A Fault Tolerant Gaussian Elimination Solver for the Cell Broadband Engine

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Introduction to Square Enix Group

• Square Enix Group is a Japanese entertainment content/service developer and publisher.
• Best known for following video game franchises.
  – FINAL FANTASY, DRAGON QUEST (SQUARE ENIX)
  – Tomb Raider (EIDOS)
  – Space Invaders (TAITO)
• Approximately 3000 employees*1 and ¥135.6 billion*2 ($1.5 billion) in sales.  *1 As of March 31, 2009  *2 FY2008
• Develop for Nintendo DS, PSP, Xbox 360, Playstation 3, Wii, PC, iPhone, cell phones, etc....
Fault tolerant Gaussian elimination

Fault tolerance idea is to back up on-chip data into main memory at checkpoints.

The algorithm’s natural serialization points are used as checkpoints.

When a fault occurs, backed up data is used to redistribute workload among remaining cores.
Fault Tolerance Capabilities

**Fault Tolerance:**
Core failures lead to redistribution of workload among remaining cores.

**Addition of Cores:**
Cores are added and rows are dynamically redistributed.

**Fault Tolerance with Replacement:**
N failed cores are replaced with M new cores.