Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Real-time detection and reduction of probe-loss in atomic force microscopy[1] PRANAV AGARWAL, University of Minnesota, twin cities, TATHAGATA DE, Iowa State University, AMES, MURTI SALAPAKA, University of Minnesota, twin cities — In this presentation, a real-time methodology is developed to determine regions of dynamic atomic force microscopy based image where the cantilever fails to be an effective probe of the sample. Probe-loss is more pronounced during high speed imaging operations. A quantitative measure called reliability index is proposed as diagnostic measure for determining probe- loss. It is experimentally demonstrated that probe-loss affected portion of the image can be unambiguously identified by a signal termed the reliability index, that can be determined in real-time. The reliability index signal, apart from indicating the probe-loss affected regions, can be used to minimize such regions of the image. A PI controller with adjustable gains has been implemented on FPGA (Field programmable gate array), which uses reliability index signal to switch. It is experimentally demonstrated that by using such a scheme, probe-loss areas can be reduced by a factor of 4, suggesting a possible increase in imaging bandwidth by the same factor. Improvement in on-sample performance has also been observed.

[1]Partial work was supported by the NSF Grant No. ECS0601571

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Date submitted: 04 Dec 2007 Electronic form version 1.4