

Annex A: RoIS Functional Components

(informative)

This section provides example cases of definition using RoSO. The first example focuses defining three RoIS basic functional components to illustrate the usage of RoSO ontology. RoIS specific vocabularies are defined in Section A.1, followed by three examples of RoIS functional components in sections A.2 (Person Detection), A.3 (Person Localization) and A.4 (Follow). Finally Section A.5 demonstrates how to describe additional requirements for Person Detection using RoSO vocabularies.

A.1 RoIS Functional Component Ontology

Data types of parameters are statically defined as sub classes of RoSO data types. Parameters used in RoIS functional components are defined as properties and range of them are defined upon RoSO vocabularies. RoIS basic functional components are defined as subclasses of `roso:Sensor` or `roso:Actuator`.

Table A.1: Robotic Functional Service (RoIS) Component Ontology Metadata

Metadata Term	Value
OntologyIRI	https://www.omg.org/spec/RoSO/Example/RoboticInteractionServiceComponentOntology/
<code>rdfs:label</code>	Robotic Interaction Service (RoIS) Component Ontology
<code>dct:abstract</code>	The Robotic Interaction Service Components Ontology provides vocabularies to describe RoIS basic functional components
<code>cmns-av:copyright</code>	Copyright © 2022-2025 Japan Robot Association
<code>cmns-av:copyright</code>	Copyright © 2022-2025 Korea Association of Robot Industry
<code>cmns-av:copyright</code>	Copyright © 2023-2025 Shibaura Institute of Technology
<code>cmns-av:copyright</code>	Copyright © 2023-2025 Advanced Institute of Science and Technology, Japan
<code>cmns-av:copyright</code>	Copyright © 2023-2024 Université Sorbonne Paris Nord
<code>cmns-av:copyright</code>	Copyright © 2023-2025 Object Management Group
<code>dct:references</code>	http://purl.org/dc/terms/

dct:references	http://www.w3.org/2004/02/skos/core#
dct:title	Robotic Interaction Service Component Ontology
owl:versionIRI	https://www.omg.org/spec/ROSO/20250801/Example/RoboticInteractionServiceComponentOntology/

Table A.2: Robotic Functional Service (RoIS) Component Ontology Details

Properties

Name	Annotations	Property Axioms
<i>hasDetectionRegion</i> (has detection region)	<u>Definition</u> : indicates a region in which a component can detect targets	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>roso:Region</i>
<i>hasDetectionThreshold</i> (has detection threshold)	<u>Definition</u> : indicates a spatial interval by which a component can distinguish detected targets	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>roso:SpatialInterval</i>
<i>hasDetectionTimelimit</i> (has detection timelimit)	<u>Definition</u> : indicates a time limit within which a component is expected to detect the target	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>cmns-dt:TimeInterval</i>
<i>hasMaximumInterval</i> (has maximum interval)	<u>Definition</u> : indicates a periodic interval within which a component notifies events in maximum	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>cmns-dt:TimeInterval</i>
<i>hasMinimumDistance</i> (has minimum distance)	<u>Definition</u> : indicates a minimum spatial distance that a robot can approach while following the target	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>rois:SpatialInterval</i>
<i>hasMinimumInterval</i> (has minimum interval)	<u>Definition</u> : indicates a periodic interval by which a component can detect targets	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>cmns-dt:TimeInterval</i>
<i>hasTarget</i> (has target)	<u>Definition</u> : indicates an agent or an object as a target of the function	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>cmns-pts:Agent</i> \cup <i>roso:PhysicalThing</i>
<i>hasTimeLimit</i> (has time limit)	<u>Definition</u> : indicates a time limit by which a component completes the function	<u>Parent Property</u> : <i>roso:hasAttribute</i> <u>Domain</u> : <i>roso:Function</i> <u>Range</u> : <i>cmns-dt:TimeInstant</i>

Classes

Name	Annotations	Class Expressions
AudioStreaming (audio streaming)	<u>Definition</u> : component function to transmit audio streaming	<u>Parent Class</u> : roso:Function
FaceDetection (face detection)	<u>Definition</u> : component function to count the number of faces detected in the detection region	<u>Parent Class</u> : roso:Sensing
FaceLocalization (face localization)	<u>Definition</u> : component function to localize positions of faces detected in the detection region	<u>Parent Class</u> : roso:Sensing
Follow (follow)	<u>Definition</u> : component function to move following a target agent	<u>Parent Class</u> : roso:Actuation
GestureRecognition (gesture recognition)	<u>Definition</u> : component function to recognize gestures represented by other agents	<u>Parent Class</u> : roso:Sensing
Move (move)	<u>Definition</u> : component function to move along the indicated path	<u>Parent Class</u> : roso:Actuation
Navigation (navigation)	<u>Definition</u> : component function to navigate another agent to the indicated goal point	<u>Parent Class</u> : roso:Actuation
SoundDetection (sound detection)	<u>Definition</u> : component function to count the number of sound sources detected in the detection region	<u>Parent Class</u> : roso:Sensing
SoundLocalization (sound localization)	<u>Definition</u> : component function to localize positions of sound sources detected in the detection region	<u>Parent Class</u> : roso:Sensing
SpeechRecognition (speech recognition)	<u>Definition</u> : component function to recognize speech sound to text	<u>Parent Class</u> : roso:Sensing
SpeecSynthesis (speech synthesis)	<u>Definition</u> : component function to synthesize speech sound from text	<u>Parent Class</u> : roso:Actuation
PersonDetection (person detection)	<u>Definition</u> : component function to count the number of persons detected in the detection region	<u>Parent Class</u> : roso:Sensing
PersoIdentification (person identification)	<u>Definition</u> : component function to identify persons detected in the detection region	<u>Parent Class</u> : roso:Sensing
PersonLocalization (person localization)	<u>Definition</u> : component function to localize positions of persons detected in the detection region	<u>Parent Class</u> : roso:Sensing
Reaction (reaction)	<u>Definition</u> : component function to perform motions to interact with other agents	<u>Parent Class</u> : roso:Actuation

VideoStreaming (video streaming)	<u>Definition</u> : component function to transmit video streaming	<u>Parent Class</u> : roso:Function
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A.2 Person Detection

RoIS Person Detection component has an event message called 'Person Detected.' PersonDetectionEvent is defined as a subclass of ComponentEvent, which represents the real-world event 'Person Detected.'

The relationship between function, component, and event is shown in the following figure.

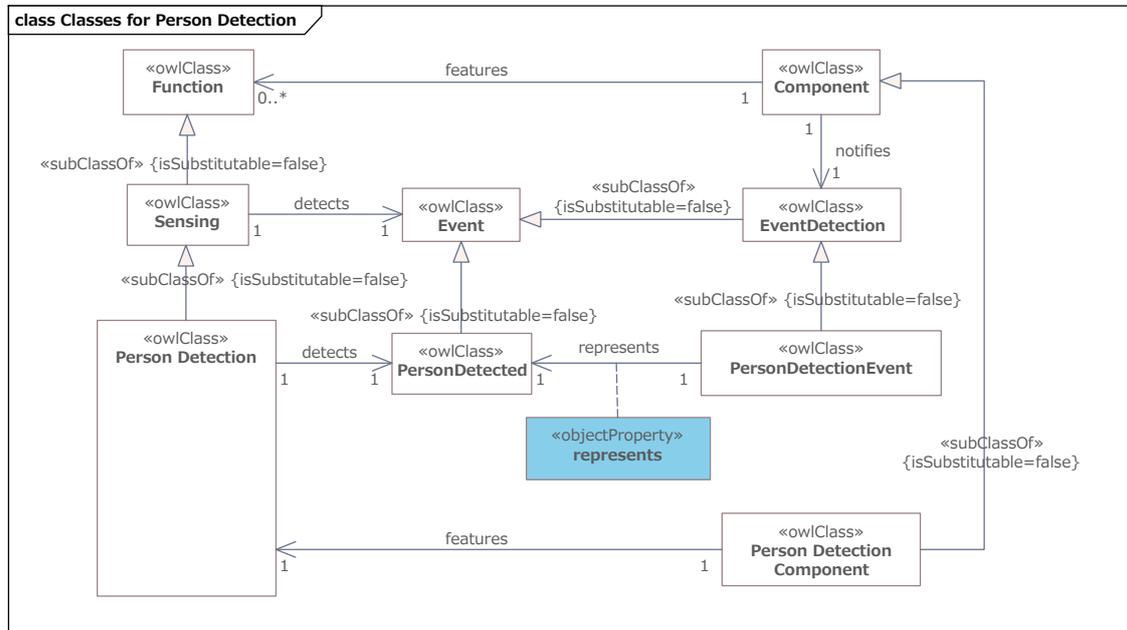


Figure 9 RoIS Person Detection Component.

A.3 Person Localization

In addition to the previous example, RoIS Person Localization component has two parameters that represent constraints to the component. It also has an event message called 'Person Localization.' The parameters as restrictions are represented on the left side of Figure 10.

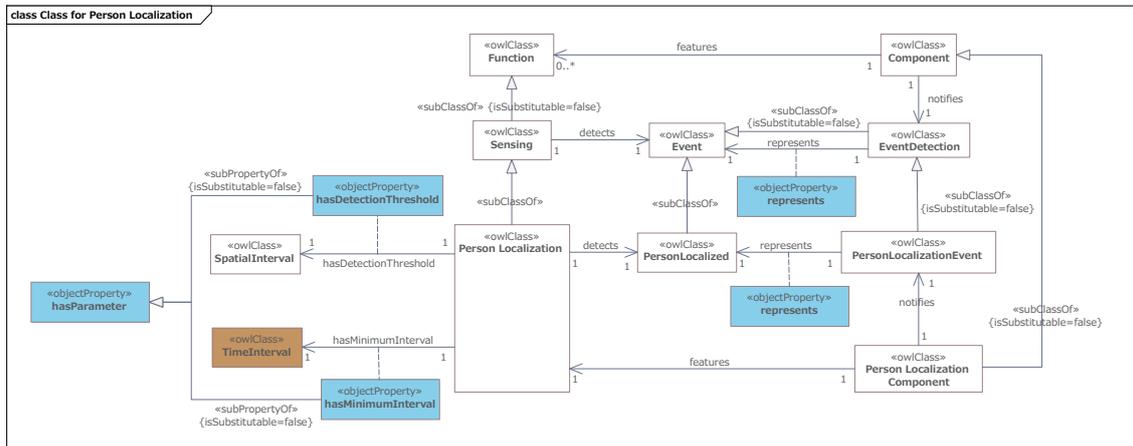


Figure 10 RoIS Person Localization Component

A.4 Follow

Different from the previous two examples, the RoIS Follow component has an actuation function. Figure 11 represents no events on the right side but several restriction parameters in the left side.

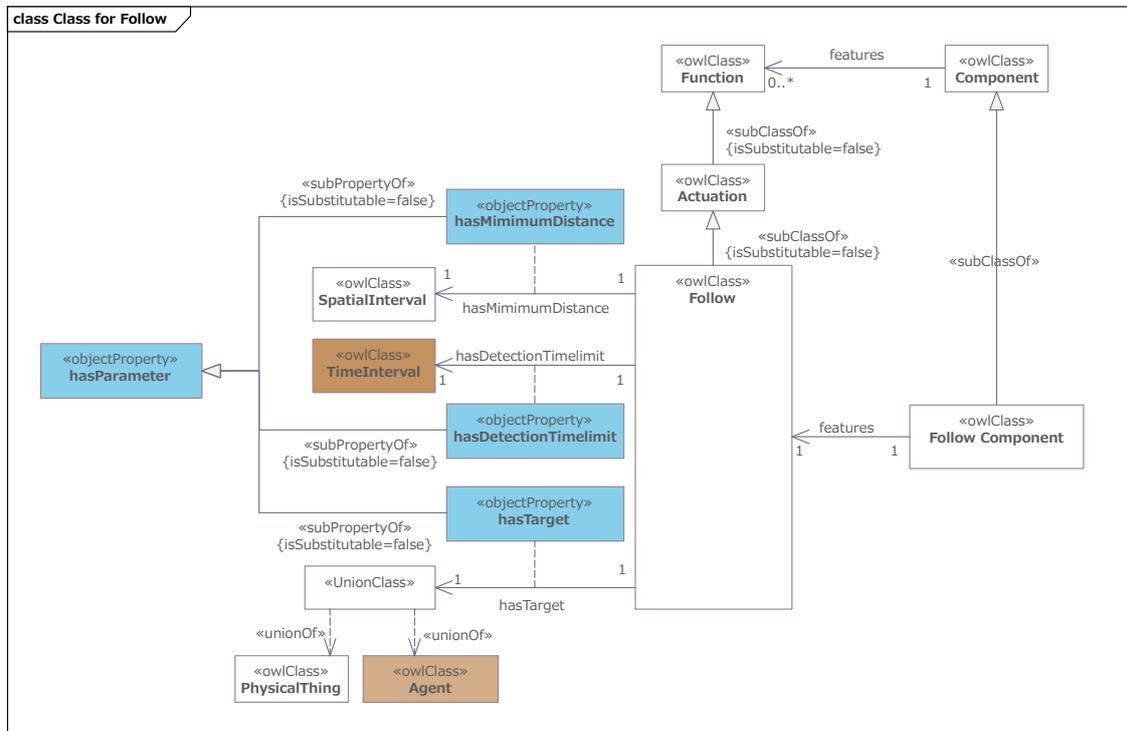


Figure 11 RoIS Follow Component

A.5 Additional Requirements for Person Detection

In addition to the requirements defined as RoIS parameters, service environments may have several extra requirements that are outside the scope of the RoIS message definitions, as both components and service applications cannot affect such values. Examples of additional requirements for Person Detection are shown on the left side of Figure 12.

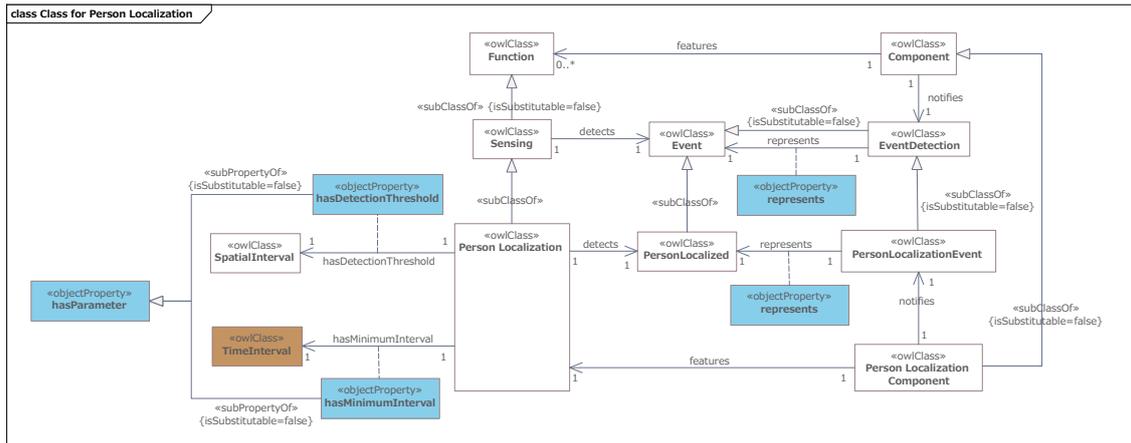


Figure 12 RoIS Person Detection Component with extra requirements