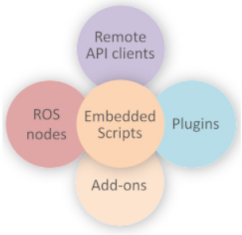
CoppeliaSim main features

5 Programming Approaches



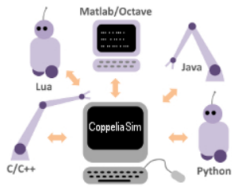
Simulator and simulations are fully customizable, with 5 programming approaches that are mutually compatible and that can even work hand-in-hand. 6 supported programming languages.

Powerful APIs, 7 languages

```
def sysCall_init():
    print("From sysCall_init")
    global cube, vel
    vel = 0.1 #m/s
    cube = sim.getObject('.')

def sysCall_cleanup():
    print("From sysCall_cleanup")

def sysCall_actuation():
    print("From sysCall_actuation
    pos = sim.getObjectPosition(
    pos[1] = pos[1]+vel*sim.getSi
    sim.setObjectPosition(cube,-1

def sysCall_sensing():
    pass
```

Regular API: Python, Lua and C/C++
Remote API: C/C++, Python, Java, JavaScript, Matlab & Octave
ROS interfaces: publishers, subscribers & service calls. Support all standard messages, extendable.

Remote API



Control a simulation or the simulator itself remotely (e.g. from a real robot or another PC)

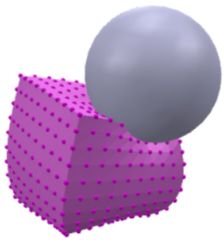
Dynamics/Physics

5 physics engines (MuJoCo, Bullet Physics, ODE, Vortex and Newton Dynamics) for fast and customizable dynamics calculations, to simulate real-world physics and object interactions (collision response, grasping, etc.)

Inverse/Forward Kinematics

Inverse/forward kinematics calculations for any type of mechanism (branched, closed, redundant, containing nested loops, etc.). An embeddable version of the IK/FK algorithms is available (i.e. can run on your robot).

Soft Bodies

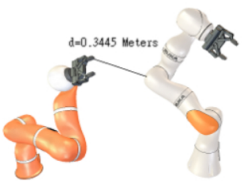


CoppeliaSim supports via the MuJoCo engine soft bodies, strings, ropes, cloths, etc.

Collision Detection

Fast interference checking between any mesh, OC tree, point cloud, or collection of those.

Minimum Distance Calculation

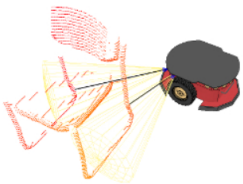


Fast and exact minimum distance calculation between any mesh (convex, concave, open, closed), OC tree, point cloud, or collection of those.

Cross-Platform & Portable

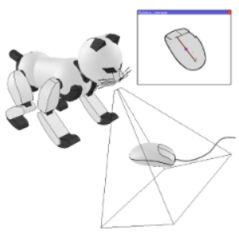
CoppeliaSim is cross-platform, and allows the creation of portable, scalable and easy maintainable content: a single portable file can contain a fully functional model (or scene), including control code.

Proximity Sensor Simulation



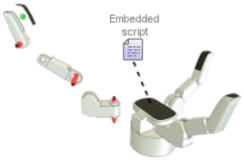
Powerful and realistic proximity sensor simulation (exact min. distance calculation

Vision Sensor Simulation



Simulation of vision sensors with many possibilities for image processing, fully

Building Block Concept



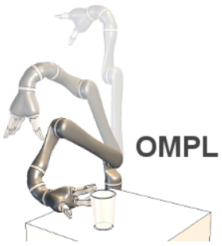
Anything - from sensors or actuators, to whole robotic systems - can be built within

within a customizable detection volume). Much more continuous operation than with discrete ray sensors. Operates on meshes, OC trees and point clouds

customizable and extendable (e.g. via plugin)

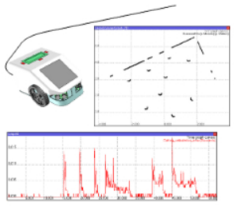
CoppeliaSim by combining basic objects and linking various functionality via embedded scripts. Every scene object can have its own embedded script!

Path/Motion Planning



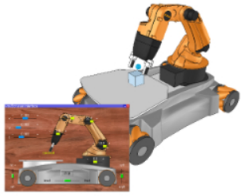
Path planning / motion planning is supported in a very flexible way via the OMPL library wrapped in a plugin for CoppeliaSim

Data Recording and Visualization



A large variety of recordable data streams (including user-defined) can display time-graphs, or can be combined with each other to form x/y-graphs, or 3D curves

Custom User Interfaces

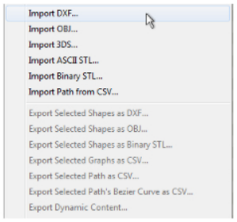


Unlimited number of fully customizable user interface elements

Integrated Edit Modes

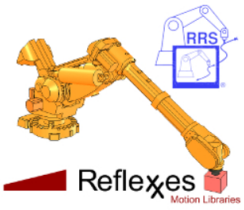
Special mesh edit modes are supported (including a semi-automatic primitive shape extraction method, convex decomposition, mesh decimation, etc.)

Easy Data Import/Export



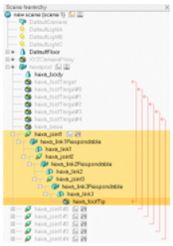
Many formats are supported: URDF, SDF, Collada, STL, DXF, OBJ, glTF, etc.

RRS Interface & Motion Library



The RRS-1 interface specifications are fully implemented, and the Reflexxes Motion Library and Ruckig Online Trajectory Generator are fully supported.

Full-Featured Scene Hierarchy

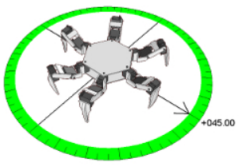


The scene composition is intuitively visualized in a scene hierarchy view, indicating object aliases, types, associated control scripts, loop closures, selection and visibility states, warnings, etc.

Convenient Model Browser

The integrated model browser supports drag-and-drop operations (also during simulation!) for convenient scene composition. The available model library, updated at each release, can be easily extended by the user

Full Interaction



Full interaction also during simulations: models, together with their associated behavior (i.e. embedded scripts) can be shifted, rotated, copy/pasted, scaled, erased, etc. without having to adjust any code

Free Educational License

CoppeliaSim edu

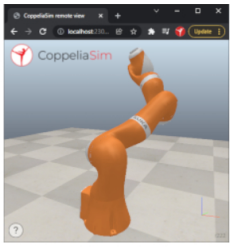
Educational entities (hobbyists, students, teachers, professors, schools and Universities) can use CoppeliaSim Edu for free. The source code of all elements is available. Refer to the licensing page for

Lite Version

CoppeliaSim lite

A CoppeliaSim Lite runtime version is available, meant to be embedded and shipped with your own application.

Many More features



e.g. three.js browser-based viewer, multilevel undo/redo, movie recorder, simulation of paint or welding seams, OC trees, point clouds, exhaustive documentation, etc.


details