Physical objects for SDF format

It would be helpful to have a **Point** (described below) as a physical object in SDF format. Listed below are four physical objects that help properly describe geometry, kinematics, mass/inertia properties, force/moment/torque, momentum and energy for rigid body dynamics (**F** = m**a**), and for robotic, biomechanic, automotive, and aerospace applications.[1]

Physical Object	Description
Point	A point is a 0-dimensional object having **translational** properties, e.g., position from another point, velocity, acceleration, jerk, and force. A point does not have rotational properties, e.g., a point does not have orientation or angular velocity. A point may or may not be part of (physically welded to) a rigid body If part of a rigid body, it must be apparent in the .sdf and urdf format. Points may be the origin of a frame, the center of mass of a body, a point on a rigid body where a force is applied, or a convenience for tracking out the path (trajectory) of contact of an object with another object. Note: A point may represent a computed location such as the center of mass of a system of bodies and/or particles and may be transient such as a contact point between two bodies.
Particle **Optional for SDF**	A particle is a point with mass. In addition to the attributes of a point, it may also have translational momentum, translational kinetic energy, etc.
Frame or RigidFrame	A RigidFrame is a 3D rigid object with a point (the frame's origin) together with a 3D rigid vector basis (e.g., three right-handed orthogonal unit vectors). The frame's 3D vector basis has **rotational** properties. These rotational properties include orientation (e.g., 3x3 rotation matrix to another frame), angular velocity, angular acceleration. Since a rigid frame has a point (its origin) with **translational** properties and has a 3D vector basis with **rotational** properties, it has combined rotational/translational properties, including spatial-position (transform), spatial-velocity ($\boldsymbol{w}$, **v**), spatial-acceleration(**α**, **a**), and spatial-force (force/torque). A frame may or may not be part of a rigid body. Frames may be the origin of a rigid body, aligned with the principal inertia axis of a rigid body, welded to a rigid body for the purpose of locating a joint or constraint (e.g., a revolute joint), or used for tracking a camera, etc.
RigidBody	A rigid body is a rigid frame together with mass, center of mass, and inertia properties. In addition to the attributes of a rigid frame, it may also have translational/angular momentum, kinetic energy, etc. It can be useful to combine a rigid body's rotational/translational properties, e.g., combine linear/angular momentum into spatial momentum and combine effective force and moment of effect force into spatial effective force. Note, it is important to distinguish a RigidBody from a Body, as flexible bodies (which are also bodies) share many properties of a rigid body (e.g., momentum, kinetic energy, etc).

[1] E-mailed May 15, 2017 to Nate Koening (OSRF) from Paul Mitiguy. Notes from meetings on SDF/ URDF parsers with Nate Koening (OSRF), Adam Leeper (Google), Terry Denery (Mathworks), Paul Mitiguy (TRI/Stanford).