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NURBS surface

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1 Introduction

A *NURBS surface*, which is an acronym for *Non-Uniform Rational B-Spline surface*, is a generalization of both <http://planetmath.org/BezierCurve> Bézier and B-splines surfaces. NURBS are commonly used in computer graphics, computer-aided design (CAD), engineering (CAE), and manufacturing (CAM).

2 Definition

A NURBS surface is parametric surface defined by its , an array of $n + 1$ rows and $m + 1$ columns weighted control points and a knot vector in each direction. It is defined as

$$c(u, v) = \frac{\sum_{i=0}^n \sum_{j=0}^m N_{i,p}(u) N_{j,q}(v) w_{i,j} P_{i,j}}{\sum_{i=0}^n \sum_{j=0}^m N_{i,p}(u) N_{j,q}(v) w_{i,j}} \quad 0 \leq u \leq 1, \quad 0 \leq v \leq 1$$

where u and v are the parameters in each direction, p is the in the u -direction, q is the in the v -direction, $N_{i,p}$ and $N_{j,q}$ are the B-spline basis functions, $P_{i,j}$ are the control points and $w_{i,j}$ are the weights.