ISO 17506:2022-03 (E)

Industrial automation systems and integration - COLLADATM digital asset schema specification for 3D visualization of industrial data

Contents

Page

Foreword ... xi

Introduction ... xii

1 Scope ... 1

2 Normative references ... 1

3 Terms and definitions ... 2

3.1 Terms and definitions ... 2

3.2 Abbreviated terms ... 4

4 Notational conventions ... 5

4.1 Typographic conventions and notation ... 5

4.2 Notation and organization in the reference sections ... 5

4.2.1 Child element conventions ... 5

4.2.2 Child element order ... 6

5 COLLADA format ... 7

5.1 Design considerations ... 7

5.1.1 Introduction ... 7

5.1.2 Assumptions and dependencies ... 7

5.1.3 Goals and guidelines ... 7

5.2 Tool requirements and options ... 11

5.2.1 Introduction ... 11

5.2.2 Exporters ... 11

5.2.3 Importers ... 14

5.2.4 Archive packaging ... 15

5.3 Schema concepts ... 15

5.3.1 Introduction ... 15

5.3.2 XML overview ... 15

5.3.3 Address syntax ... 16

5.3.4 Instantiation and external referencing ... 19

5.3.5 The Common profile ... 21

5.3.6 Common profile elements ... 21

5.3.7 Example and discussion on techniques ... 22

5.3.8 Common glossary ... 22

5.4 Programming guideline ... 24

5.4.1 General ... 24

5.4.2 Parameters in COLLADA ... 24

5.4.3 Curve interpolation ... 25

5.4.4 Skin deformation (or skinning) in COLLADA ... 31

5.5 Core elements reference ... 33

5.5.1 General ... 33
5.5.2 Elements by category ... 34
5.5.3 accessor ... 38
5.5.4 ambient ... 44
5.5.5 animation ... 45
5.5.6 animation_clip ... 47
5.5.7 asset ... 49
5.5.8 bool_array ... 52
5.5.9 camera ... 53
5.5.10 channel ... 55
5.5.11 COLLADA ... 56
5.5.12 color ... 58
5.5.13 contributor ... 58
5.5.14 controller ... 59
5.5.15 control_vertices ... 61
5.5.16 directional ... 63
5.5.17 evaluate_scene ... 64
5.5.18 extra ... 65
5.5.19 float_array ... 67
5.5.20 formula ... 68
5.5.21 geographic_location ... 70
5.5.22 geometry ... 72
5.5.23 IDREF_array ... 74
5.5.24 imager ... 75
5.5.25 input (shared) ... 77
5.5.26 input (unshared) ... 79
5.5.27 instance_animation ... 81
5.5.28 instance_camera ... 82
5.5.29 instance_controller ... 83
5.5.30 instance_formula ... 85
5.5.31 instance_geometry ... 87
5.5.32 instance_light ... 88
5.5.33 instance_node ... 90
5.5.34 instance_visual_scene ... 92
5.5.35 int_array ... 93
5.5.36 joints ... 94
5.5.37 library_animation_clips ... 95
5.5.38 library_animations ... 96
5.5.39 library_cameras ... 97
5.5.40 library_controllers ... 98
5.5.41 library_formulas ... 100
5.5.42 library_geometries ... 101
5.5.43 library_lights ... 102
5.5.44 library_nodes ... 103
5.5.45 library_visual_scenes ... 104
5.5.46 light ... 105
5.5.47 lines ... 107
5.5.48 linestrips ... 108

5.5.49 lookat ... 110
5.5.50 matrix ... 112
5.5.51 mesh ... 113
5.5.52 morph ... 115
5.5.53 Name_array ... 117
5.5.54 newparam ... 119
5.5.55 node ... 121
5.5.56 optics ... 123
5.5.57 orthographic ... 125
5.5.58 param (data flow) ... 126
5.5.59 param (reference) ... 127
5.5.60 perspective ... 130
5.5.61 point ... 131
5.5.62 polygons ... 133
5.5.63 polylist ... 136
5.5.64 rotate ... 138
5.5.65 sampler ... 139
5.5.66 scale ... 146
5.5.67 scene ... 147
5.5.68 setparam ... 149
5.5.69 SIDREF_array ... 150
5.5.70 skeleton ... 151
5.5.71 skew ... 153
5.5.72 skin ... 154
5.5.73 source (Core) ... 158
5.5.74 spline ... 160
5.5.75 spot ... 161
5.5.76 targets ... 163
5.5.77 technique (Core) ... 164
5.5.78 technique_common ... 165
5.5.79 Token_array ... 166
5.5.80 translate ... 167
5.5.81 triangles ... 168
5.5.82 trifans ... 170
5.5.83 tristrips ... 172
5.5.84 vertex_weights ... 173
5.5.85 vertices ... 175
5.5.86 visual_scene ... 176
5.6 Physics Reference ... 178
5.6.1 General ... 178
5.6.2 Elements by category ... 178
5.6.3 attachment ... 181
5.6.4 box ... 182
5.6.5 capsule ... 183

5.6.6 convex_mesh 184
5.6.7 cylinder 186
5.6.8 force_field 187
5.6.9 instance_force_field 188
5.6.10 instance_physics_material 189
5.6.11 instance_physics_model 190
5.6.12 instance_physics_scene 192
5.6.13 instance_rigid_body 193
5.6.14 instance_rigid_constraint 196
5.6.15 library_force_fields 198
5.6.16 library_physics_materials 199
5.6.17 library_physics_models 200
5.6.18 library_physics_scenes 201
5.6.19 physics_material 202
5.6.20 physics_model 204
5.6.21 physics_scene 206
5.6.22 plane 209
5.6.23 rigid_body 211
5.6.24 rigid_constraint 215
5.6.25 shape 220
5.6.26 sphere 222
5.7 Getting started with COLLADA FX 223
5.7.1 General 223
5.7.2 Using profiles for platform-specific effects 223
5.7.3 About parameters in COLLADA FX 227
5.7.4 Shaders 228
5.7.5 Rendering 228
5.7.6 Texturing 230
5.8 FX reference 232
5.8.1 General 232
5.8.2 Elements by category 232
5.8.3 About COLLADA FX 235
5.8.4 alpha 235
5.8.5 annotate 236
5.8.6 argument 237
5.8.7 array 239
5.8.8 binary 241
5.8.9 bind (FX) 242
5.8.10 bind_attribute 243
5.8.11 bind_material 244
5.8.12 bind_uniform 246
5.8.13 bind_vertex_input 248
5.8.14 blinn 250
5.8.15 code 252

5.8.16 color_clear ... 253
5.8.17 color_target ... 254
5.8.18 compiler ... 256
5.8.19 constant (FX) ... 257
5.8.20 create_2d ... 259
5.8.21 create_3d ... 261
5.8.22 create_cube ... 263
5.8.23 depth_clear ... 265
5.8.24 depth_target ... 266
5.8.25 draw ... 268
5.8.26 effect ... 269
5.8.27 evaluate ... 271
5.8.28 format ... 273
5.8.29 fx_common_color_or_texture_type ... 275
5.8.30 fx_common_float_or_param_type ... 277
5.8.31 fx_sampler_common ... 278
5.8.32 image ... 282
5.8.33 include ... 284
5.8.34 init_from ... 285
5.8.35 instance_effect ... 287
5.8.36 instance_image ... 288
5.8.37 instance_material (geometry) ... 290
5.8.38 instance_material (rendering) ... 292
5.8.39 lambert ... 294
5.8.40 library_effects ... 296
5.8.41 library_images ... 297
5.8.42 library_materials ... 298
5.8.43 linker ... 299
5.8.44 material ... 300
5.8.45 modifier ... 302
5.8.46 pass ... 303
5.8.47 phong ... 305
5.8.48 profile_BRIDGE ... 307
5.8.49 profile_CG ... 309
5.8.50 profile_COMMON ... 311
5.8.51 profile_GLES ... 313
5.8.52 profile_GLES2 ... 316
5.8.53 profile_GLSL ... 320
5.8.54 program ... 321
5.8.55 render ... 323
5.8.56 RGB ... 324
5.8.57 sampler1D ... 325
5.8.58 sampler2D ... 326
5.8.59 sampler3D ... 327

5.8.60 samplerCUBE 327
5.8.61 samplerDEPTH 328
5.8.62 samplerRECT 329
5.8.63 sampler_image 330
5.8.64 sampler_states 331
5.8.65 semantic 332
5.8.66 shader 333
5.8.67 sources 335
5.8.68 states 336
5.8.69 stencil_clear 342
5.8.70 stencil_target 343
5.8.71 technique (FX) 344
5.8.72 technique_hint 346
5.8.73 texcombiner 347
5.8.74 texenv 350
5.8.75 texture_pipeline 352
5.8.76 usertype 354
5.9 B-Rep Reference 355
5.9.1 General 355
5.9.2 Elements by category 356
5.9.3 About B-rep in COLLADA 357
5.9.4 brep 362
5.9.5 circle 364
5.9.6 cone 365
5.9.7 curve 367
5.9.8 curves 368
5.9.9 cylinder (B-Rep) 369
5.9.10 edges 370
5.9.11 ellipse 372
5.9.12 faces 373
5.9.13 hyperbola 375
5.9.14 line 376
5.9.15 nurbs 377
5.9.16 nurbs_surface 380
5.9.17 orient 382
5.9.18 origin 383
5.9.19 parabola 384
5.9.20 pcurves 385
5.9.21 shells 387
5.9.22 solids 389
5.9.23 surface 390
5.9.24 surfaces 392
5.9.25 surface_curves 393
5.9.26 swept_surface 394

5.9.27 torus ... 396
5.9.28 wires ... 397
5.9.29 Complete B-Rep example ... 399
5.10 Kinematics reference ... 409
5.10.1 General ... 409
5.10.2 Elements by Category ... 409
5.10.3 articulated_system ... 412
5.10.4 attachment_end ... 413
5.10.5 attachment_full ... 414
5.10.6 attachment_start ... 415
5.10.7 axis_info ... 417
5.10.8 bind (kinematics) ... 420
5.10.9 bind_joint_axis ... 421
5.10.10 bind_kinematics_model ... 422
5.10.11 connect_param (kinematics) ... 423
5.10.12 effector_info ... 424
5.10.13 frame_object, frame_origin, frame_tcp, frame_tip ... 426
5.10.14 instance_articulated_system ... 427
5.10.15 instance_joint ... 428
5.10.16 instance_kinematics_model ... 429
5.10.17 instance_kinematics_scene ... 431
5.10.18 joint ... 432
5.10.19 kinematics ... 434
5.10.20 kinematics_model ... 436
5.10.21 kinematics_scene ... 439
5.10.22 library_articulated_systems ... 440
5.10.23 library_joints ... 441
5.10.24 library_kinematics_models ... 442
5.10.25 library_kinematics_scenes ... 443
5.10.26 link ... 444
5.10.27 motion ... 446
5.10.28 prismatic ... 447
5.10.29 revolute ... 449
5.11 Types ... 450
5.11.1 General ... 450
5.11.2 Simple Value Types ... 450
5.11.3 Parameter-type elements ... 451
5.11.4 Other simple types ... 452
5.11.5 Value-or-param types ... 453
Annex A (informative) COLLADA example ... 454
Annex B (informative) Profile GLSL and GLES2 examples ... 457
B.1 Example: <profile-GLSL> ... 457
B.2 Example: <profile-GLES2> ... 462
Annex C (informative) Index of COLLADA elements ... 469
Bibliography ... 476