

**Department of Mathematical Sciences
Colloquium**

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**ASYMPTOTIC BEHAVIOR FOR SOME DIFFERENCE
EQUATIONS IN A HILBERT SPACE**

We consider the following first order difference equation, called the proximal point algorithm:

$$\begin{cases} u_{n+1} - u_n \in c_n A u_n + f_n; & n \geq 1 \\ u_0 \in H \end{cases} \quad (1)$$

as well as the following second order difference equation :

$$\begin{cases} u_{n+1} - 2u_n + u_{n-1} \in c_n A u_n; & n \geq 1 \\ u_0 \in H, \quad \sup_{n \geq 0} |u_n| < +\infty \end{cases} \quad (2)$$

where A is a maximal monotone operator in a real Hilbert space H , $f_n \in H$, and $\{c_n\}$ is a positive real sequence. These equations are the discrete analogues of the corresponding first and second order evolution equations. We investigate the asymptotic behavior of solutions to these equations. With suitable conditions on $\{c_n\}$, we prove ergodic theorems, as well as weak and strong convergence theorems for solutions to these equations, converging to an element of $A^{-1}(0)$, implying in particular that solutions exist if and only if $A^{-1}(0) \neq \emptyset$. Our results extend and give simpler proofs to previous results by many authors, and have many applications in approximation and optimization theory.

2000 AMS Subject Classification. 39A12; 39A11; 47H05.

**Friday, February 27, 2009 at 4pm in Bell Hall 143
The University of Texas at El Paso**

Please note the unusual time for the Colloquium.

Refreshments will be served in front of the colloquium room,
15 minutes before the start of the colloquium.

For further information, please contact Dr. Andrzej Pownuk, Bell Hall 201.

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