We introduce a new model of parametric contours defined in a continuous fashion. Our curve model relies on Hermite spline interpolation and can easily generate curves with sharp discontinuities; it also grants direct access to the tangent at each location. With these two features, the Hermite snake distinguishes itself from classical spline-snake models and allows one to address certain bioimaging problems in a more efficient way. More precisely, the Hermite snake construction allows introducing sharp corners in the snake curve and designing directional energy functionals relying on local orientation information in the input image. Using the formalism of spline theory, the model is shown to meet practical requirements such as invariance to affine transformations and good approximation properties. Finally, the dependence on initial conditions and the robustness to the noise is studied on synthetic data in order to validate our Hermite snake model, and its usefulness is illustrated on real biological images acquired using brightfield, phase-contrast, differential-interference-contrast, and scanning-electron microscopy.