|  |  |
| --- | --- |
| Project | **Specification of Sensor Interface for Cyber and Physical World**<<https://sagroups.ieee.org/2888/> **>** |
| Title | **Syntax and semantics of environmental sensor data** |
| DCN | **2888-20-0025-00-0001** |
| Date Submitted | **July 20, 2020**  |
| Source(s) | Sang-Kyun Kim, goldmunt@gmail.com (Myongji University)Min Hyuk Jeong, jmh8900@gmail.com (Myongji University)Kyoungro Yoon, yoonk@konkuk.ac.kr (Konkuk University)Sangkwon Jeong, ceo@joyfun.kr (Joyfun)HyeonWoo Nam, hwnam@dongduk.ac.kr (Dongduk Women’s University)Dong Soo Choi, soochoi@dau.ac.kr (Dong-A University)Jeonghwoan Choi jordhanchoi@skonec.com (Skonec Entertainment) |
| Re: |  |
| Abstract | This contribution illustrates the basic JSON schema structure for representing environmental sensor information in the physical world in a standardized data format. The semantics and examples of the environmental sensor information are presented.  |
| Purpose | To start discussion on purpose of the standard |
| Notice | This document has been prepared to assist the IEEE 2888 Working Group. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein. |
| Release | The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE’s name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE’s sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that IEEE 2888 may make this contribution public. |
| Patent Policy | The contributor is familiar with IEEE patent policy, as stated in [Section 6 of the IEEE-SA Standards Board bylaws](http://standards.ieee.org/guides/opman/sect6.html#6.3) <[http://standards.ieee.org/guides/bylaws/sect6-7.html#6](http://127.0.0.1:4664/cache?event_id=757737&schema_id=1&s=5X0vID10lu_E6yrIkWkNd4Wz2H8&q=hancock)> and in *Understanding Patent Issues During IEEE Standards Development* <http://standards.ieee.org/board/pat/faq.pdf> |

# Data formats for environmental sensors

## Ambient light sensor

### General

This sub-clause specifies a sensor data type, which describes a light intensity and its color.

### Syntax

|  |
| --- |
| "lightSensorType": { "type": "object", "properties": { "value": { "$ref:": "#/definitions/colorWType" }, "unit": { "$ref": "#/definitions/unitType" }, "color": { "%ref": "#/definitions/colorType" }, "colorValue": { "%ref": "#/definitions/colorValueType" }, "model": { "$ref": "#/definitions/colorSpaceType" } } }, "colorWType": { "type": "array", "items": [ { "type": "number" }, { "type": "string", "pattern": "#[0-9A-Fa-f]{2}" } ] }, "colorValueType": { "type": "array", "items": [ { "type": "number", } ], "minItems": 3, "maxItems": 3 }, "colorSpaceType": { "type": "string", "enum": [ "XYZ", "Yxy", "Lab", "Lch", "LUV", "HunterLab" ] },} |

### Semantics

Semantics of the lightSensorType:

| *Name* | *Definition* |
| --- | --- |
| lightSensorType | Tool for describing sensed information with respect to a light sensor. |
| value | Describes the sensed intensity of the light with respect to the unit defined in the unit attribute. This attribute can be used to represent “White” when the light sensor senses “RGBW”. |
| unit | Specifies the unit of the sensed value as a reference to a term that shall be using the valueType. |
| color | Describes the list of colors which the light sensor can sense either as a reference to a term that shall be using the colorType. |
| colorWType | Tool for describing a color in 1 byte (256 level) value of White. |
| colorValue | Describes the sensed values of a color sensor with respect to color space models. |
| model | Describes the color model of the sensed values from a color sensor using colorSpaceType.  |
| colorValueType | Describes three values from a color sensor. The meaning of the three values is determined by the color space model. EXAMPLE The color model *CIEXYZ* would have three values of *X*, *Y*, and *Z* in order. |
| colorSpaceType | The color space models utilized by a color sensor are *Yxy*, *CIEXYZ*, *CIELAB*, *CIELCH*, *CIELUV*, and *Hunter Lab*.  |

### Examples

The light sensor detected 200 lux of light. Colors represent blue with 0.14, 0.8, and 0.78 in the CIE XYZ color space

|  |
| --- |
| { “sensedInfoBaseAttributes”:{}, “lightSensorType”: {“value”: [200],“unit”: “lux”,“colorValue”: [0.14, 0.8, 0.78],“model”: “XYZ”}} |

## Ambient noise sensor

### General

This sub-clause specifies a sensor data type, which describes an ambient noise and its duration.

### Syntax

|  |
| --- |
| "ambientNoiseSensorType": { "type": "object", "properties": { "lifespan": { "type": "number" }, "value": { "type": "number" }, } } |

### Semantics

Semantics of the ambientNoiseSensorType:

| *Name* | *Definition* |
| --- | --- |
| ambientNoiseSensorType | Tool for describing sensed information using an ambient noise sensor. |
| lifespan | Describes the duration taken to measure the information based on the timestamp. The unit of lifespan is the internal clock count. |
| value | Describes the sensed value of the ambient noise with respect to decibel (dB). |

### Examples

The ambient noise intensity is measured every 100 ticks of the clock in the ambient noise sensor. The ambient noise measured is 10 decibels.

|  |
| --- |
| {“sensedInfoBaseAttributes”:{},“ambientNoiseSensorType”: { “lifespan”: 100, “value”: 10,}} |

## Temperature sensor

### General

This sub-clause specifies a sensor data type, which describe a temperature.

### Syntax

|  |
| --- |
| "temperatureSensorType": { "type": "object", "properties": { "value": { "type": "number" }, "unit": { "$ref": "#/definitions/unitType" } } }, |

### Semantics

Semantics of the temeratureSensorType:

| *Name* | *Definition* |
| --- | --- |
| temperatureSensorType | Tool for describing sensed information with respect to a temperature sensor. |
| value | Describes the sensed value of the temperature with respect to the unit defined in the unit attribute. |
| unit | Specifies the unit of the sensed value as a reference to a term that shall be using the unitType. |

### Examples

The measured temperature is 36.5 C˚.

|  |
| --- |
| {“sensedInfoBaseAttributes”:{},“temperatureSensorType”: { “value”: 36.5, “unit”: “celsius”}} |

## Humidity sensor

### General

This sub-clause specifies a sensor data type, which describe a humidity.

### Syntax

|  |
| --- |
| "humiditySensorType": { "type": "object", "properties": { "value": { "type": "number" }, } }, |

### Semantics

Semantics of the humiditySensorType:

| *Name* | *Definition* |
| --- | --- |
| humiditySensorType | Tool for describing sensed information with respect to a humidity sensor. |
| value | Describes the value sensed by the humidity sensor with respect to percentage (%). |

### Examples

The humidity measured was 60%.

|  |
| --- |
| {“sensedInfoBaseAttributes”: {},“humiditySensorType”: { “value”: 60,}} |

## Wind sensor

### General

This sub-clause specifies a sensor data type also known as “anemometer”, which measures a velocity of wind at a certain position.

### Syntax

|  |
| --- |
| "windSensorType": {"$ref": "#/definitions/velocitySensorType"},"velocitySensorType": {"type": "object","properties": {"velocity": {"$ref": "#/definitions/float3DVectorType"},"unit": {"$ref": "#/definitions/unitType" } }}, |

### Semantics

Semantics of the windSensorType:

| *Name* | *Definition* |
| --- | --- |
| windSensorType | Tool for describing sensed information captured wind sensor. |
| velocity | Describes the speed and direction of a wind flow with respect to the unit defined in the unit attribute. Values represent the wind speeds from the x, y, and z directions, respectively.  |
| unit | Specifies the unit of the sensed value as a reference to a term that shall be using the unitType.  |

### Examples

In this example, the velocities of wind measured were 1m/s from x direction, 0.7m/s from y direction, and 3.5m/s from z direction.

|  |
| --- |
| {“sensedInfoBaseAttributes”: {},“windSensorType”: { “velocity”: [1, 0.7, 3.5] “unit”: “meterpersec”}} |

## Gas sensor

### General

This sub-clause specifies a sensor data type, which describes a gas type and its gas concentration degree.

### Syntax

|  |
| --- |
| "gasSensorType": { "type": "object", "properties": { "gasType": { "$ref": "#/definitions/gasType"}, "value": { "type": "number" }, "unit": { "$ref": "#/definitions/unitType" } } |

### Semantics

Semantics of the gasSensorType:

| *Name* | *Definition* |
| --- | --- |
| gasSensorType | Tool for describing sensed information with respect to a gas sensor. |
| gasType | Specifies the type of gas as a reference to a term provided by gasType. |
| value | Describes the sensed gas concentration value by the gas sensor with respect to the unit defined in the unit attribute. |
| unit | Specifies the unit of the sensed value as a reference to a term provided by UnitType. |

### Examples

In this example, gas sensor measured 100ppm of methane.

|  |
| --- |
| {“sensedInfoBaseAttributes”: {},“gasSensorType”: { “gasType”: “methane”, “value”: 100, “unit”: “ppm”}} |

## Dust sensor

### General

This sub-clause specifies a sensor data type, which describes a dust concentration value without identifying the type of dust.

### Syntax

|  |
| --- |
| "dustSensorType": { "type": "object", "properties": { "value": { "type": "number" }, "unit": { "$ref": "#/definitions/unitType" } } }, |

### Semantics

Semantics of the dustSensorType:

| *Name* | *Definition* |
| --- | --- |
| dustSensorType | Tool for describing sensed information with respect to a dust sensor. |
| value | Describes the sensed dust concentration value by the dust check with respect to the unit defined in the unit attribute. |
| unit | Specifies the unit of the sensed value as a reference to a term provided by UnitType. |

### Examples

The dust concentration value measured was 100 micro gram per cubic meters.

|  |
| --- |
| {“sensedInfoBaseAttributes”: {},“dustSensorType”: { “value”: 100, “unit”: “microgpcm”}} |