Resume/Howard Brand

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Critical Infrastructure Systems Research: Situational awareness involves localizing sensor networks or sensor pose in a coordinate system. It allows for object recognition and tracking within any infrastructure. Many models used to describe infrastructure and infrastructure inter-dependence require manually obtained information. I investigate how automated situational awareness can enable autonomous mobile systems to obtain information needed to implement infrastructure models. This relieves the manual burden of information retrieval resulting in greater accuracy and improved safety in many scenarios, and also enables automated infrastructure monitoring solutions.

Objective: To apply my knowledge and skills in situational awareness estimation toward the advancement of autonomous systems for infrastructure resilience.

Education: Clemson University
PhD Candidate in Automotive Engineering

Virginia Polytechnic Institute and State University
Master's Degree in Mechanical Engineering
May 2016

Virginia Polytechnic Institute and State University
Bachelor's Degree in Mechanical Engineering
May 2012

Research and Work Experience

August 2017 – present – NRT (NSF Research Traineeship) Fellow
- Infrastructure Mapping – extending simultaneous localization and mapping (SLAM) to infrastructure monitoring problems toward automated infrastructure monitoring and situational awareness

January 2017 – present – Automation, Robotics and Mechatronics Laboratory (ARMLAB) CUICAR
- Simultaneous localization and mapping (SLAM) for autonomy in industrial environments
- Simultaneous localization and mapping (SLAM) and tracking in complex dynamic environments

September 2014 – December 2016 – Remote Sensing Research at the USDA-ARS (Co-Op)
- Conducting research in modeling cotton crop yield variability with an RGB camera and a UAV
- Studied the utilization of UAVs as sensor nodes for monitoring crop growth and development
- Developed algorithms for outdoor crop segmentation of color-infrared images for herbicide study
- Developed algorithms for automated spectral analysis of crops from hyperspectral images

June 2014 – August 2014 – Autonomous Systems Lab (Kumamoto University, Kumamoto Japan)
- Developed a mobile base station for processing and integrating data from multiple autonomous unmanned systems.
- Conducted research on dynamic obstacle avoidance

August 2012 – June 2014 – Computational Multiphysics Lab
- Developed a mobile base station for processing and integrating data from multiple autonomous unmanned systems.
- Developed vehicle mountable macrotexture road profiling system (for Center for Tire Research (CenTiRe))
- Involved in research evaluating to ability to perform simultaneous localization and mapping in illumination environment with an RGB-D sensor on an unmanned ground vehicle

July 2013 – August 2013 – TA Mechanical Engineering Lab
- Set up lab experiments and facilitated lab sessions
- Evaluated assignments

January 2013 – May 2013 – TA Rising Sophomore Abroad Program (Collaborative course between Virginia Tech and North Carolina A&T in an online hybrid format that engaged students in global perspectives on science and engineering)
- Assisted with the class sessions
- Hosted guest lecturers
- Evaluated assignments

May 2010 - August 2010 – Research Group in *Unmanned Systems Lab at Virginia Tech*
- Involved in research using stereovision to develop path planning algorithms
- Designed a stereo-boom mount, designed obstacles, and setup scale model experiment for UGV path planning
- Set up tests for human interface capabilities with the map and a search vehicle

July 2009 - August 2009 – Research Group in *Unmanned Systems Lab at Virginia Tech*
- Researched limitations of a UGV and visual interface of UGV camera.
- Recorded UGV prototype specs and performing preliminary designs of UGV obstacles for testing purposes.

Outreach Activities

January 2016 – May 2016 – Consulting for Sunflower County Consolidated School District FIRST Robotics Team
- Mentored high school students in utilizing engineering design principles
- Mentored students on programming
- Mentored students in CAD
- Mentored students in motor control with microcontrollers

Honors

June 2014-August 2014
> **National Science Foundation East Asia Pacific Summer Institute Fellowship** (Selected to spend 10 weeks conducting research in Japan on autonomous systems)

June 2010-August 2010
> **Summer Undergraduate Research Internship** (Selected to spend 10 weeks conducting undergraduate research with a faculty member in Unmanned Systems.)

Publications and Presentations

Huang, Y., Brand, H., Sui, R., Thomson, S., Furukawa, T., & Ebelhar, M. (2016). *Cotton Yield Estimation Using Very High-Resolution Digital Images Acquired on a Low-Cost Small Unmanned Aerial Vehicle*. Transactions of the ASABE. 59(6):1563-1574.

Huang, Y., Brand, H., Pennington, D., Reddy, K., Thomson, S. (2016). *Assessing Soybean Injury from Dicamba Using RGB and CIR Images Acquired on Small UAVs*. Paper presented at the 2016 International Conference on Precision Agriculture.

Huang, Y., Thomson, S., Brand, H., Reddy, K. (2016). Development and evaluation of low-altitude remote sensing systems for crop production management. International Journal of Agricultural and Biological Engineering, *9*(4), 1-11.

Brand, H., Nidamarthy, S., Furukawa, T. (2014). *A Vehicle Mountable Road Profiling System based on RGB-D Sensor and Feature Matching*. Paper presented at the 2014 Tire Society Conference. Akron, OH.