Abdramane Serme* (aserme@bmcc.cuny.edu), BMCC/CUNY-The City University of New York, Department of mathematics, N770, New York, NY 10007, and Jean W. Richard (jrichard@bmcc.cuny.edu), BMCC/CUNY-The City University of New York, Department of mathematics, N524, New York, NY 10007. On the convergence of iterative refinement/improvement of the solution to an ill conditioned linear system.

This talk is about improving the solution \( x = A^{-1}b \) to an ill conditioned linear system \( Ax = b \). We extend the classical iterative refinement/improvement algorithm to the matrix equation \( CW = U \) and compute \( W = C^{-1}U \) in \( I_r - V^H C^{-1}U \) using the following algorithm.

\[
W_i \leftarrow fl(C^{-1}U_i) = C^{-1}U_i - E_i \\
U_{i+1} \leftarrow U_i - CW_i
\]

for \( i = 0, 1, \ldots, k \), \( U = U_0 \) and \( C(W_0 + \cdots + W_k) = U - CE_k \). We proved that if \( \frac{\|C^{-1}F_k\|}{1-\|C^{-1}F_k\|} < 1 \), where \( F_k = C_k - C \), \( X_k = W_0 + \cdots + W_k \) and \( X = W \), then \( \|X_k - X\| \leq \mathcal{O}(\bar{u}) \). By applying forward error analysis, we proved that \( \frac{\|X_k - X\|}{\|X\|} \leq \mathcal{O}(u) \), and by applying backward error analysis we proved that \( \lim_{k \to \infty} \frac{\|U_k - CW_k\|}{\|C\|\|W_k\|} = \frac{4c_1(k)}{1-c_1(k)\text{cond}_2Cu} \bar{u} \), where \( c_1(k) \) and \( c_1'(k) \) are linear functions in \( k \). In this talk we show how we improve the bound \( \frac{4c_1(k)}{1-c_1(k)\text{cond}_2Cu} \bar{u} \) and use it to prove the convergence of the error matrix \( -E_k \) to zero as \( k \to \infty \) in the equation \( C(W_0 + \cdots + W_k) = U - CE_k \). (Received September 22, 2010)