



A Methodology for Exploring Finite-Precision Effects when Solving Linear Systems of Equations with Least-Squares Techniques in Fixed-Point Hardware

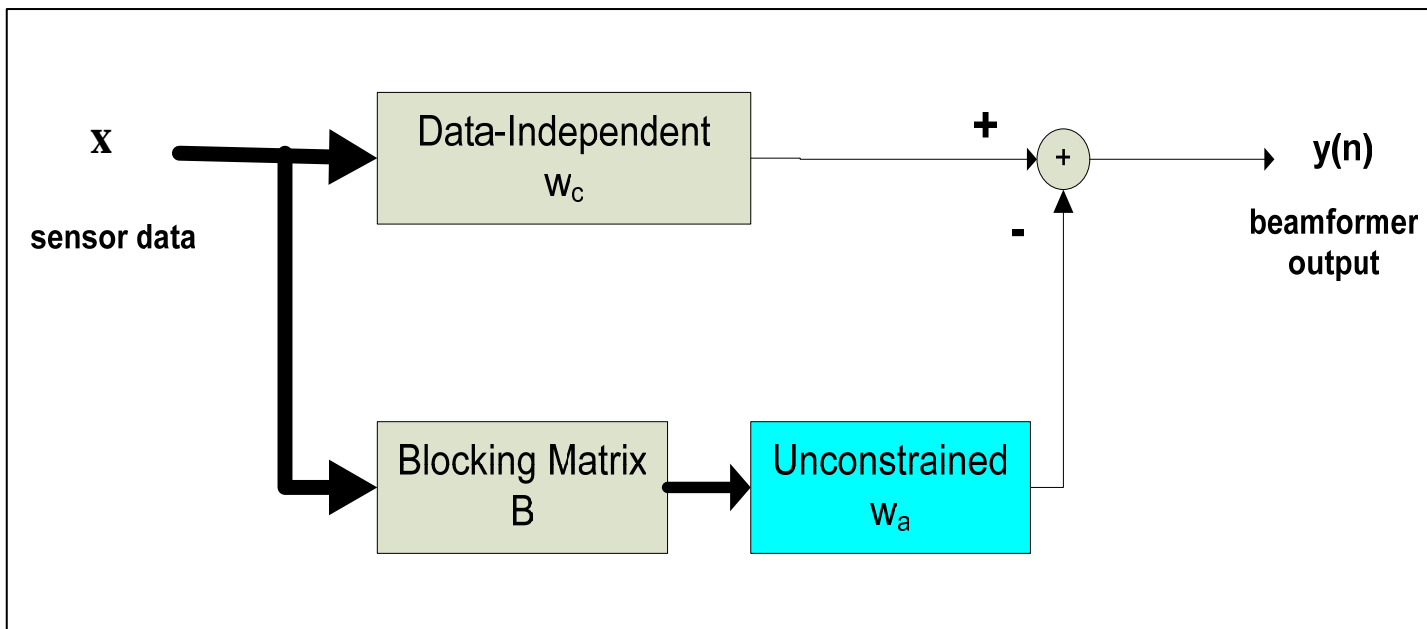
Ramon Uribe and Thomas Cesear

9/20/05

*DSP Solutions that
Accelerate Chip Design*

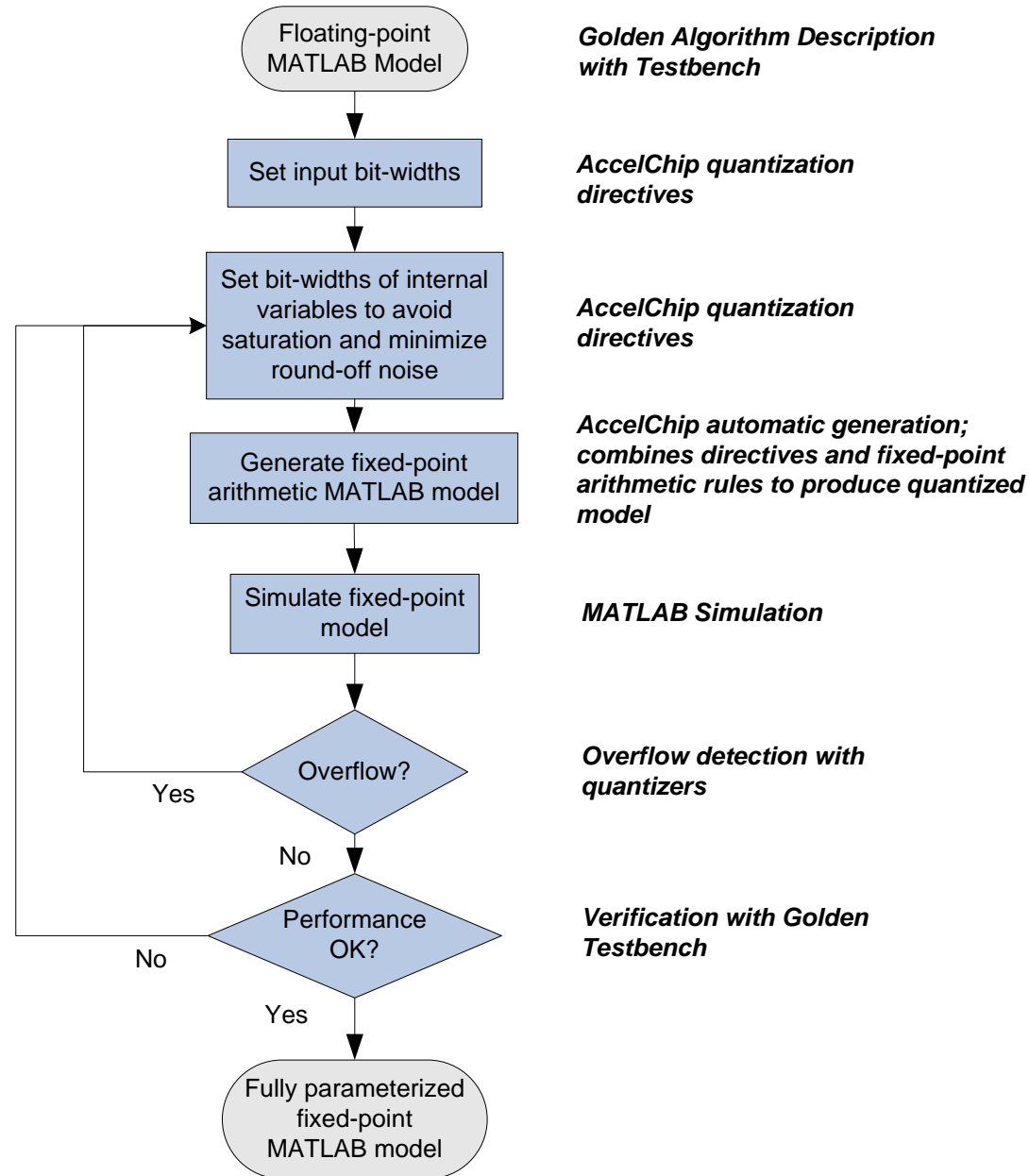
GSC Beamformer

- Least-Squares in Adaptive Nulling with Generalized Sidelobe Canceller (GSC)
 - Apply Least-Squares to unconstrained optimization in GSC to find optimum weights \mathbf{w}_a

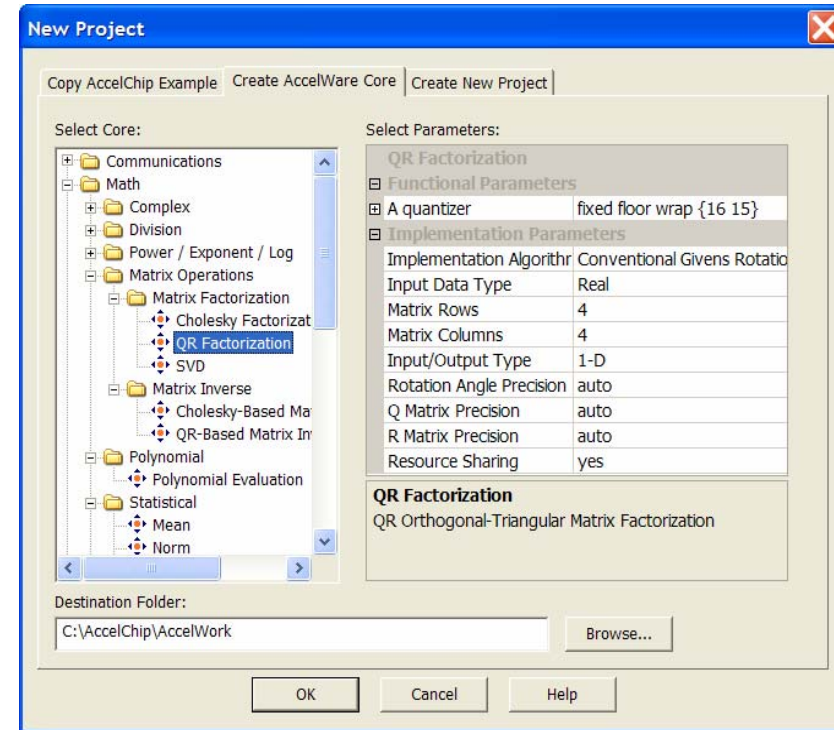
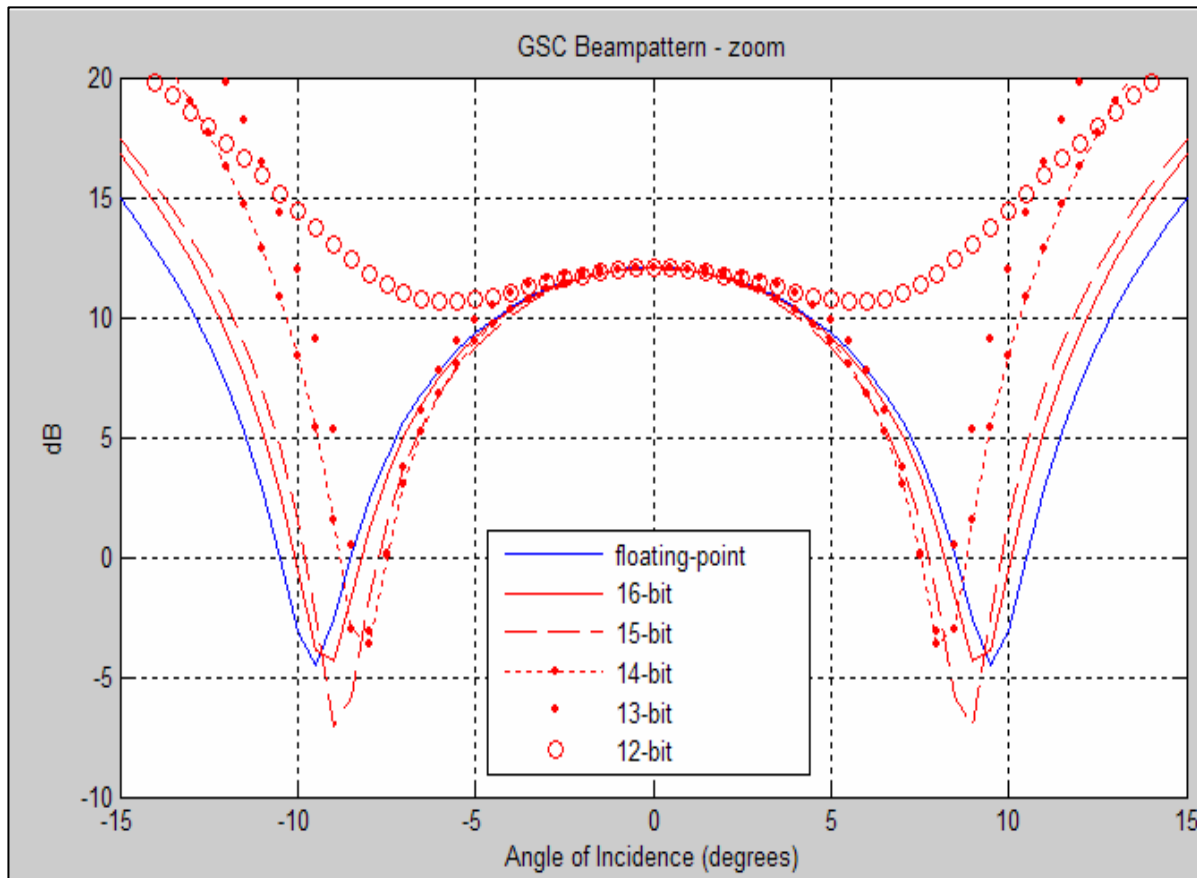


- Options:
 - Solution to normal equations with Cholesky factorization
 - Recursive Least-Squares with QR Decomposition (QRD-RLS)
 - Pseudo-inversion with SVD for rank-deficient LS

Overview of the Methodology



Results: QRD-RLS



- Recursive Least-Squares with QR Decomposition
 - AccelWare IP
 - qrdrls_spatial adaptive filter core
 - Fixed-Point effects for 4-sensor system (3 channel filter)