

Master's thesis in  
Applied Computer Science

## CoolingGen

A parametric 3D-modeling software for turbine  
blade cooling geometries using NURBS

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I hereby declare that this thesis has been written by myself and no other resources than those mentioned have been used.

A handwritten signature in blue ink, appearing to read 'Lüken', with a stylized, cursive script.

Göttingen, June 17, 2022

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# Chapter 1

## Introduction

### 1.1 Motivation

### 1.2 Bézier Curves and Surfaces

#### 1.2.1 Definition

#### 1.2.2 De Casteljau's Algorithm

#### 1.2.3 Properties (Motivation of Bézier)

## Chapter 2

# Non-Uniform Rational B-Splines

### 2.1 Definition

#### 2.1.1 NURBS Curve

#### 2.1.2 NURBS Surface

### 2.2 De Boor's Algorithm

### 2.3 Properties (Motivation of NURBS)

### 2.4 Common Methods on NURBS Objects

## Chapter 3

# Cooling Geometries

3.1 Chambers

3.2 Turnarounds

3.3 Slots

3.4 Film Cooling

3.5 Impingement Cooling

## Chapter 4

# Practical Considerations

### 4.1 CENTAUR File Export

### 4.2 STEP File Export



## Chapter 5

# Discussion

### 5.1 Grid-Searching With CoolingGen

### 5.2 Things Desired