. (M)
9. Dynamics, motion analysis of a multi-link manipulator model with flexible arms – simulation studies of flexibility and compliance models. (M)
10. Dynamics, motion analysis of a space robot model with flexible arms – simulation studies of flexibility and compliance models. (M)

11. Dynamics, motion analysis of a space robot model with flexible appendages – simulation studies of flexibility and compliance models. (M)
12. Dynamics analysis of space missions and docking for spacecraft

Ph.D., Associate Professor Marcin Żugaj

The area of navigation

3. Sensor data fusion algorithms (E,M)
4. Statistical and spectral analysis of sensor signals (P,E,M)

The area of dynamics and control

1. Digital automatic flight control system for manned and unmanned aircraft. (M)
2. Influence of attitude measurement system performance on autopilot efficiency. (E,M)

The area of dynamics modeling and simulation

1. UAV dynamic modeling and simulation for automatic flight control system design. (E,M)
2. Sailplane dynamic modeling and simulation. (E,M)
3. Estimation of geometric, mass and aerodynamic characteristics of A320 aircraft. (P,E,M)
4. Quadrotor dynamic stability analysis. (M)

Ph.D., Associate Professor Maciej Zasuwa

The area of navigation

1. Imulation of navigation algorithms (ex. GPS) (P,E)

The area of aeronautical systems

2. Simulation of the control systems operation (E,M)
3. Simulation of the selected aeronautical system operation (eg GPWS, TCAS, VOR, etc.) (P)

The area of dynamics modeling and simulation

1. Concept and software development for dynamics module for flight simulator (E,M)
2. Concept and software development for selected aeronautical system for flight simulator (E,M)
3. Concept and software development for autopilot in the selected channel for flight simulator (E,M)
4. Implemention of open source graphics engine to DAAS simulator (E,M)
5. Concept and software development for objects interactions (collisions) for flight simulator (E,M)
6. Topics regarding pilot training in simualator with VR/AR equipment (E,M)

The area of unmanned aerial vehicles

2. Topics regarding unmanned aerial vehicles/systems proposed by the students (P,E,M)
3. Sense and avoid system development for UAV/UGV (E,M)

M.Sc. Eng., Assistant Lecturer Mateusz Sochacki

The area of navigation

1. Spacecraft navigation systems (P)
2. Spacecraft navigation in near Earth, interplanetary and interstellar space (P)
3. Algorithms for attitude determinations using images of stars – star tracker (P)

The area of aeronautical systems

1. Modeling and simulation of spacecraft systems (P)

The area of dynamics and control

1. Spacecrafts' orbital maneuvers (P)

The area of dynamics modeling and simulation

1. Orbital mechanics (P)
2. Spacecraft' orbital maneuvers (P)
3. Modeling and simulation of spaceflight (P)
4. Modeling and simulation of spacecraft launch to low Earth orbit (P)
5. Modeling and simulation of spacecraft landing maneuver (P)
6. Modeling of loads action on spacecraft during orbital flight (P)

Other

1. Space mission planning, analysis and design (P)
2. Analysis of spacecrafts' distribution in near Earth space (P)
3. Spacecraft orbit determination based on observations from the surface of Earth (P)