

TRENDS AND VISION FOR AUTOMATION IN TERRESTRIAL MINING AND ITS APPLICABILITY TO EXTRATERRESTRIAL RESOURCE EXTRACTION. J. D. Humphrey, Market Professional – Autonomy Caterpillar Global Mining Division Caterpillar Inc., Decatur, Illinois Humphrey_James_D@Cat.com, K. L. Stratton, Senior Technical Steward for Site Systems and Automation, Product Development and Global Technology Division, Caterpillar Inc., Mossville, Illinois Stratton_Ken_L@Cat.com

The authors address the trends and vision for automation and autonomy in terrestrial mining and how these technologies will be required for resource extraction on other planetary surfaces. The authors also address the process and challenges of implementing major technological advances that involve the blending of multiple advanced systems. Specifically discussing issues with the determination of functional requirements for new technologies that were previously unknown to the user, and will likely create new application methods and processes.

James D. Humphrey is the Mining Market Professional for the Global Mining Division of Caterpillar. He has over 30 year's world wide experience in the mining industry. His recent work with Caterpillar in the development of an autonomous haulage system has lead to seven patent applications relevant to mining automation. Humphrey is a Mining Engineering graduate of the University of Missouri – Rolla (Missouri School of Science and Technology), and he is a Professional Engineer in four states. He is a contributing author to *Surface Mining 2nd edition* and the new *Mining Engineering Handbook* currently in development, as well; he has authored numerous technical papers. Humphrey has worked for both mining companies and manufacturers in operations management, technical and marketing roles. His primary area of expertise is large surface mining operations and equipment.

Ken Stratton, Caterpillar Inc.

Ken is the Automation and Robotics SR. Technical Steward and Program Manager within Caterpillar's Product Development Center of Excellence Division. Ken is a former member of the Board of Directors of the Collaborative Research Center – Mining with a focus on terrestrial mining automation. Ken manages Caterpillar's Automation and Robotic Technology development including programs for Autonomous Earthmoving Machines, Intelligent Remote Controls Systems, GPS augmentation, perception and navigation. Ken's previous

position was in the Caterpillar Trimble Control Technologies Joint Venture as the New Product Manager with product responsibility for Caterpillar's AccuGrade and Trimble's GPS & Laser based automated grade control systems. Ken has worked at Caterpillar for 30 years and in that time he has lead the technology strategy used on Caterpillar's Autonomous Mining Truck, Autonomous Blasthole drill research programs and Large Track Type Tractor Automated Blade Control (Auto-Carry). Ken was also a member of the DARPA Grand Challenge Red Team (2005). Mr. Stratton holds an Electrical Engineering degree from the University of Missouri-Rolla and has completed an Executive Management program at Bradley University.