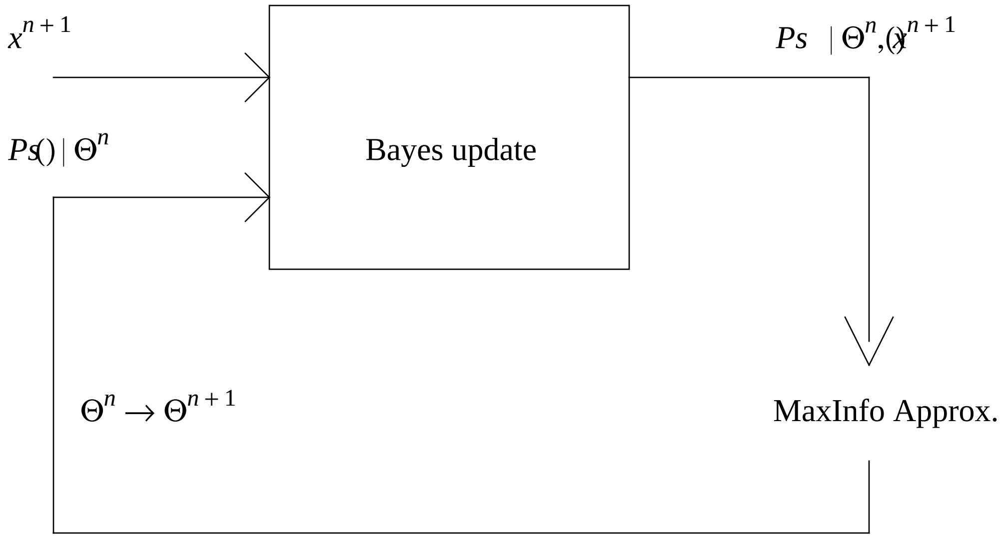
GKF Update Loop Equation



The elements going into $P(s \mid \Theta^n)$ are the prior, restricted to some knowledge H about the field, $P(s \mid H)$. (In the main text example, H is the set of known surface height field values.) and the Knowledge Representation (KR) distribution is $P(H \mid \Theta^n)$, which is the learned knowledge about the specifics of the surface at the n'th iteration of the GKF.

These form the approximate posterior $P(s \mid \Theta^n)$ given by the integral over H of the product of the KR distribution and the prior distribution given H known, that is

$$P(s \mid \Theta^n) = \int P(s \mid H) P(H \mid \Theta^n)\, dH \quad (1)$$

At update $n+1$, the new data and the approximate posterior from iteration n are incorporated using the likelihood $P(x^{n+1} \mid s)$ and Bayes' theorem to produce the data-dependent posterior written $P(s \mid \Theta^n, x^{n+1})$. Then, the new KR that caputres an approximation to this exact posterior using (1) above with $n \rightarrow n+1$ via Maximally informative statistical inference completes the GKF loop.

Figure 1 - Generalized Kalman Filter Update Loop