

Contents

Preface — VII

Part I: Basics of 3D Ultrasound

- 1 Basics of 3D and 4D Volume Acquisition — 3**
 - 1.1 Introduction — 3
 - 1.2 Preparing the volume acquisition — 3
 - 1.3 Types of volume acquisition — 10
 - 1.4 Conclusions — 13
- 2 Orientation and Navigation within a Volume — 15**
 - 2.1 Introduction — 15
 - 2.2 Storing and exporting volume data sets — 15
 - 2.3 Orientation in the three orthogonal planes — 16
 - 2.4 Navigation within the orthogonal planes — 17
 - 2.5 Artifacts in the multiplanar mode — 23
 - 2.6 Conclusions — 25

Part II: Methods of 3D Rendering

- 3 3D Rendering of a Volume — 29**
 - 3.1 Introduction — 29
 - 3.2 The render box and the orientation within a 3D volume — 29
 - 3.3 Artifacts in 3D rendering — 30
 - 3.4 Different rendering modes and the mixing of modes — 34
 - 3.5 Special effects in 3D: dynamic depth 3D rendering and light source — 39
 - 3.6 Threshold, transparency, brightness and color scales — 41
 - 3.7 Magicut, the electronic scalpel — 43
 - 3.8 Multiple light sources and „HD-live studio“ — 46
 - 3.9 Conclusions — 48
- 4 Volume Contrast Imaging (VCI) — 49**
 - 4.1 Introduction — 49
 - 4.2 Principle of VCI — 49
 - 4.3 Static VCI — 53
 - 4.4 4D with VCI-Omniview — 56
 - 4.5 4D with VCI-A — 58
 - 4.6 Conclusions — 61

5	Multiplanar Display I – Orthogonal Mode and Omniview Planes — 62
5.1	Principle — 62
5.2	Multiplanar reconstruction and different ways of displaying cross-sectional images — 62
5.3	Practical approach in orthogonal mode — 63
5.4	Practical approach in getting an „anyplane“ using Omniview tool — 64
5.5	Typical applications of Omniview planes — 67
5.6	Conclusions — 74
6	Multiplanar Display II: Tomographic Mode — 75
6.1	Principle — 75
6.2	Practical approach — 75
6.3	Typical applications in tomographic mode — 81
6.4	Conclusions — 88
7	Surface Mode Rendering and HD-Live — 93
7.1	Principle — 93
7.2	Practical approach — 93
7.3	Typical applications of surface mode — 98
7.4	Conclusions — 105
8	Maximum Mode Rendering — 106
8.1	Principle — 106
8.2	Practical approach — 107
8.3	Typical applications of maximum mode — 112
8.4	Conclusions — 116
9	The Minimum Mode — 117
9.1	Principle — 117
9.2	Practical approach — 117
9.3	Typical applications of minimum mode — 119
9.4	Conclusions — 124
10	The Inversion Mode — 125
10.1	Introduction — 125
10.2	Practical approach — 125
10.3	Typical applications of inversion mode — 127
10.4	Conclusions — 132
11	The Silhouette Tool — 133
11.1	Principle — 133

11.2	Practical application —	133
11.3	Typical applications of silhouette tool —	137
11.4	Conclusions —	142
12	The Glass-Body Mode and HD-Live Flow —	143
12.1	Principle —	143
12.2	Practical approach —	144
12.3	Glass-body mode with HD-live flow function —	148
12.4	Typical applications in the glass-body mode —	148
12.5	HD-live flow using the color silhouette tool —	153
12.6	Conclusions —	155
13	The B-Flow Mode —	156
13.1	Principle —	156
13.2	Practical approach —	158
13.3	Typical applications of the B-flow mode —	158
13.4	Conclusions —	161
14	Biplane Display using the Electronic Matrix Transducer —	162
14.1	Principle —	162
14.2	Practical approach —	162
14.3	Typical applications of biplane mode —	164
14.4	Conclusions —	177
15	Calculation of 3D Volumes —	178
15.1	Principle —	178
15.2	Practical approach —	178
15.3	Clinical application of volume calculation —	184
15.4	Conclusions —	184

Part III: Clinical Applications of Prenatal Diagnosis

16	3D Fetal Neurosonography —	187
16.1	Introduction —	187
16.2	Fetal neurosonography with 3D ultrasound —	187
16.3	3D visualization of specific brain structures —	192
16.4	Reconstruction of fetal brain structures in 3D rendering —	196
16.5	The intracranial vascular system in color Doppler —	196
16.6	Fetal neurosonography before 14 weeks of gestation —	200
16.7	Conclusions —	205

17 3D of the Fetal Skeleton — 206

- 17.1 Limitations in the assessment of the fetal skeleton using 2D ultrasound — **206**
- 17.2 3D of fetal spine and ribs — **206**
- 17.3 3D of the fetal limbs — **213**
- 17.4 3D of the facial and cranial bones — **216**
- 17.5 Conclusions — **218**

18 3D of the Fetal Face — 219

- 18.1 The sonographic examination of the face in 2D and 3D ultrasound — **219**
- 18.2 The face in multiplanar display — **220**
- 18.3 The normal face in 3D/4D surface mode — **223**
- 18.4 The abnormal face in 3D/4D — **229**
- 18.5 The facial bones in 3D/4D — **234**
- 18.6 Conclusions — **235**

19 3D Intrathoracic and Intraabdominal Organs — 236

- 19.1 Introduction — **236**
- 19.2 Intrathoracic organs — **236**
- 19.3 Intraabdominal organs — **242**
- 19.4 Conclusions — **254**

20 STIC and 3D/4D Fetal Echocardiography — 255

- 20.1 The sonographic assessment of the heart in two-dimensional ultrasound — **255**
- 20.2 Acquiring cardiac volumes — **255**
- 20.3 Fetal echocardiography in 3D/4D multiplanar reconstruction — **257**
- 20.4 Fetal heart in 3D/4D volume rendering — **258**
- 20.5 Conclusions — **268**

21 3D in Early Pregnancy — 269

- 21.1 Background — **269**
- 21.2 3D volume rendering in early gestation — **269**
- 21.3 Multiplanar display in early gestation — **278**
- 21.4 Conclusions — **282**

Further literature references and sources — 283

Index — 287