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| Project | **Standard for Actuator Interface for Cyber and Physical World**<https://sagroups.ieee.org/2888/ **>** |
| Title | **Environmental Change Related Actuator Capabilities** |
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| Re: |  |
| Abstract | This contribution proposes syntax, semantics and example of the environmental changing related actuator capability. |
| Purpose | To start discussion on purpose of the standard |
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# Introduction

This contribution proposes syntax and semantics of the enviromental changing related actuator capability description vocabulary which comprises the following actuators:

* Sprayer actuator capability
* Fog actuator capability
* Wind actuator capability
* Bubble actuator capability

# Data formats for environmental changing related capabilities

* 1. Sprayer actuator capability
		1. General

This Subclause specifies syntax and semantics of sprayer capabilities of spray actuators.

* + 1. Syntax

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| --- |
| "sprayerActuatorCapabilityData":{ "type": "object", "properties":{ "sprayingType": { "$ref": "#/definitions/sprayingType", }, "maxIntensity": { "type": "integer", },  "unit": { "$ref": "#/definitions/unitType" }, "numOfLevels": { "type": "integer", "minimum": 1 } }, "required":[ "sprayingType" ], "additioanlProperty": false }, |

* + 1. Semantics

The semantics of the sprayerActuatorCapabilityData:

| *Name* | *Definition* |
| --- | --- |
| sprayerActuatorCapabilityData | Provide a structure for describing a command for a spraying actuator. |
| sprayingType | Describes the type of material that the sprayer can spray as a reference to a classification scheme term. The reference to the classification scheme shall be done using the sprayingType. |
| maxIntensity | Describes the maximum intensity that the sprayer can provide in terms of ml/h. |
| unit | Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the maxIntensity is used, as a reference to unitType. |
| numOfLevels | Describes the number of intensity levels of the sprayer that the actuator can provide in between zero and maximum intensity. |

* + 1. Examples

This example shows the description of a sprayer actuator capability with the following semantics. The maximum intensity of the spraying amount is 10 millilitres per hour with three levels of control. This actuator has water spraying type and takes 5 milliseconds to start and 5 milliseconds to reach the target intensity. The location of the sprayer actuator is the midway side according to the position model described in locationType.

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| {"actuatorCapabilityBaseData": { "zerothOrderDelayTime": 5, "firstOrderDelayTime": 5, "locater": "midway" }, "sprayerActuatorCapabilityData": { "sprayingType": "water", "maxIntensity": 10, "numOfLevels": 3 }} |

* 1. Fog actuator capability
		1. General

This Subclause specifies syntax and semantics of fog capabilities of fog actuators.

* + 1. Syntax

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| --- |
| "fogActuatorCapabilityData":{ "type": "object", "properties":{ "maxIntensity": { "type": "integer", },  "unit": { "$ref": "#/definitions/unitType" }, "numOfLevels": { "type": "integer", "minimum": 1 } }, "additionalProperty": false }, |

* + 1. Semantics

Semantics of the fogActuatorCapabilityData:

| *Name* | *Definition* |
| --- | --- |
| fogActuatorCapabilityData | Provide a structure for describing a command for a fog actuator. |
| maxIntensity | Describes the maximum intensity that the fog can provide in terms of ml/h. |
| unit | Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the maxIntensity is used, as a reference to unitType. |
| numOfLevels | Describes the number of intensity levels of the fog that the actuator can provide in between zero and maximum intensity. |

* + 1. Example

This example shows the description of a fog actuator capability with the following semantics. The maximum intensity of the fog amount is 100 millilitres per hour with five levels of control. This actuator takes 30 milliseconds to start and 100 milliseconds to reach the target intensity. The location of the fog actuator is the back side according to the position model described in locationType.

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| {"actuatorCapabilityBaseData": { "zerothOrderDelayTime": 30, "firstOrderDelayTime": 100, "locater": "back" }, "fogActuatorCapabilityData": { "maxIntensity": 100, "numOfLevels": 5 }} |

* 1. Wind actuator capability
		1. General

This Subclause specifies syntax and semantics of wind capabilities of wind actuators.

* + 1. Syntax

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| "windActuatorCapabilityData":{ "type": "object", "properties":{ "maxWindSpeed": { "type": "integer", "minimum": 0 },  "unit": { "$ref": "#/definitions/unitType" }, "numOfLevels": { "type": "integer", "minimum": 1 } }, "additionalProperty": false }, |

* + 1. Semantics

Semantics of the windActuatorCapabilityData:

| *Name* | *Definition* |
| --- | --- |
| windActuatorCapabilityData | Provide a structure for describing a command for a wind actuator. |
| maxWindSpeed | Describes the maximum wind speed that the fan can provide in terms of Meter per second. |
| unit | Specifies the unit of the intensity, if a unit other than the default unit specified in the semantics of the maxWindSpeed is used, as a reference to unitType |
| numOfLevels | Describes the number of wind speed levels that the actuator can provide in between maximum and minimum speed. |

* + 1. Example

This example shows the description of a wind actuator capability with the following semantics. The maximum wind speed of the wind actuator (possibly a fan) is 30 meter per second. This specified actuator can support 5 levels in controlling the wind speed. This actuator takes 10 milliseconds to start and 10 milliseconds to reach the target intensity. The location of the wind actuator is the center according to the position model described in locationType.

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| {"actuatorCapabilityBaseData": { "zerothOrderDelayTime": 10, "firstOrderDelayTime": 10, "locater": "center" }, "windActuatorCapabilityData": { "maxWindSpeed": 30, "numOfLevels": 5 }} |

* 1. Bubble actuator capability
		1. General

This Subclause specifies syntax and semantics of bubble capabilities of bubble actuators.

* + 1. Syntax

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| --- |
| "bubbleActuatorCapabilityData":{ "type": "object", "properties":{ "flag":{ "type": "boolean", "default": false } }, "additionalProperty": false }, |

* + 1. Semantics

Semantics of the bubbleActuatorCapabilityData:

| *Name* | *Definition* |
| --- | --- |
| bubbleActuatorCapabilityData | Provide a structure for describing a command for a bubble actuator. |
| flag | Describes the existence of the bubble capability of the given actuator in terms of “true” and “false”. |

* + 1. Example

This example shows the description of a bubble capability with the following semantics. Since the flag is “true”, the bubble actuator is equipped with a capability of a bubble effect.

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| { "actuatorCapabilityBaseData": {}, "bubbleActuatorCapabilityData": { "flag": true }} |