Levin and Schnorr (independently) introduced the monotone complexity, $K_m(\alpha)$, of a binary string $\alpha$. We use monotone complexity to define the relative complexity (or relative randomness) of reals. We define a partial ordering $\preceq_{K_m}$ on $2^\omega$ by $\alpha \preceq_{K_m} \beta$ iff there is a constant $c$ such that $K_m(\alpha \upharpoonright n) \leq K_m(\beta \upharpoonright n) + c$ for all $n$. The monotone degree of $\alpha$ is the set of all $\beta$ such that $\alpha \preceq_{K_m} \beta$ and $\beta \preceq_{K_m} \alpha$. We show the monotone degrees contain an antichain of size $2^{\aleph_0}$, a countable dense linear ordering, and a minimal pair. We also show there is no minimal computably enumerable monotone degree.

Downey, Hirschfeldt, LaForte, Nies and others have studied a similar structure, the $H$-degrees, where $H$ is the prefix-free Kolmogorov complexity. A minimal pair of $H$-degrees was constructed by Csima and Montalbán. Of particular interest are the noncomputable trivial reals, first constructed by Solovay. We define a real to be $(K_m, H)$-trivial if for some constant $c$, $K_m(\alpha \upharpoonright n) \leq H(1^n) + c$ for all $n$. We show every $K_m$-minimal real is $(K_m, H)$-trivial. (Received September 28, 2005)