FUZZY LOGIC

Property	Rating	Comment
Network output function:		(Use of centroids assumed.)
Continuous	Yes	Basis functions—pyramids—are continuous.
Smooth	Yes	Quadratic centroid guarantees smoothness.
Easily visualized	Yes	Basis functions are localized and scaled to height of function at peak of pyramid.
Generalizes beyond domain	Somewhat	Around periphery, centroids cause output value between function values at nearby pyramid peaks. Zero divided by zero occurs beyond periphery.
Method for determining coefficients or weights:		
Inner product of target function and basis function	No	Pyramids are not orthogonal
Simultaneous equations for data points	Fair	Noise in data around periphery may create problems with ill-conditioned equations owing to small sum of centroids in denominator.
Coeffs = func values at pyramid peaks	Good	This is the standard way of finding coefficients.
Gradient descent with all points on surface available for training.	Good	Because pyramids are localized, local minima are seldom a problem.
Gradient descent with finite number of points on surface available for training.	Adequate	Need at least one training point per pyramid and lying in the region where the pyramid is nonzero.
Behavior at data points:		(Coeffs = func values at pyramid peaks assumed.)
Reproduces data values exactly	Yes	
Suited to randomly scattered data versus regular grid	Fair	See comment for *Simultaneous equations for data points*, above.
Well-behaved between data points	Good	Value between points is bounded by values at peaks of surrounding pyramids. Function is sigmoidal between pyramid peaks and flat at peaks.
Expands for new data points	No	Uses one function value for each pyramid.
Matches slope at finite number of data points	No	Output function is always flat at data points if centroid is quadratic or higher order.
Complexity:		
Difficulty of writing computer program	Easy	Membership functions are triangles, fuzzy AND is min() function, centroid is quadratic, and output is weighted sum.
Speed of coefficient calculation	High	Coefficients equal function values given by expert.
Speed of function evaluation	High	Only a few pyramid functions need be evaluated.