

Quick Reference

Radial Basis Functions

using namespace rbf;

The RBFs supported in Radial ++ are:

RBF	C++
Multiquadric	MQ
Thin-Plate Splines	TPS
Radial Powers	POT
Gaussian	GAU
Inverse Multiquadric	IMQ

The declaration of the RBF in C++ can be done as:

MQ<T> mq; where T=float, double, etc.

the same sintaxis follow for the rest of kernels.

The generalized RBFs are:

C++	Phi(x)	beta
MQ	$(r^2+c^2)^{(\text{beta}/2)}$	1,3,5,7,..
IMQ	$(r^2+c^2)^{(-\text{beta}/2)}$	1,3,5,7,..
GAU	$\exp(-r^2*c^2)$	-----
TPS	$r^{\text{beta}} \log(r)$	2,4,6,8,...
POT	r^{beta}	1,3,5,7,...

$r = \|x\|_2$ Euclidean distance

c = shape parameter

The default beta values are:

C++	default beta value
MQ	1
IMQ	1
GAU	-
TPS	2
POT	1

The degree of the polynomial for each RBF internally is calculated as:

C++	m
MQ	$\text{ceil}(\text{beta}/2)$
IMQ	---
GAU	---
TPS	$1+\text{beta}/2$
POT	$\text{ceil}(\text{beta}/2)$

See the theorems, 8.15, 6.13, 6.10, 8.17 and 8.16 in the book Scattered Data Approximation by Holger Wendland.

Recall, the total degree of the polynomial is at most $m-1$.
You can configurate this value to obtain more polynomial precision.
Each RBF can be configurated with beta and m.

Author.
José Antonio Muñoz-Gómez
Universidad de Guadalajara
CUCSUR
Agosto - 2009