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**Title:**

Exploiting New Features to Enhance the Capability of Flash Storage Devices

**Abstract:**

Flash storage devices have drawn a lot of attention in recent years. Because of the cost-reduction issue and the advance of manufacturing technologies, high-density multiple-level-cell and 3D flash memory chips are emerging as popular alternatives in embedded applications, but also introduce new challenges with respect to reliability, performance, and endurance. In this talk, we tackle the design issues of flash storage devices by exploiting the new features of flash-memory technologies. First, we will talk about how to resolve the write disturbance issue on high-density 3D flash with a software solution. Second, instead of using the indirect index “erase count” to conduct wear leveling, we will talk about how to use the direct hardware information to conduct wear leveling, and propose solutions to resolve this issue. In addition, we will introduce how to utilize the sub-block erase feature to resolve the garbage collection performance issue when the block size is getting larger in 3D flash memory. Finally, this talk will also discuss the design of file systems to improve the space utilization of flash storage devices.

**Biography:**

Yuan-Hao Chang is an associate research fellow in Institute of Computer Science, Academia Sinica (since March 2015). He has published more than one hundred research papers in major highly-reputable international journals and conferences. They were mainly published in top journals (e.g., IEEE TC, IEEE TVLSI, IEEE TCAD, ACM TECS, ACM TODAES, and ACM TOS) and conferences (e.g., ACM/IEEE DAC, ACM/IEEE ICCAD, ACM/IEEE ISLPED and ACM/IEEE CODES). His research received best paper nominations from top conferences (i.e., ACM/IEEE DAC 2016, ACM/IEEE DAC 2014, ACM/IEEE CODES 2014, and ACM/IEEE DAC 2007) and important conference ACM/IEEE ASP-DAC 2016. He also received Ta-You Wu Memorial Award from Ministry of Science and Technology (MOST) in 2015, Outstanding Youth Electrical Engineer Award from Chinese Institute of Electrical Engineering (CIEE) in 2014, and Excellent Research Project Award from National Program for Intelligent Electronics (NPIE) of Ministry of Science and Technology (MOST) in 2014.

Dr. Chang also serves as a program co-chair of IEEE Non-Volatile Memory Systems and Applications Symposium (NVMSA) 2017, and a local co-chair of ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED) 2017. His research interests include memory/storage systems, operating systems, embedded systems, and real-time systems. He is a Senior Member of IEEE and a Lifetime Member of ACM.

張原豪博士現職為中央研究院資訊科學研究所副研究員 (從 2015 年 3 月起)。 張博士至今於重要知名國際期刊及國際會議發表超過一百篇研究論文，其中多數發表於頂尖國際期刊 (如 IEEE TC、IEEE TVLSI、IEEE TCAD、ACM TECS、ACM TODAES 及 ACM TOS) 及國際會議 (如 ACM/IEEE DAC、ACM/IEEE ICCAD、ACM/IEEE ISLPED 及 ACM/IEEE CODES)，此外也獲得多個美國及中華民國專利。曾經獲得頂尖國際會議 ACM/IEEE DAC 2016、ACM/IEEE DAC 2014、ACM/IEEE CODES 2014 及 ACM/IEEE DAC 2007 的「最佳論文提名」以及重要國際會議 ACM/IEEE ADSP-DAC 2016 的「最佳論文提名」，同時獲得2015年科技部「吳大猷先生紀念獎」、2014年中國電機工程學會「優秀青年電機工程師獎」以及2014年科技部智慧電子國家型科技計畫成果「特優獎」。

張博士同時擔任許多重要國際會議及研討論 (如 ACM/IEEE DAC、ACM/IEEE ASP-DAC 及 IEEE ICDC) 的議程委員，並且擔任多個重要國際期刊的論文審查委員 (如 IEEE TC/TCAD/TKDE/TMSCS/TR/TVLSI 及 ACM TECS/TODAES/TOS)；同時也受邀不同的重要國際會議、大學、機關組織及公司進行學術演講。曾經擔任過 IEEE IEEE Non-Volatile Memory Systems and Applications Symposium (NVMSA) 2017 的議程主席 (program chair) 以及 ACM/IEEE International Symposium on Low Power Electronics and Design (ISLPED) 2017 的當地事務規劃主 (local chair)。研究興趣包含記憶體系統、儲存系統、作業系統、嵌入式系統與及時系統。目前為國際電機電子工程師學會 (IEEE) 資深會員及計算機協會 (ACM) 終身會員。