Huiyang Deng

Automation

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Education

2014–2017 **Master**, *Robotics*, Beijing University of Aeronautics and Astronautics, *Beijing*.
GPA:90.1(15/128) (Class Rank: 1st)

2010–2014 **Bachelor**, *Automation*, Beijing Institute of Technology, *Beijing*.
GPA:86.3(34/189)

Master thesis

Title *The Research on Decoupling Control of the Permanent Magnet Spherical Motor in the Presence of Uncertainty*

Supervisors Jingmeng Liu

Description My work focuses on key problems yet to be resolved in high precision position control of spherical motors. First, I optimized the mechanical structure of the spherical motor by redesigning multi-pole magnetic array to improve output torque and adjusting the measurement and support system to reduce the body size. Accordingly, I proposed adaptive sliding mode control based on backstepping algorithm, and dynamic decoupling control based on extended state observer to eliminate the coupling effect between spinning motion and tilting motion, as well as ensure the robustness and anti-interference of the system.

Excellent Contribution 1 I proposed adaptive sliding mode control based on a backstepping algorithm. This control strategy can achieve systematic controller synthesis for the uncertain system, introducing variable structure control to make the system fully adaptive to disturbances and an adaptive controller for online estimation of dynamic model parameters. In light of possible modeling errors, friction or electromagnetic disturbances and load variation, the control algorithm based on dynamic model ensured the robustness of the system.

Excellent Contribution 2 I introduced distributed adaptive disturbance rejection control (ADRC) into dynamic decoupling control of the spherical motor. This structure regarded cross-couplings and various uncertainties in the spherical motor as lumped disturbance and estimated the disturbance via extended state observer (ESO). By online state estimation, this innovative method eliminated serious cross-coupling effect among various degrees of freedom in the spherical motor and thus improved the motion control accuracy of the spherical motor.

Publications

Jingmeng Liu, Huiyang.Deng, etc, *A Robust Dynamic Decoupling Control for Permanent Magnet Spherical Actuators Based on Extended State Observer, IET Control Theory and Applications, IF: 1.957(Published).*

Jingmeng Liu, Huiyang.Deng, etc, *Adaptive Backstepping Sliding Mode Control for 3-DOF Permanent Magnet Spherical Actuator, Aerospace Science and Technology, IF: 1.751(Published).*

Jingmeng Liu, Huiyang.Deng, etc, *A Dynamic Decoupling Control Structure for Permanent Magnet Spherical Actuators Based on Active Disturbance Rejection Control, Proc. of IEEE Int. Conf. on Industrial Electronics and Applications (ICIEA), June, 2016, Hefei, China (Published).*

Experience During Master Study

2016.03–2016.04 **Project Leader**, *Design and Implement of Hardware Lifespan Management System*.

Develop a system that can display and update status of the beacon and battery on the web.

- Create and encode individual beacon when it enters into the depositary, and generate the batch number and operating record according to certain rules.
- Divide the progress of output into several stages, which preliminarily requires related personnel to apply and check, and design a pre-output command for the beacon and battery to reduce burdens and avoid errors
- Design and implement the procedure for recycling beacons when the corresponding requests are approved

2015.11–2015.12 **Project Leader**, *POI-based Data Processing*.

Develop a system that can automatically capture data packets of POI and construct distribution maps using local search service from Baidu JavaScript API.

- Crawl and parse the data to obtain the expected field using *Requests* module of Python
- Display the data of POI on the web in form of table and map
  - Fulfill cross-domain request using JSONP
  - Employ corresponding methods from JavaScript class, such as *Geolocation*, *Map*, *Marker* and *Point*, to construct a data map
  - Construct a platform for presenting obtained data, which supports paging, searching and filtering

2015.10–2015.12 **Project Leader**, *Design and Implement of Project Management System*.

Design the structure of database and interface of web according to the requirement specification from party A.

- Design a RABC-based access control
- Design a module for establishing various types of projects, including creating, building, checking and planning
  - Generate a new project with data from self-designed table of business, shop and community
  - Associate the project with its subtasks by ID, and show details of tasks using Gantt chart
  - Implement the business process by changing status of the project and inform involved staff via e-mail
- Design a module for keeping statistics on working hours and generating charts in three dimensions, such as project, person and time
  - Design a week form for staff to save and submit working hours
  - Storage information of working hours in the table, where the record is determined uniquely by project, person and time
- Design a module for system settings to maintain information about users, shops, cost, etc
  - Load data asynchronously by AMD and implement multi-level linkage about convince, city and area
  - Automatically complete the search box and obtain the coordinate of target address with related JavaScript class
  - Dynamically generate the propertygrid of per hour cost by utilizing built-in labels and inquiring the table where the record is determined uniquely by user ID, group ID and series ID

Achievement

2017.03 **Excellent Graduate Student**, *Beihang University*.

2017.03 **Excellent Graduate Thesis**, *Automation of Science and Electrical Engineering at Beihang University*.

2014.06 **BIT Top Ten**, *Beijing Undergraduate Students Research and Entrepreneurship Action Plan*.

2012.12 **1st Prize(Beijing)**, *Mathematical Contest in Modeling for Chinese College Students*.

2012.12 **2nd Prize**, *"WellinTech Cup" Configuration Software Application Design Contest of National Information Technology Contest*.

2012.04 **2nd Prize**, *Mathematical Contest in Modeling for American College Students*.

2011.12 **2nd Prize**, *"Chinese Society for Electrical Engineering Cup" Electrical Engineering Mathematical Contest in Modeling*.

Achievement

2016 **ROBIO Reviewer**, *IEEE International Conference on Robotics and Biomimetics (ROBIO)*.

2016 **ICCA Reviewer**, *IEEE International Conference on Control and Automation (ICCA)*.

2015,2016 **ICIEA Reviewer**, *IEEE Conference on Industrial Electronics and Applications (ICIEA)*.

2015-2016 **Teaching Assistant (TA)**, *ARM9 Embedded System Experiment*.

2015-2016 **Teaching Assistant (TA)**, *Circuit Analysis*.

Skills

Languages Matlab, C/C++, Phython, JavaScript, PHP

Theory State Estimation, Control Theory, Machine Learning