IOWA STATE UNIVERSITY
Agricultural and Biosystems Engineering

Brian L. Steward

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Education

Ph.D. Agricultural Engineering, 1999
University of Illinois, Urbana

M.S. Electrical Engineering, 1994
South Dakota State University

B.S. Electrical Engineering, 1989
South Dakota State University

Honors and Awards

Honorary membership in Alpha Epsilon, Agricultural Engineering Honor Society (2015)

ISU College of Agriculture and Life Sciences Mid-Career Achievement in Research Award, Presented at the CALS Spring University Convocation (2013)

ASABE Honorable Mention Paper Award for Transactions of the ASABE journal article (2011).

ISU College of Agricultural and Life Sciences Outstanding Achievement in International Agriculture Award, Presented at the CALS Spring University Convocation (2011)

ISU Louis Thompson Distinguished Undergraduate Teacher Award, Presented at the ISU Fall University Convocation (2010)

Recent Publications

Sharma, B., **B. L. Steward**, S. K. Ong, and F. E. Miguez. 2017. Evaluation of teaching approach and students' learning in an interdisciplinary sustainable engineering course. *Journal of Cleaner Production* 142 (4) : 4032-4040

Kshetri, S., **B. L. Steward**, and S. J. Birrell. 2016. Dielectric spectroscopic sensor for particle contaminant detection in hydraulic fluids. *International Journal of Fluid Power.* dx.doi.org/10.1080/14399776.2016.1210422

Du, Y., M. C. Dorneich, and **B. L. Steward**. 2016. The development of a virtual operator modeling method for excavator trenching. *Automation in Construction* 70(October):14-25. doi: 10.1016/j.autcon.2016. 06.013.

Felizardo, K. R., H. V. Mercaldi, P. E. Cruvinel, V. A. Oliveira, and **B. L. Steward**. 2016. Modeling and model validation of a chemical injection sprayer system. *Applied Engineering in Agriculture* 32(3): 285- 297. doi: 10.13031/aea.32.10606

Monga, M. D. Roggow, M. Karkee*, S. Sun, L. K. Tondehal, B. Steward, A. Kelkar, and J. Zambreno. 2015. Real-time simulation of dynamic vehicle models using a high-performance reconfigurable platform. Microprocessors and Microsystems 39(8): 720–740.

Research

Dr. Steward's research has recently focused on off-highway vehicles investigating ways to sustainably improve performance. Specific emphasis has been given to hydraulic systems. In particular, his recent research projects have focused on filtration, agricultural automation, and physical system modeling and simulation. Some relevant project include:

Magnetic Filtration of Particle Contaminants from Hydraulic Fluids

A majority of hydraulic system failures are due to fluid contamination. However, many of the micron to sub-micron scale particles produced by internal wear are not removed from hydraulic fluids because of the challenges conventional sieve filtration faces in capturing these small particles. The use of high strength rare-earth magnets have been shown to be effective in removing these small particles, but no standard methods for performance testing exists. This project seeks develop testing methods of magnetic filtration technologies and develop scientific knowledge needed for designing magnetic filtration for real world applications.

Robotic weeding technology for high-value crops

Weed control is essential for the production of high-yielding, high quality crops. For high-value vegetable crops, particularly those grown for organic markets, effective weed control can be challenging. The goal of this project is to develop both the sensing and actuation technology to control intra-row weeds with robotic mechanical cultivation. Machine vision technology is used to determine the location of crop plants, and automatic control is employed to precisely control the position of the tillage tool.

Hydrostatic Transmission Testing with Real-time Vehicle Simulation

Hydrostatic transmissions (HST) are used in a variety of off-highway vehicle platforms for vehicle propulsion. They enable higher productivity and functionality over other transmission technologies. HST testing typically involve quasi-static loading without regard for the dynamics that transmissions will encounter in applications. This project seeks to develop approaches for testing HSTs under dynamic loading using real-time simulation of vehicle models. An HST test stand has been built to enable this research. This equipment is also available for student education and industrial projects.

Hydraulic cylinder cushion design modeling and optimization

Hydraulic cylinder cushions are used to decelerate cylinder motion near end of stroke. Cushions operate by restricting fluid flow out of the cylinder. Cushion component geometry plays an important role in the deceleration of the cylinder. In this project, models relating cushion geometry to end-of-stroke deceleration were developed and a design optimization process was implemented. A cylinder cushion test stand has been built and will be used for student education and research.