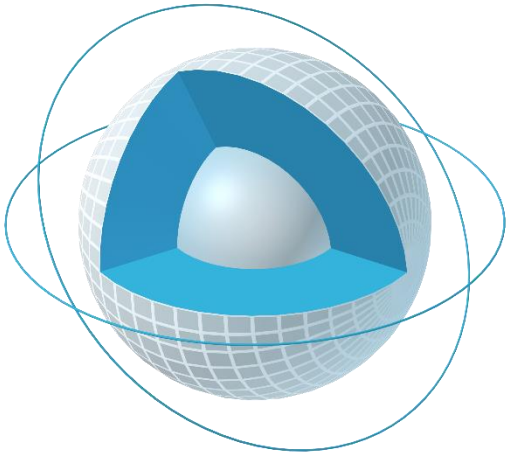
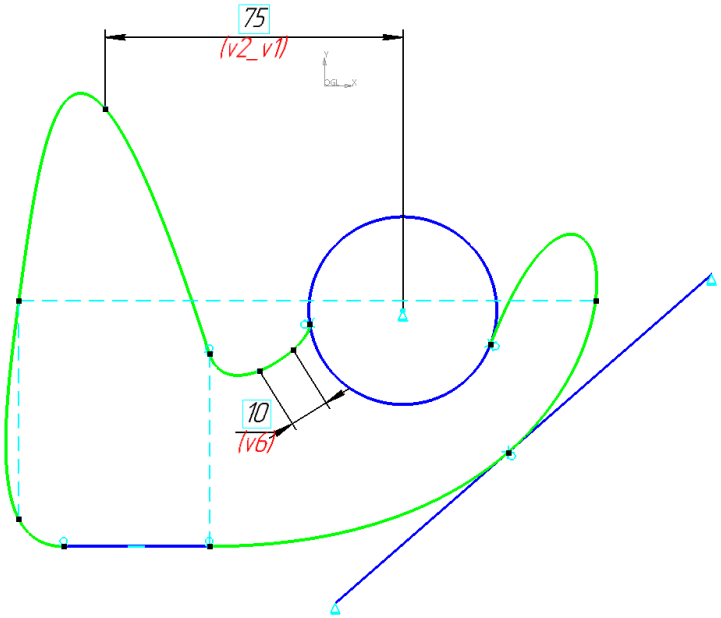
C3D Solver 2017

With New Component! C3D Solver for JavaScript



What is C3D Solver?



C3D module to help developers solve 2D & 3D dimensional and geometrical constraints

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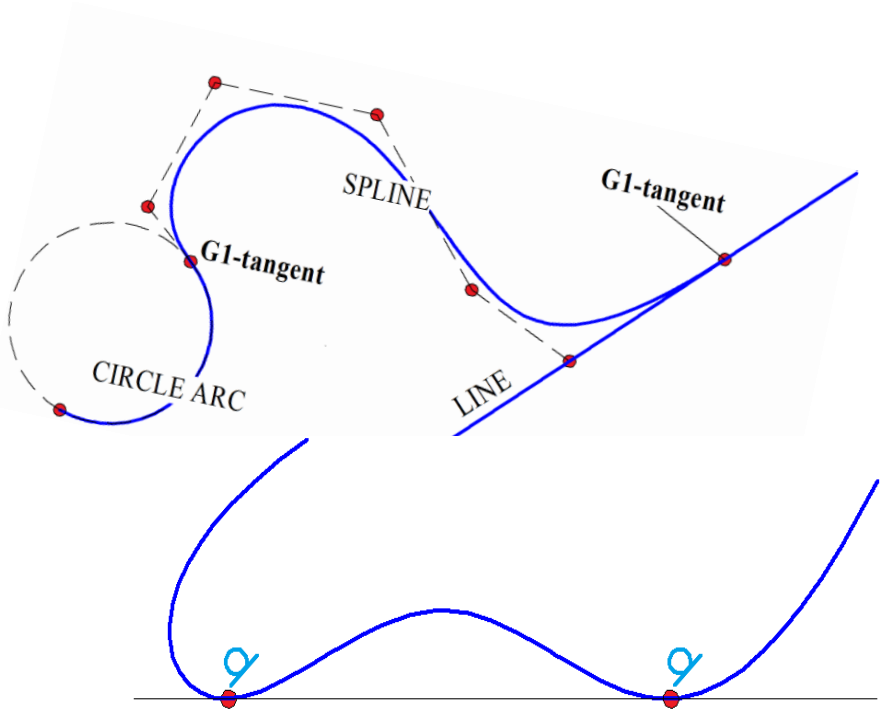
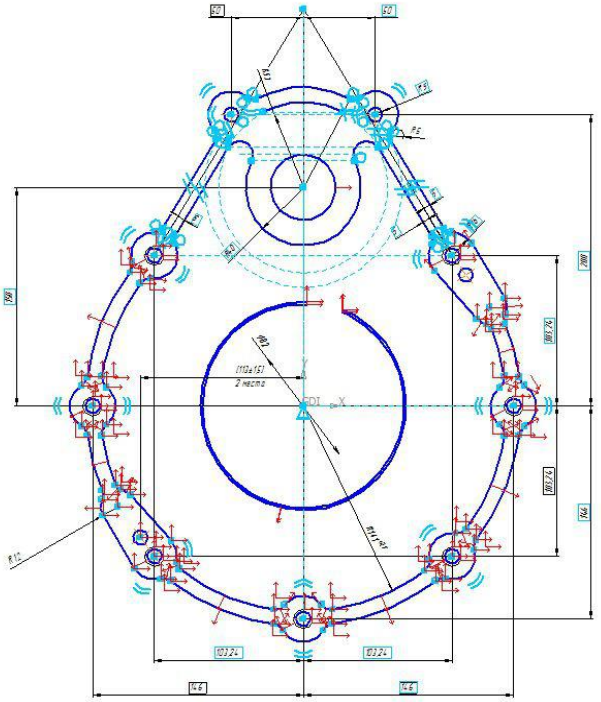
Main Features

2D Solver





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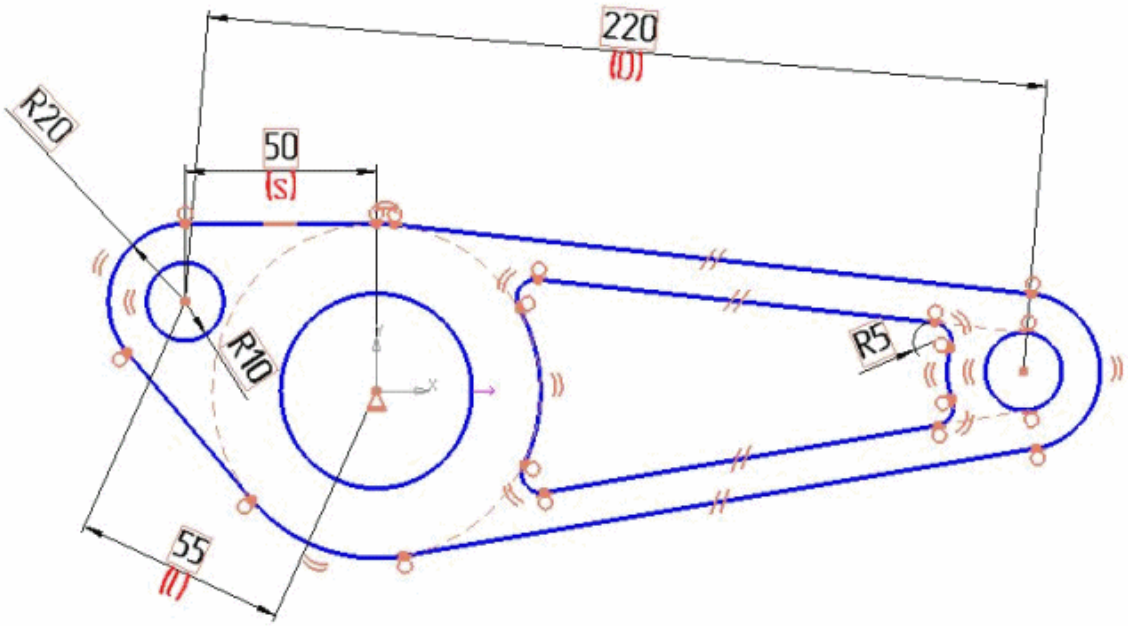
Main Features

2D Solver



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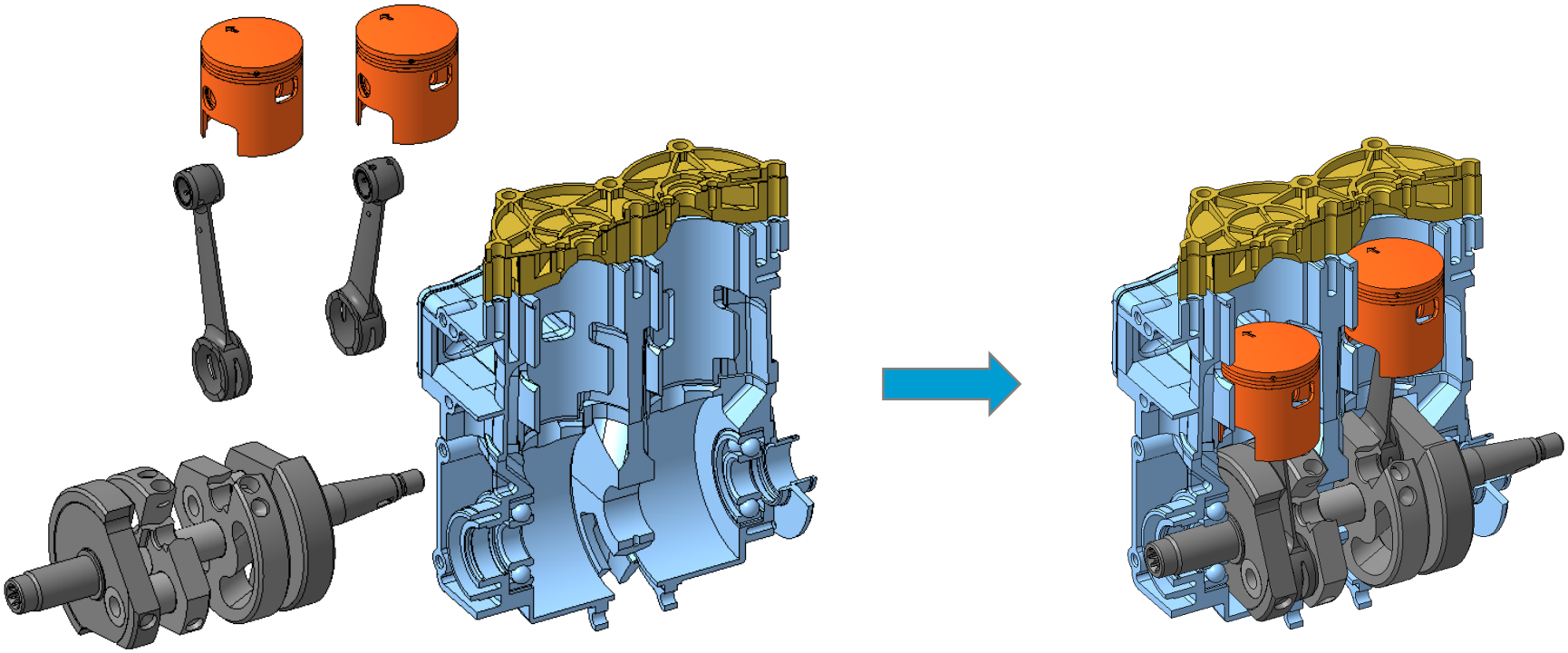
Main Features

3D Solver



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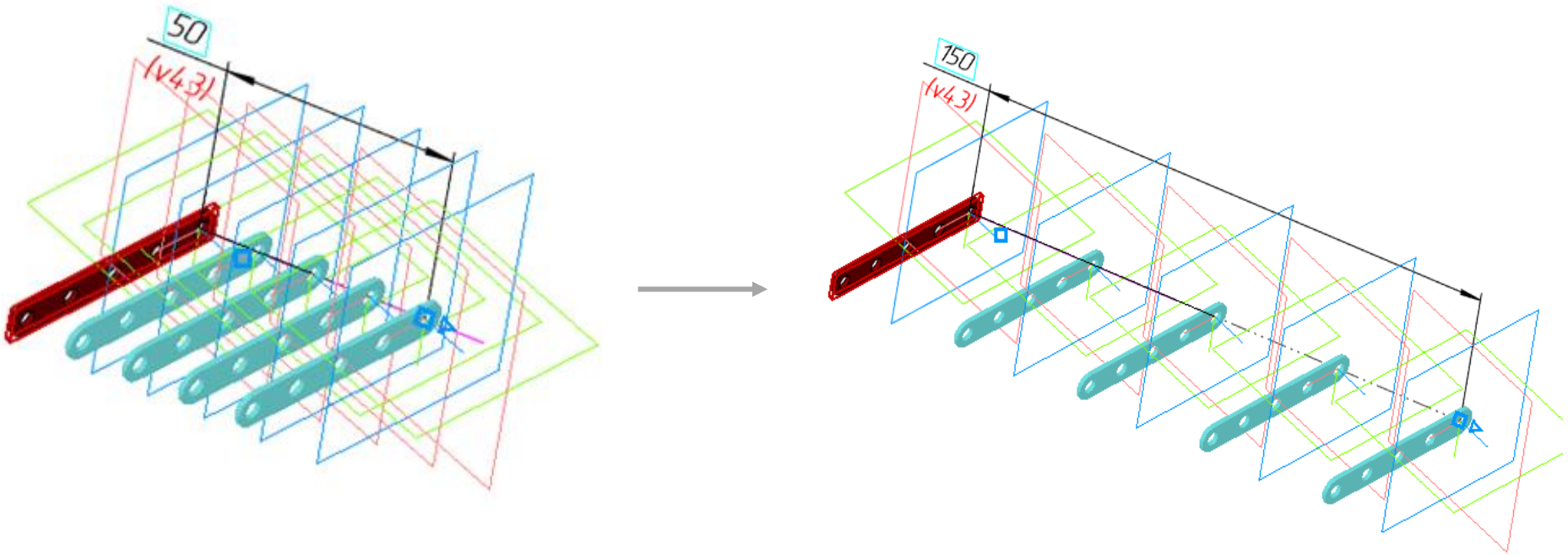
Main Features

Scalable Patterns



For both linear and angular types

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Main Features

Journaling of API Calls

```
(C3D_Version 285212679)
(GCM_AddGeom (GCM_LCS (0.0 0.0 0.0) (0.0 0.0 1.0) (1.0 0.0 0.0) (0.0 1.0 0.0)) #1)
(GCM_AddGeom (GCM_LCS (0.0 0.0 0.0) (0.0 0.0 1.0) (1.0 0.0 0.0) (0.0 1.0 0.0)) #3)
(GCM_AddGeom (GCM_LCS (0.0 0.0 0.0) (0.0 0.0 1.0) (1.0 0.0 0.0) (0.0 1.0 0.0)) #4)
(GCM_SubGeom (#1 (GCM_LINE (0.0 0.0 0.0) (0.0 0.0 1.0))) #5)
(GCM_SubGeom (#1 (GCM_PLANE (0.0 0.0 0.0) (0.0 0.0 1.0))) #7)
(GCM_SubGeom (#3 (GCM_POINT 0.0 100.0 0.0)) #8)
(GCM_SubGeom (#4 (GCM_LINE (0.0 0.0 0.0) (0.0 0.0 1.0))) #10)
(GCM_SubGeom (#4 (GCM_POINT 0.0 0.0 0.0)) #11)
(GCM_SubGeom (#2 (GCM_LINE (0.0 0.0 0.0) (0.0 1.0 0.0))) #13)
(GCM_AddConstraint (GCM_CONCENTRIC #5 #10 GCM_COORIENTED) #14)
(GCM_AddConstraint (GCM_COINCIDENT #7 #11 GCM_COORIENTED) #15)
(GCM_AddConstraint (GCM_DISTANCE #7 #8 10.0 GCM_CLOSEST) #16)
(GCM_AddConstraint (GCM_CONCENTRIC #6 #9 GCM_CLOSEST) #17)
(GCM_AddConstraint (GCM_PARALLEL #5 #9 GCM_COORIENTED) #18)
(GCM_AddConstraint (GCM_COINCIDENT #8 #13 GCM_CLOSEST) #19)
(GCM_Evaluate GCM_RESULT_Ok)
```

C3D Solver Manual

S.1.7. Representation of geometric objects

Geometric constraint solver works with a certain geometric object representation form shown in *Fig.S.1.7.* All objects are expressed using point, vector and number coordinates (scalars).

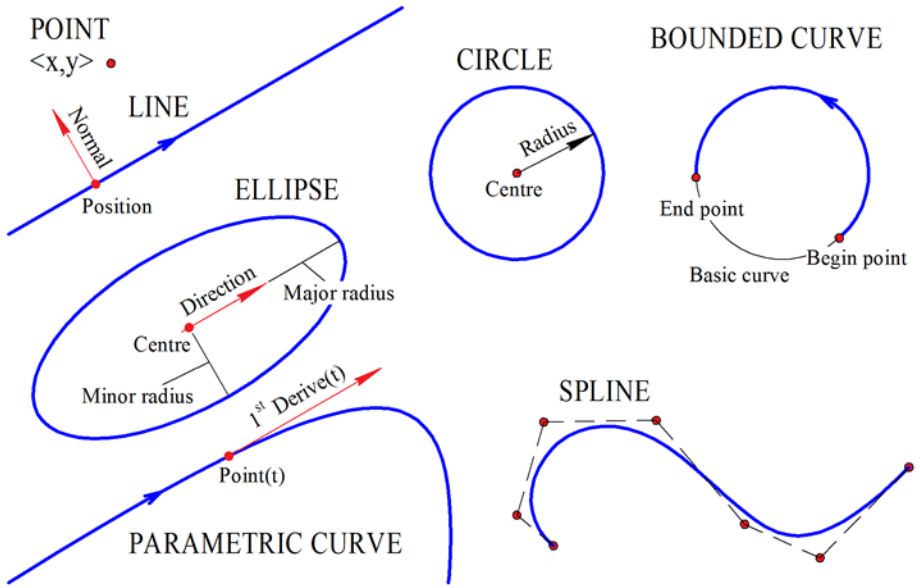

Fig. S.1.7.

The application can have its own representation of geometric objects that differs from solver representation. However, passing object status data in the solver and passing the calculation results back are based on the fact that each geometry type has its representation:

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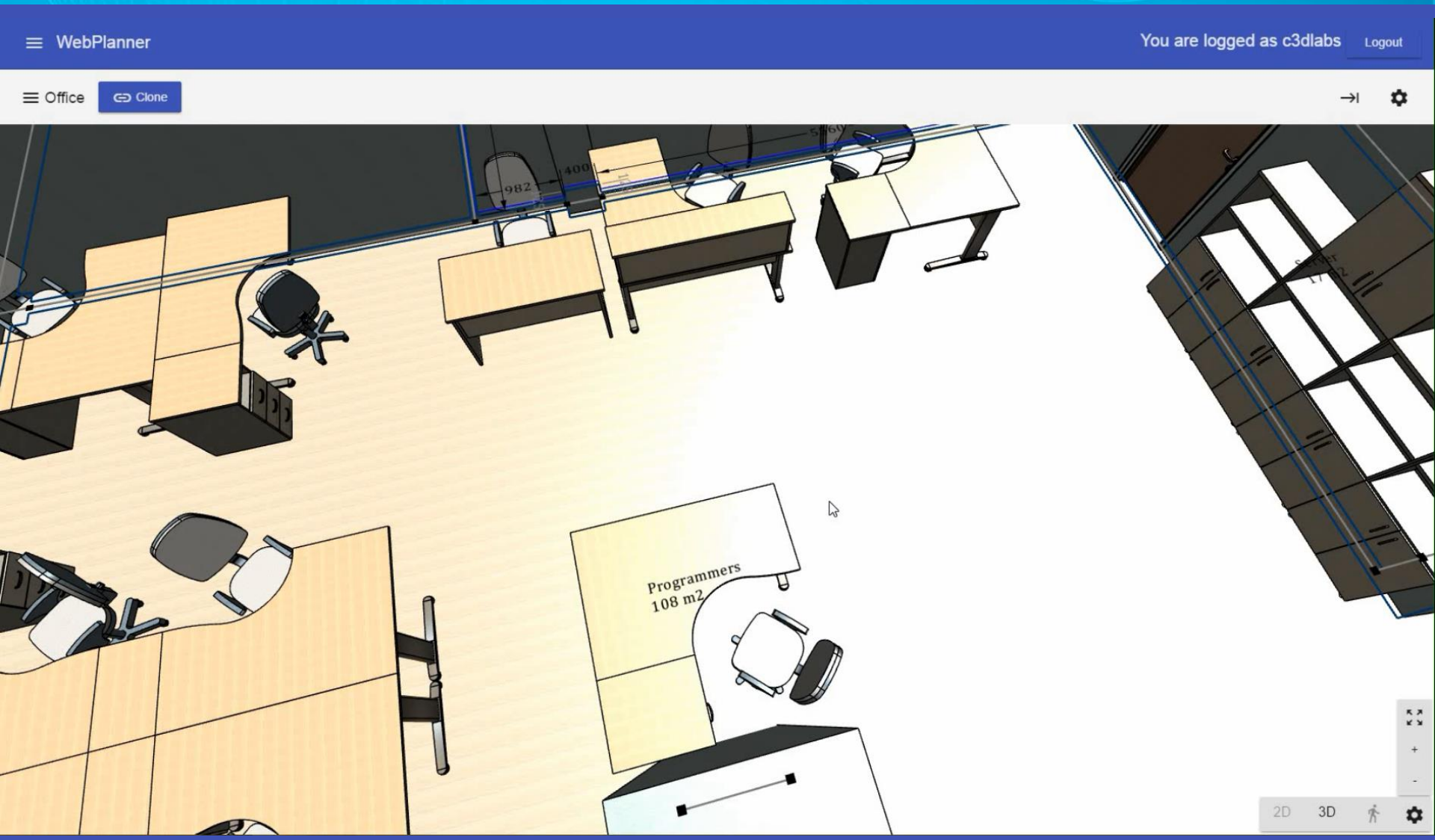
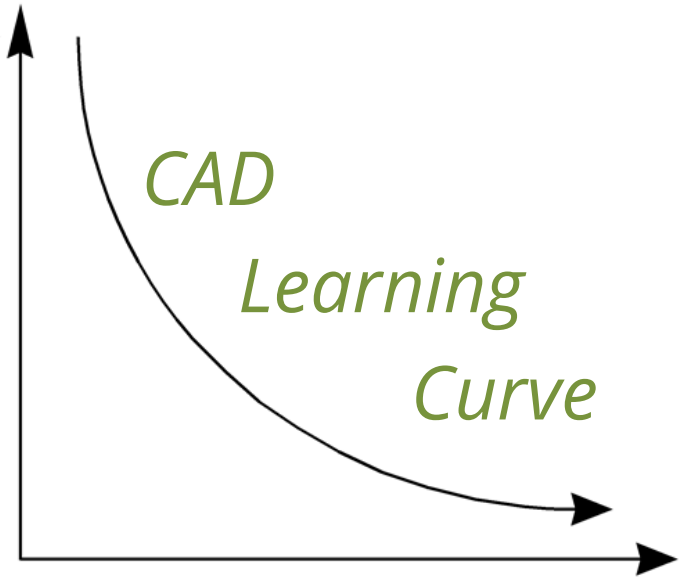
CAD + JavaScript = ?



C3D Solver for JavaScript

What is the Main Benefit?

Complexity of Development



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C3D Solver for JavaScript

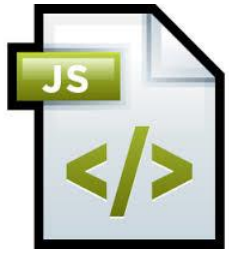
How Was It Ported from C++?

Clang

```
var circle = new c3dlib.GCE_circle();
circle.set_centre(circle_center); circle.set_radius(1.2);
var circle1_geom = c3d_solver_api.GCE_AddCircle(c3d_solver, circle);

// Create tangent of line with the circle1
var geoms = [line_geom, circle1_geom];
var pars = [-1, -1];
var tangent = c3d_solver_api.GCE_AddTangent(c3d_solver, geoms, pars);
```

emscripten



asm.js

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C3D Solver for JavaScript

Using C++ API in JavaScript Natively

Need to create a {wrapper} for API

- *How can we do that?*

Take ***WebIDL-Binder*** to declare the binding in a separate file. This is run through the binder tool to create “glue” code that is then compiled with the project.

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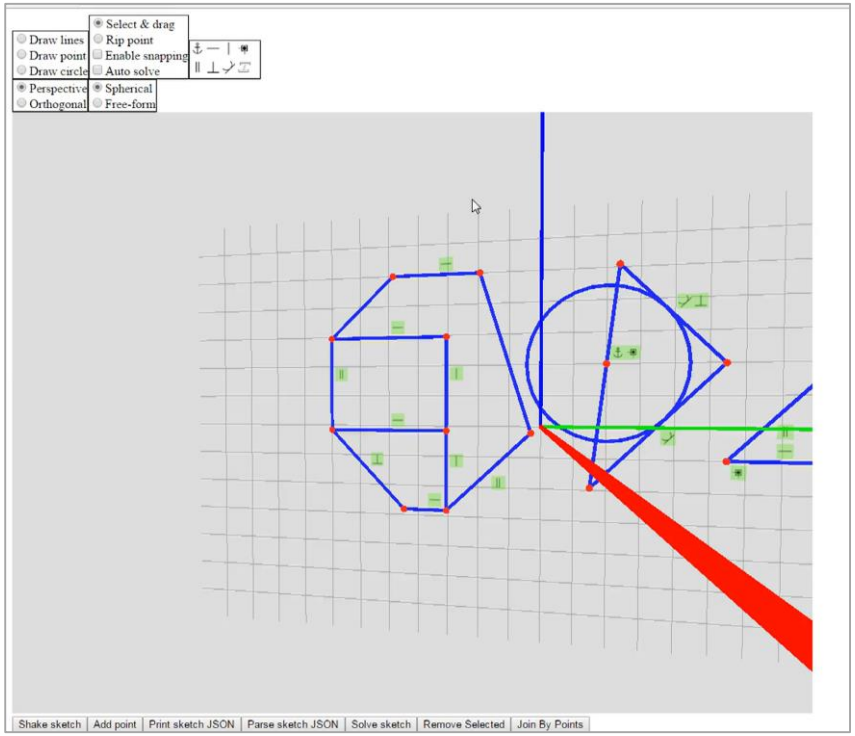
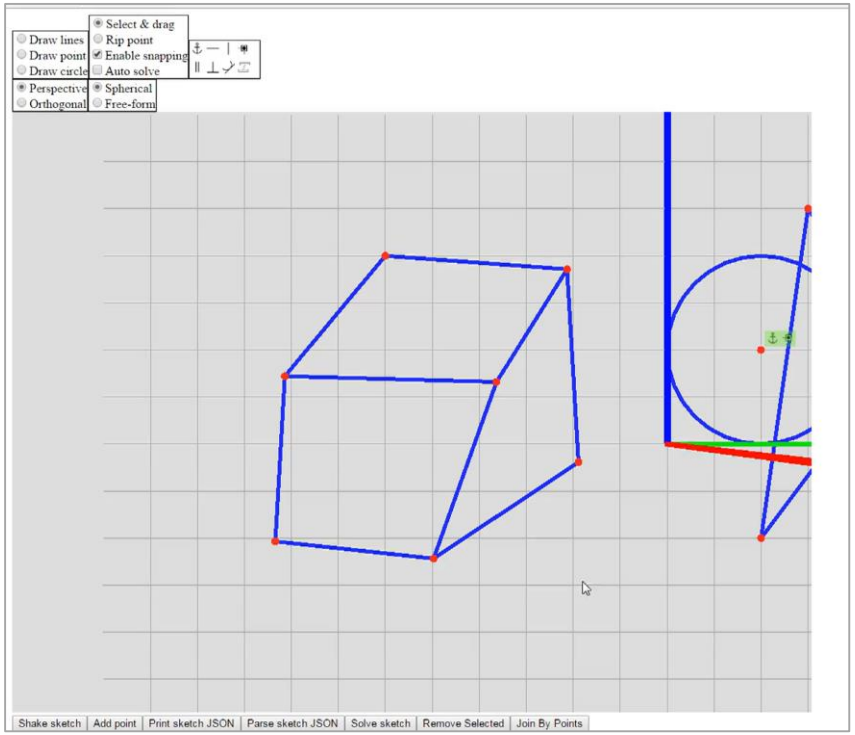
How Does It Work?





All the mathematics are being calculated on browser side!

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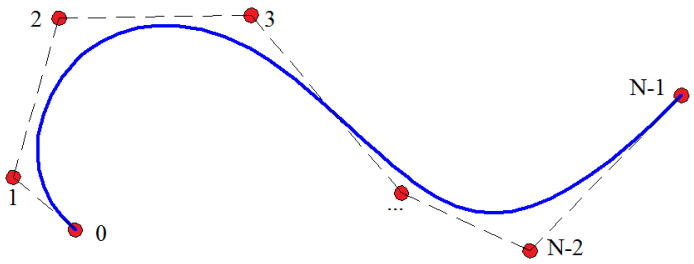
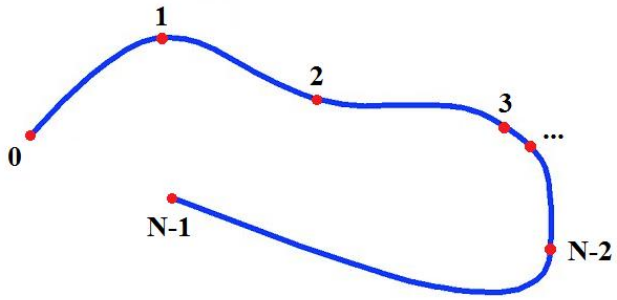
Future Plans for C3D Solver

Translating Splines (STL containers) to JScript





Compiling C3D Solver to WebAssembly →

WEBASSEMBLY

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Thank You!

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C3D Solver for JavaScript

Unit Test Samples

```
[----------] 5 tests from GCM_Samples
[ RUN      ] GCM_Samples.SimpleAPITest
[       OK ] GCM_Samples.SimpleAPITest (9 ms)
[ RUN      ] GCM_Samples.PrismTest
[       OK ] GCM_Samples.PrismTest (80 ms)
[ RUN      ] GCM_Samples.3DAngleTest
[       OK ] GCM_Samples.3DAngleTest (32 ms)
[ RUN      ] GCM_Samples.PistonEngine
[       OK ] GCM_Samples.PistonEngine (79 ms)
[ RUN      ] GCM_Samples.RadiusTest
[       OK ] GCM_Samples.RadiusTest (6 ms)
[----------] 5 tests from GCM_Samples (207 ms total)
```

Run on C3D API for JavaScript

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C3D Solver for JavaScript

WebIDL Samples

```
interface GCE_ldim_pars
{
  GCE_ldim_pars GCE_ldim_pars();
  [Value] attribute GCE_dim_pars dPars;
  attribute double dirAngle;
  attribute geom_item [] hp;
  void set_hp_arr(geom_item [] hp);
};
```

```
enum coord_name
{
  "GCE_X",
  "GCE_Y",
  "GCE_ACRD",
  "GCE_DCRD",
  "GCE_RADIUS",
  "GCE_MAJOR_RADIUS",
  "GCE_MINOR_RADIUS",
  "GCE_NULL_CRD"
};
```

```
interface gce_api
{
  gce_api gce_api();
  static constraint_item GCE_AddPointOnPercent(GCE_system gSys, geom_item curve, geom_item [] pnt, double k);
  static geom_item GCE_AddCircle(GCE_system gSys, [Ref, Const] GCE_circle cVal);
  static boolean GCE_RemoveConstraint(GCE_system gSys, constraint_item con);
  static GCE_system GCE_CreateSystem();
  static GCE_system GCE_CreateSystem(VoidPtr arg1);
  static double GCE_DimensionParameter(GCE_system gSys, constraint_item dItem);
```