Song-Wen Huang

I am working at Velodyne LiDAR, Inc. for developing simultaneous localization and mapping (SLAM) for autonomous driving, 3D pointcloud processing, sensor fusion (LiDAR, GPS, IMU, and wheel odometry), unsupervised sensor calibration, and sensor model simulation.

CONTACT
INFORMATION

4200 The Woods Dr. Apt 905
San Jose, CA 95136

716-429-6530
songwenh@buffalo.edu
www.linkedin.com/in/song-wen-huang
https://songwenhuang.github.io

TECHNICAL
SKILLS

Autonomous Driving, Computer Vision, SLAM, LiDAR, GPS, IMU, Sensor Fusion

C, C++, Linux, ROS, MATLAB, Simulink, Verilog, VHDL, SPICE

DSP, mmWave, MIMO, OFDMA, Optimization, Software-Defined Radio

Wireless Communication, Signal Processing, Channel Modeling, Chirp Spread Spectrum

EDUCATION

State University of New York at Buffalo   Aug. 2014 - Dec. 2017.
Ph.D. in Electrical Engineering
Dissertation: "Multicarrier Chirp-Division Multiplexing for RF and Underwater Acoustic Communications"
Advisor: Dr. Dimitris A. Pados.   GPA: 3.92/4.00

National Chiao Tung University   Sep. 2009 - Jul. 2011.
M.S. in Electronics Engineering

National Chiao Tung University   Sep. 2005 - Jun. 2009.
B.S. in Electronics Engineering

WORK
EXPERIENCES

Algorithms and Signal Processing Engineer at Velodyne LiDAR, Inc. Jan. 2018 - present.

- Developed accurate localization algorithms in C++ in Robotic Operating System (ROS) for building 3D maps for autonomous driving. Initial poses are generated by Extended Kalman Filter (EKF) sensor fusion of LiDAR, GPS, IMU, and wheel odometry.

- Developed LiDAR simultaneous localization and mapping (SLAM) simulators in MATLAB. Simulations are evaluated for errors in 6 degrees of freedom (DoF) in time and probabilities in statistics for performance evaluation.

- Implemented unsupervised sensor calibration, including extrinsic, intrinsic, and reflectivity calibration. Extrinsic calibration is conducted for sensor mounting parameters and estimating transformation between LiDAR and GPS/IMU.

- Built LiDAR sensor modeling for driving simulation software. Sensor models are capable of supporting different mockup platforms. Simulation is especially effective for testing driving algorithms prior to on-road experiments.

Research Assistant at State University of New York at Buffalo   Aug. 2014 - Dec. 2017.

- Developed DSP algorithm in simulations for communication systems of various digital modulations. Implemented circuit design with in-house built prototypes with FPGA and PCB boards, including customized mixers, oscillators, filters as well as dipole antennas. Receiver design consists commercial software-defined radio antenna compatible with the PC, so received signals can be observed, stored, or further processed.

- Designed mmWave beamforming antenna arrays for WiGig (802.11ad) at 60 GHz, capable of adjusting phases of incident signals to the desired reflective angles and eliminated potential

interferences. Moreover, amplitude of reflective signals is enhanced by the weighted coefficients of the antenna array.

- Utilized orthogonal chirp waveforms as frequency subcarriers in multicarrier communication systems, e.g., OFDM, that have both advantages of chirps and multicarrier transmission. Multicarrier chirping is also compatible with higher order modulations, e.g., 8-PSK, 16-QAM, for providing higher data rates in RF fading channels.

- Simulated and experimented a 2×2 MIMO system. With channel state information obtained by training symbols, precoding matrix is applied at the transmitter for BER and SNR performance enhancement in underwater acoustic multipath channels in Lake Erie experiments.

- Developed iterative joint channel estimation and data detection algorithm for blind symbol detection in spread spectrum underwater acoustic communication systems. The algorithm is guaranteed to converge after sufficient iterations.

- Designed ultra-wideband nano-transceivers on graphene, which can support waveform propagation on the surface. Communications conduct in Terahertz frequencies and can be applied in biomedical applications, such as intra-body sensor networks.

Teaching Assistant at State University of New York at Buffalo   Aug. 2014 - Dec. 2017.

- Reviewed lecturing concepts, such as circuit analysis, signals and systems, communication systems, VHDL digital design, for students in recitation classes.

- Responsible for office hours for clarifying students' doubts for lectures or homework.

- Developed problems for homework or exams for examining students' studies.

Senior Engineer at Macronix International Co., Ltd., Taiwan   Feb. 2013 - May 2014.

- Designed DRAM circuits and collaborated with other R&D teams. Since memory elements are integrated in large numbers; speed, latency, and power consumption are the key design factors. Based on customers' requirements, customized NVM-based memory circuit design.

- Maintained Design Rule Checking (DRC) files for IC manufacturing process in 65 nm. Debugged the obscure descriptions that may result in design errors for clearly defining DRC rules for layout engineers.

- Modified and customized layout patterns by pre-sizing command files for specific design modifications, e.g. $65\text{nm} \times 2\mu\text{m}$ of Metal 1, to reduce time consuming for 80% and to keep the product cycle on track.

- Automated generation of Question & Answer (QA) patterns for verifying DRC rules. During the process, some description errors in DRC rules were discovered and reported to the corresponding teams.

Mandatory Military Services at Taiwanese Army, Taiwan   Oct. 2011 - Oct. 2012.

- Laid guns for tank artillery, and maintained artillery systems of tanks.

Research Assistant at National Chiao Tung University, Taiwan   Sept. 2009 - Jul. 2011.

- Designed digital IC for various kinds of 64 bits multiplier-adders with CAD tools. Implemented with verilog, VHDL, RTL schematic, and layouts' verification. Conducted comparison of process time and power consumption between various designs of multiplier-adders.

- Conducted projects of simulation studies of QPSK and 16-QAM modulations with C/C++. Analyzed the iterative soft decoding of 3GPP Turbo Code by EXIT chart and Monte Carlo simulation for performance evaluation.

- Modeled cooperative cognitive radio networks with resource allocation, e.g., time allocation and power control. Formulated the problem objective as an optimization problem and solved by a coalitional game, in which all the PUs and SUs join a grand coalition to form a cooperative communication network.

- Utilized digital image processing techniques with C/C++ implementations to identify specific objects, e.g., human figures, for security or object identification. It can be also applied in color modification or softness for image enhancement.

HONORS AND AWARDS

2nd Place, for Erie Hack All-region Finals, ExtremeComms Lab proposed underwater sensor distributed networks for real-time early warning of harmful algal blooms, awarded by Cleveland Water Alliance in May 2017.

Teaching Assistantship, awarded by State University of New York at Buffalo for tuition waiver and stipends for financial assistance of pursuit of Ph.D. degree from Aug. 2014 to Dec. 2017.

Rank 11th, for undergraduate score in the class of Electronics Engineering at National Chiao Tung University in Jun. 2009.

PATENT

U.S. Patent, "A Chirping Modulation Method And Apparatus For High Data Rate Long Range Acoustic And RF Communication," under review.

PUBLICATIONS

Peered-reviewed Journals

2 **S.-W. Huang**, and D. A. Pados,"Adaptive Multiuser Chirp-Division Multiplexing for Underwater Acoustic Communications," *in preparation.*

1 **S.-W. Huang**, and D. A. Pados,"M-ary Orthogonal Chirp Modulation for Coherent and Non-coherent Underwater Acoustic Communications," *in preparation.*

Peered-reviewed Conferences

3 **S.-W. Huang**, and D. A. Pados,"Multicarrier Chirp-Division Multiplexing for Wireless Communications," *in preparation.*

2 **S.-W. Huang**, G. Sklivanitis, D. A. Pados, and S. N. Batalama,"Underwater Acoustic Communications Using Quasi-Orthogonal Chirps," in *Asilomar Conference on Signals, Systems, and Computers*, Oct. 2017.

1 **S.-W. Huang**, Y.-W. Chan, F.-T. Chien and Y.-C. Chung, "Efficient Resource Allocation in Cooperative Cognitive Radio Networks: A Coalitional Game Approach," in *IET International Communication Conference on Wireless Mobile and Computing (CCWMC)*, Nov. 2011.

Theses

2 **S.-W. Huang**, "Multicarrier Chirp-Division Multiplexing for RF and Underwater Acoustic Communications," *Doctoral Dissertation at State University of New York at Buffalo, Feb. 2018.*

1 **S.-W. Huang**, "Coalitional Game Theoretic Power Control and Time Allocation in Cooperative Cognitive Radio Networks," *Master Thesis at National chiao Tung University*, Sept. 2011.

SERVICES AND ACTIVITIES

- Technical Paper Reviewer for IEEE ICCE 2019, IEEE WCNC 2018, IEEE SSP 2018, BIOCAS 2018, NoF 2017
- Member of IEEE Communications, Signal Processing, Power & Energy Societies
- Senator of Taiwanese Graduate Student Association at State University of New York at Buffalo
- Lecturer of Heart Chan Meditation Class at State University of New York at Buffalo
- Director of General Affairs of Student Association of EE at National Chiao Tung University
- President of Chan Meditation Club at National Chiao Tung University
- Executive Secretary of Global Youth Leadership Summit
- Chief Coordinator of Chan Meditation Retreat
- Volunteer of World Leadership Education Foundation in Taiwan