BFO - Domain ontology of a hydroponic plant
Federal University of Rio Grande do Sul
CMP196 - Ontology Engineering

HYDROPONIC DOMAIN ONTOLOGY

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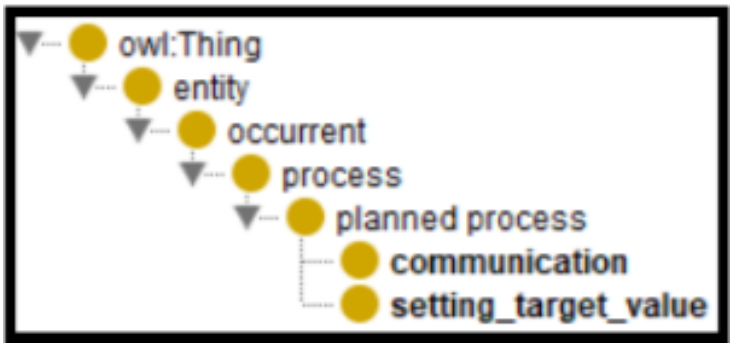
The domain of work is the production of nutrient solution for hydroponic farming, which is a method of growing plants without soil, using only water and nutrients. The work proposes a domain ontology based on BFO to represent the concepts and relationships involved in this domain, such as devices, sensors, actuators, communication protocols, industrial assets, tanks, valves, pumps, filters, solutions, pH, electrical conductivity, level, etc. The objective of the ontology is to provide a knowledge base for a system that is capable of communicating between different devices, using the information provided by the ontology, and ensuring interoperability and reuse of the ontology in different systems.

Towards the end of this report, there's a useful table that gives an overview of all the entities and relationships that have been modeled. The table encapsulates the key elements and their interconnections in the context of the ontology presented.

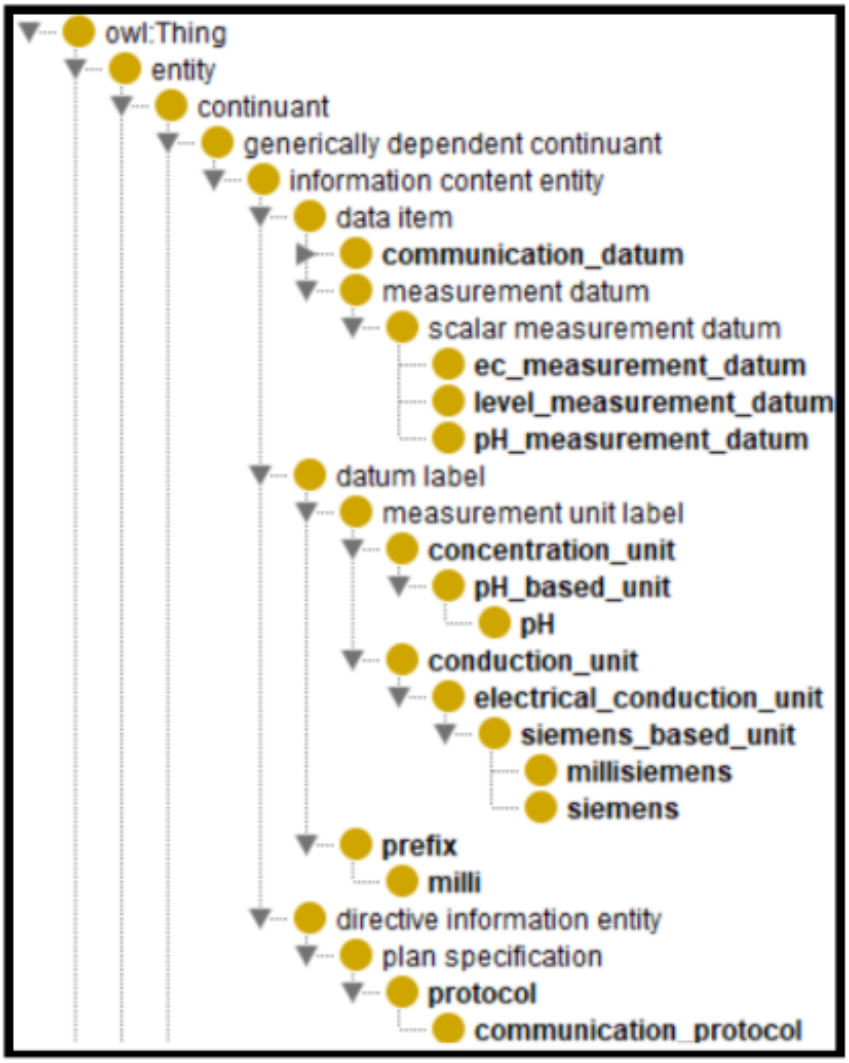
The following Protegé tree screenshots show the modeled entities in the BFO ontology tree:

Figure 1: Planned processes.



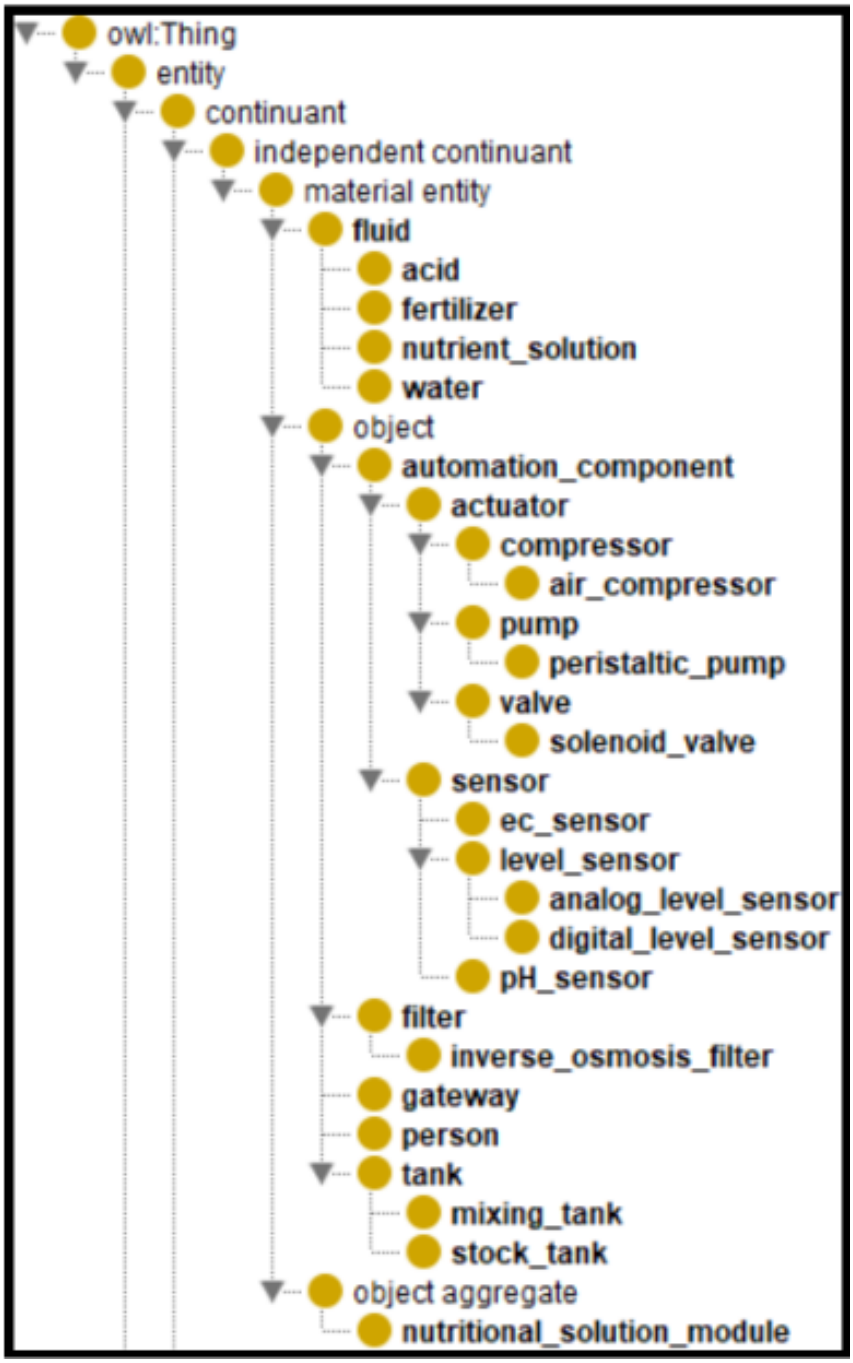
Fonte: Os autores.

Figure 2: Information Content Entities.



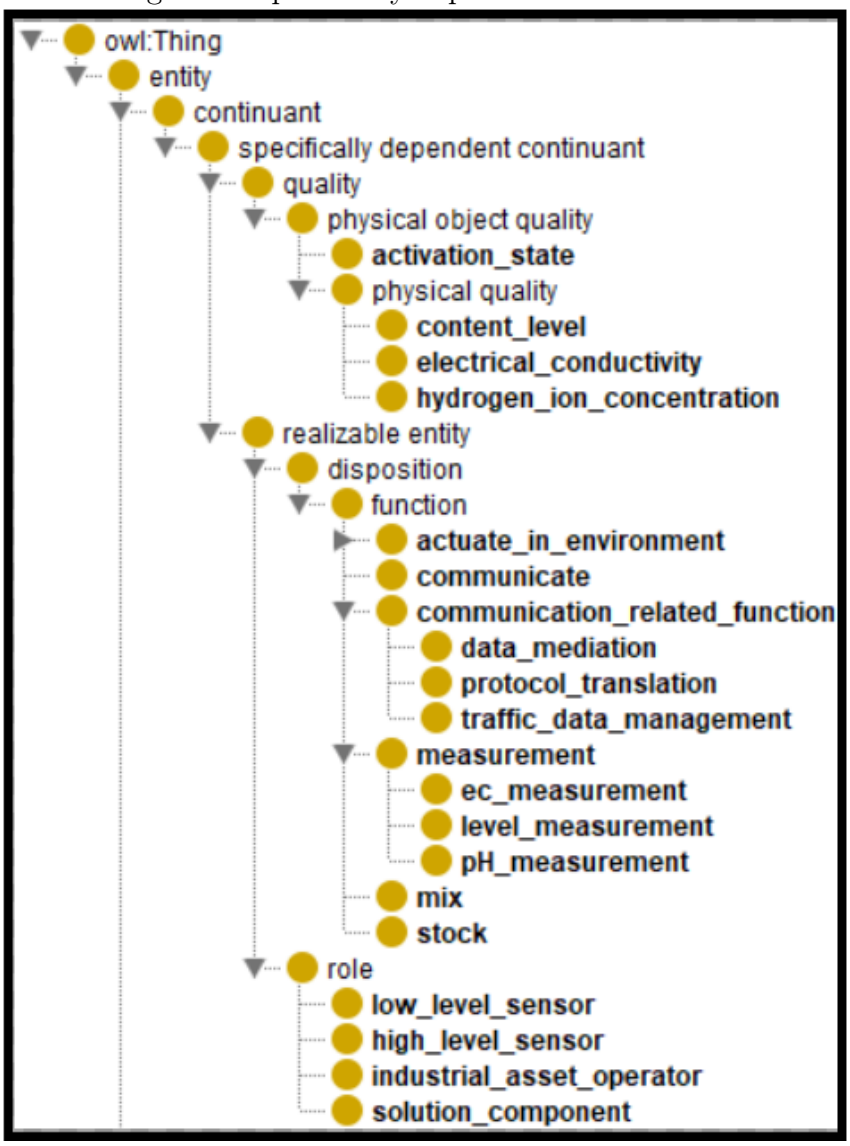
Fonte: Os autores.

Figure 3: Material Entities.



Fonte: Os autores.

Figure 4: Specifically dependent continuants.



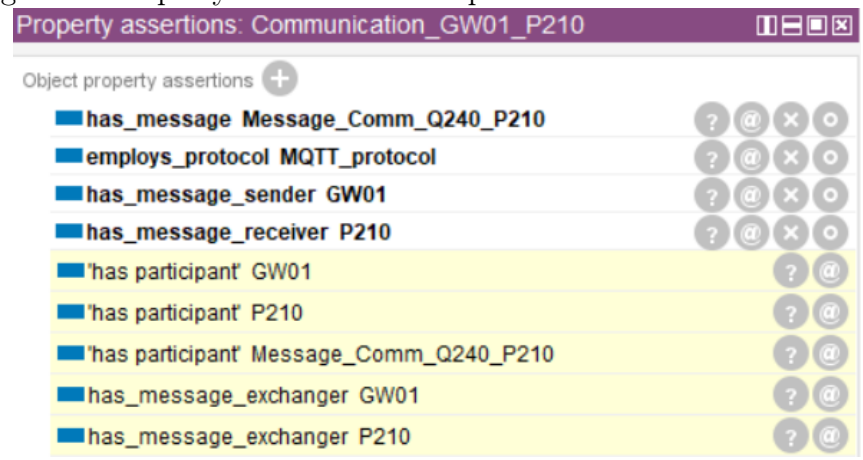
Fonte: Os autores.

Continuantes			Ocorrentes	Relações
Dependentes		Independentes	communication	carried_by
Genericamente	Especificamente	acid	setting_target_value	carries_data
message	activation state	fertilizer		communicates_with
ec_measurement_datum	content level	nutrient_solution		employs_protocol
level_measurement_datum	electrical_conductivity	water		has_message
pH_measurement_datum	hydrogen_ion_concentration	air_compressor		has_message_receiver
pH (based unit)	flow_control	peristaltic_pump		has_message_sender
siemens (elec. Cond. unit)	increase_pressure	solenoid_valve		has_prefix
millisiemens (elec. Cond. unit)	transport_fluid	ec_sensor		has_unit
milli (prefix)	communicate	digital_level_sensor		is_compatible_with
communication_protocol	data_mediation	analog_level_sensor		is_covered_by
	protocol_translation			is_measured_by
	traffic_data_management			is_mediated_by
	ec_measurement			is_mixed_by
	level_measurement			is_prefix_of
	pH_measurement			is_stocked_by
	mix			is_unit_of
	stock			measures
	industrial_asset_operator			mediates
	solution_component			mixes
	analog_level_sensor			exchanges_message_in
	digital_level_sensor			is_message_of
				phically_connected_with
				stocks

The following represents the key inferences made by the Hermit reasoner.

1. Participants in a communication instance include the sender and receiver, the protocol used, and the message itself, as shown in the screenshot below:

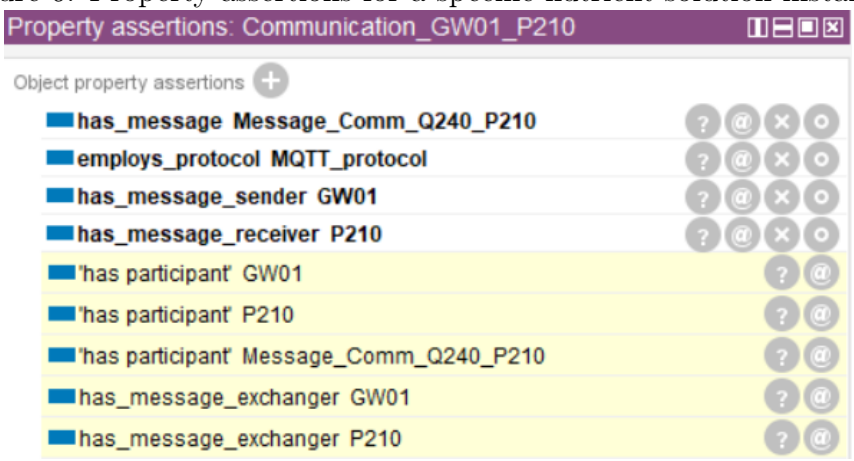
Figure 5: Property assertions for a specific communication instance.



Fonte: Os autores.

2. For a nutrient solution instance, the reasoner identifies qualities such as EC and pH, as can be seen in the image below.

Figure 6: Property assertions for a specific nutrient solution instance.



Fonte: Os autores.

Below is the link to the GitHub repository containing the OWL file to be imported into Protegé, encompassing the entire developed domain ontology.

`http://bit.ly/Hydroponic-Ontology`