Yu Sun

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EDUCATION BACKGROUND

09/2020-06/2023   Chongqing University

- **Degree**: Master degree in Mechanical Engineering
- **GPA**: **88.6**/100
- **Major Courses**: Computational Multibody System Dynamics (**A**), Finite Element Theory (**93**), High-strength Steel for Automotive Application (**95**), Intelligent and connected Vehicles (**85**), Fuel cell fundamental and fuel cell vehicle (**91**), Numerical Analysis (**86**)
- **Supervisor**: Yongjun Pan
- **Thesis**: Identification of vehicle key parameters based on multibody dynamics model and machine learning method.

09/2016-06/2020   Chongqing University of Technology

- **Degree**: Bachelor of Science in Vehicle Engineering
- **GPA**: **87.2**/100
- **Major Courses**: Advanced Mathematics [1 2] (**96 96**), Linear Algebra (**91**), College Physics [1 2] (**90 91**), Theoretical Mechanics (**83**), Mechanics of Materials (**91**), Computer Concept (**94**), Electrical & Electronic Technology [1 2] (**92 97**), Mechanical Principle (**96**), Automobile Theory (**86**)
- **Thesis**: Car steering system design and design program development.

PUBLICATIONS

Yongjun Pan (Supervisor), **Yu Sun**, et al. Maneuver-based deep learning for the identification of vehicle suspension parameters. Vehicle System Dynamics. 10.1080/00423114.2022.2084424. (IF=3.6)

Yongjun Pan (Supervisor), **Yu Sun**, et al. Machine learning approaches to estimate suspension parameters for performance degradation assessment using accurate dynamic simulations. Reliability Engineering & System Safety. 10.1016/j.ress.2022.108950. (IF=8.1, Highly cited)

Yu Sun, Yongjun Pan, et al. Combined Recurrent Neural Networks and Particle Swarm Optimization for Sideslip Angle Estimation Based on a Vehicle Multibody Dynamics Model. Multibody System Dynamics (Under review)

Haifeng Du, **Yu Sun,** et al. A Lane-changing Trajectory Re-planning Method Considering Conflicting Traffic Scenarios. Engineering Applications of Artificial Intelligence (Under review)

Liuqing He, **Yu Sun**, Yongjun Pan. Vehicle Continuous Deceleration Belt Vibration Suppression Based on Multibody Dynamics Model and Optimal Control. 18th National Conference on Nonlinear Vibration and 15th National Conference on Nonlinear Dynamics and Motion Stability, Guangzhou, Guangdong, May 07-09, 2021.

Yongjun Pan, **Yu Sun.** An Identification Method of Vehicle Suspension Performance Degradation Parameters.[P].Chinese Patent. 202210235674.4.

RESEARCH EXPERIENCES

02/2021-06/2021   Study/Semi-recursive multibody dynamics and multibody program

Supervisor: professor Yongjun Pan

Position: Student   **Chongqing, China**

- Aimed at learning a semi-recursive multi-body dynamics theory and program we use.
- Applied methods of multibody dynamics theory, fourth-order Runge-Kutta, et al.

07/2021-08/2021   Research/ Dynamic modeling and pose angle estimation of manipulator

Supervisor: professor Yongjun Pan

Position: Student   **Chongqing, China**

- Aimed at establishing the mapping relationship between end coordinates and joint rotation angle.
- Applied methods of multibody dynamics and neural network modeling.
- Used multibody dynamic method to establish the dynamics model of a manipulator and plan the end trajectory to obtain the rotation angle of each joint. Used neural network model to predict the joint rotation angle.

09/2021-12/2021   Research/ Parameter identification of vehicle suspension performance degradation

Supervisor: professor Yongjun Pan

Position: Student   **Chongqing, China**

- Aimed at identifying the suspension parameters when the vehicle suspension performance degrades and the vehicle suspension is not disassembled.
- Applied methods of multibody dynamics model, deep neural network, ME, MAE and other evaluation indicators.
- Compared nine models of suspension parameter prediction including Different training data sets and different

network hidden layers; And compared the improvement of suspension parameter prediction accuracy by adding an input.

- Used the vehicle parameters, the vehicle multi-body dynamics model is established and the vehicle state parameters are obtained to form the training data set. Part of the data sets are extracted to establish a deep neural network (DNN) suspension parameter identification model.
- Concluded that the method can effectively identify the suspension parameters. And when the training data set is large (2000 sets), the accuracy is the highest.

Supervisor: professor Yongjun Pan, professor Paolo Gardonic

Position: Student **Chongqing, China**

- Aimed at exploring the more accurate suspension parameter identification models with a smaller training data set (1000 sets).
- Applied methods of multibody dynamics model and multiple machine learning models including PSO-BP, RBFNN, GRNN, DBN, WNN, ElmanNN, ELM and FNN.
- Compared eight models of suspension parameter prediction. And compared other models under different speed conditions.
- Concluded that the PSO-BP, RBF, and ElmanNN models obtain the most accurate predictions under a smaller training data set. And the model built at higher speed shows better prediction accuracy.

03/2022-06/2022 Research/ Estimation of vehicle centroid sideslip angle

Supervisor: professor Yongjun Pan

Position: Student **Chongqing, China**

- Aimed at establishing a model combining vehicle dynamics and artificial intelligence to accurately estimate the sideslip angle of vehicles under various driving behaviors.
- Applied methods of multibody dynamics model, the long short temporal neural network (LSTM), the bidirectional long short term memory neural network and PSO.
- (BiLSTM)
- Compared four models of estimation of vehicle sideslip angle. In addition, considered adding Gaussian noise to the input data to simulate the data obtained by real vehicles.
- Concluded that the four models can effectively estimate the vehicle sideslip angle, and the PSO-LSTM model has the best accuracy. When Gaussian noise is added to the input data, the four models can also process the data well and achieve good estimation results.

INTERNSHIP EXPERIENCES

07/2022-08/2022 CAERI - China Automotive Engineering Research Institute Co. Ltd.

Position: Intern, Parts and Materials Evaluation Research Center **Chongqing, China**

- Established the suspension model in AdamsCar according to the suspension model data of a certain vehicle model
- Conducted K&C characteristic analysis on suspension model
- Added powertrain and steering system to the suspension model to form a simplified vehicle model, and analyzed its handling stability and driving comfort

EXTRACURRICULAR ACTIVITIES

09/2017-06/2018 School of Vehicle Engineering (CQUT)

Position: Member, Engineering Department of Science and Technology Association **Chongqing, China**

- Organized CQUT Smart car competition for college students;
- Organized CQUT Automobile Engine Disassembly and Assembly Competition;

04/2021-10/2021 Chongqing and Guangzhou, China

- Assisted in organizing the 22nd Chinese Conference on System Simulation Technology and its Application
- Assisted in organizing the 29th National Conference on the Application of High Technology in Vibration and Noise
- Participated in the 18th National Conference on Nonlinear Vibration and the 15th National Conference on Nonlinear Dynamics and Motion Stability

AWARDS AND HONOURS

- The second prize of the Chongqing section of the CUMCM, **10/2018**
- Third prize of The Chinese Mathematics Competitions, **11/2018**
- **Three** first-prize scholarships of Chongqing University of Technology, **2017-2019**
- **Two** national encouragement scholarships, **2018-2019**
- Outstanding graduates of Chongqing University of Technology, **05/2020**
- **Two** first-prize postgraduate scholarships of Chongqing University, **2021-2022**
- Outstanding graduate students and graduates of Chongqing University, **12/2022**

ADDITIONAL INFORMATION

- Languages: English (IELTS 7), Chinese (Native)
- Softwares: MATLAB, Simulink, Jupyter Notebook, Origin, MiKTeX, Inkscape, Hypermesh, Adams, CATIA
- Hobbies: Basketball, Table tennis, Badminton, Mountain climbing, Training left hand