1086-65-2748 **Abdramane Serme*** (aserme@bmcc.cuny.edu), 199 Chambers Street, New York, NY 10007, and **Jean W. Richard** (jrichard@bmcc.cuny.edu), 199 Chambers Street, New York, NY 10007.
Solving an Ill Conditioned Linear System using the Extended Iterative Refinement Algorithm: The Convergence Theorem.

Many numerical analysts assume the convergence of the (extended) iterative refinement algorithm. We consider the linear system $CW = U$ where W is the unknown matrix. We use the following extended iterative refinement algorithm to solve for W:

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\begin{aligned}
W_0 &= C_0^{-1}U_0 \quad (U_0 = U \, and \, C_0 = C + F_0) \\
W_k &= (C + F_k)^{-1}U_k \\
U_{k+1} &= U_k - CW_k + E_k \\
X_k &= W_0 + W_1 + \cdots + W_k, \; for \, k = 0, 1, 2, ...
\end{aligned}
$$

The goal of this talk is to show that the above extended iterative refinement algorithm convergences by providing a theorem that we called the theorem of convergence of the (extended) iterative refinement. The convergence of the iterative refinement is a central issue when solving ill conditioned linear systems. To compute the accurate solution $x = A^{-1}b$ of an ill conditioned linear system $Ax = b$ we use the Schur aggregation method and the Sherman-Morrison-Woodbury (SMW) formula $A^{-1} = C^{-1} + C^{-1}U(I - V^HC^-U)^{-1}V^HC^{-1}$. The Schur aggregate $S = I - V^HC^{-1}U$ is computed using the extended iterative refinement. The talk will also cover the notion Additive Preconditioner UV^H and when the A-modification $C = A + UV^H$ is well conditioned. (Received September 25, 2012)