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| Project | **Specification of Sensor Interface for Cyber and Physical World**<<https://sagroups.ieee.org/2888/> **>** |
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| Source(s) | Sang-Kyun Kim, goldmunt@gmail.com (Myongji University)Min Hyuk Jeong, jmh8900@gmail.com (Myongji University) |
| Re: |  |
| Abstract | This contribution illustrates the JSON schema structure for representing tracking sensor data in the physical world in a standardized data format. The semantics and examples of the tracking sensor information are presented.  |
| Purpose | To start discussion on purpose of the standard |
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# Introduction

This contribution illustrates the JSON schema structure for representing tracking sensor data in the physical world in a standardized data format. The semantics and examples of the tracking sensor information are presented.

# Tracking sensor data

## Message time type

### General

This subclause specifies a sensor data type, which describes values related to time.

### Syntax

|  |
| --- |
| "messageTimeType": { "type": "object", "properties": { "messageTimeSec": { "type": "number", }, "messageTimeFracSec": { "type": "number", },}, "additionalProperties": false "maxProperties": 1 }, |

### Semantics

Semantics of the messageTimeType:

|  |  |
| --- | --- |
| Name | Definition |
| messageTimeType | Tool for describing sensor information acquisition time. The time is defined with either messageTimeSec or messageTimeFracSec. |
| messageTimeSec | Describes the sensor information acquisition time with an elapsed time(second) from 01.01.1970 |
| messageTimeFracSec | Describes the sensor information acquisition time with an elapsed time(millisecond) from 01.01.1970 |

### Examples

This example indicates that the sensor information was acquired in 1624695473 seconds later from 01.01.1970. In general time, it is Saturday, Jun 26th, 2021, 17:17:53 UTC+0900.

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| {“messageTimeType”: { “messageTimeSec”: 1624695473}} |

## Tracker position

### General

This subclause specifies a sensor data type, which describes the position of the tracker.

### Syntax

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| --- |
| "trackerPositionSensorData": { "type": "object", "properties": { "position": { "$ref": "#/definitions/float3DVectorType" }, "orientationInQuaternion": { "$ref": "#/definitions/float4DVectorType" }  } "additionalProperties": false }, |

### Semantics

The semantics of the trackerPositionSensorData:

| Name | Definition |
| --- | --- |
| trackerPositionSensorData | Tool for describing sensor data concerning the tracker sensor’s position. |
| position | It describes the position of the tracker in a large space measured in meters. The position is described in the order of x, y, and z. |
| orientationInQuaternion | It describes the orientation of the tracker in a large space. The quaternion is described in the order of x, y, z and w. |

### Examples

In this example, the measured tracker position has x, y, and z values of 12 meters, 20 meters, and 1.8 meters, respectively. And the sensor is oriented towards the x-axis and rotated 30 degrees around the x-axis.

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| {“sensedInfoBaseAttributes”: {},“trackerPositionSensorData ”: { “position”: [12, 20, 1.8], "orientationInQuaternion": [1.0, 0, 0, 30]}} |

## Tracker velocity

### General

This subclause specifies a sensor data type, which describes the velocity of the tracker.

### Syntax

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| --- |
| "trackerVelocitySensorData": { "type": "object", "properties": { "velocity": { "$ref": "#/definitions/float3DVectorType" }, "deltaOrientationInQuaternion": { "$ref": "#/definitions/float4DVectorType" }  } "additionalProperties": false }, |

### Semantics

The semantics of the tackerVelocitySensorData:

| *Name* | *Definition* |
| --- | --- |
| trackerVelocitySensorData | Tool for describing sensor data concerning the tracker’s velocity. |
| velocity | It describes the velocity of the tracker in a large space measured in meters/second. The velocity is described in the order of x-direction, y-direction, and z-direction. |
| rotationSpeedInQuaternion | It describes the rotation speed (delta orientation) of the tracker in a large space. The quaternion is described in the order of x, y, z and w. |

### Examples

In this example, the sensor sensed that it was moving at 1.2 m/s in the x-axis and 1.5 m/s in the y-axis.

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| {“sensedInfoBaseAttributes”: {},“trackerVelocitySensorData”: { “velocity”: [1.2, 1.5, 0]}} |

## Tracker acceleration sensor

### General

This subclause specifies a sensor data type, which describes the acceleration of the tracker.

### Syntax

|  |
| --- |
| "trackerAccelerationSensorData": { "type": "object", "properties": { "acceleration": { "$ref": "#/definitions/float3DVectorType" }, "rotationalAccelerationInQuaternion": { "$ref": "#/definitions/float4DVectorType" }, "unitTimeForRA": { "type": "number", }, } "additionalProperties": false }, |

### Semantics

The semantics of the trackerAccelerationSensorData:

| *Name* | *Definition* |
| --- | --- |
| trackerAccelerationSensorData | Tool for describing sensor data concerning the tracker’s acceleration. |
| acceleration | It describes the acceleration of the tracker in a large space measured in meters/second/second. The acceleration is described in the order of x-direction, y-direction, and z-direction. |
| rotationalAccelerationInQuaternion | It describes the rotational acceleration (delta delta orientation) of the tracker in a large space. The quaternion is described in the order of x, y, z and w. |
| unitTimeForRA | It describes the unit time (in seconds) for calculating rotational acceleration. |

### Examples

In this example, the sensor sensed that it was accelerating at -0.5 m/s2 in the x-axis and 1.0 m/s2 in the z-axis.

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| --- |
| {“sensedInfoBaseAttributes”: {},“trackerAccelerationSensorData”: { “acceleration”: [-0.5, 0, 1]}} |