Real-Time Characterization of Slurry at the Wet End of a Paper Machine

James S. Goddard[1], Hamed Sari-Sarraf, Martin A. Hunt, John C. Turner, Besma R. Abidi
Oak Ridge National Laboratory[2]

ABSTRACT

The papermaking process at the wet end in the forming section of a paper machine has long been a difficult area for the paper industry to characterize. Most properties of the finished paper are determined at the wet end but up until now have primarily been measured at the dry end. At ORNL, a vision-based system is under development that addresses this need by automatically measuring and interpreting the pertinent paper web parameters at the wet end. The wet-end characterization of the paper web by the vision system involves a four-dimensional measurement of the slurry (water and fiber mixture) in real time. These measurements include the two-dimensional spatial information, the intensity profile, and the depth profile of the slurry and its structures. This work, however, goes beyond the sensing of the web. Sophisticated image processing and pattern recognition algorithms have been developed that extract detailed information from the measured data. These algorithms measure homogeneity of the web and location and topography of web streaks that correspond to predicted paper properties such as formation or to production events such as table activity and web breaks. Characterization of the web in this manner may also be used as a tool by researchers to better understand and quantify headbox flow dynamics. In addition, the algorithms are designed for real-time operation providing 100% coverage of the moving web in both the direction of motion and in the cross direction. In this presentation, we will present our approach to the real-time topographical measurement problem and will describe the implementation using special purpose image processing hardware. Results from on-site field tests will demonstrate the method for extracting and tracking structures from the slurry images.

BIOGRAPHICAL SKETCH

James S. Goddard, received the B.S. degree in electrical engineering from Georgia Tech, the M.S. degree in electrical engineering from the University of Maryland, and a Ph.D. from The University of Tennessee, Knoxville, also in electrical engineering. His field of specialty is in machine vision and real-time computer systems. He has a broad range of experience in developing computer solutions for both industry and government. Presently, he is a development engineer with the Image Science and Machine Vision Group at ORNL. His recent vision-based work at ORNL includes the development of an image acquisition subsystem for characterizing paper and a vision system for high-speed inspection of printed circuit ceramics. He has developed a vision-based, three-dimensional object localization method for a battlefield ammunition resupply vehicle. He is a member of IEEE and SPIE. Current research interests include image acquisition methods and defect detection and classification.

[1] Corresponding Author. Email: goddardjsjr@ornl.gov; Address: Oak Ridge National Laboratory, P.O. Box 2008, Oak Ridge, Tennessee, 37831-6011; Telephone: 423-574-9034; Fax: 423-574-6663.

[2] Research supported by the Laboratory Directed Research and Development Program of Oak Ridge National Laboratory managed by Lockheed Martin Energy Research Corporation for the U.S. Department of Energy under contract DE-AC05-96OR22464.