Ontology Report

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Link to download the ontology:
https://github.com/aleksamarusic/IA301-Ontology-project/blob/main/IA301Exam.owl

Introduction

This ontology addresses one of the most important topics today - the health crisis linked to COVID-19. Its aim is to assess the dangerousness of places according to different factors and to track the spread of the virus in order to protect the population.

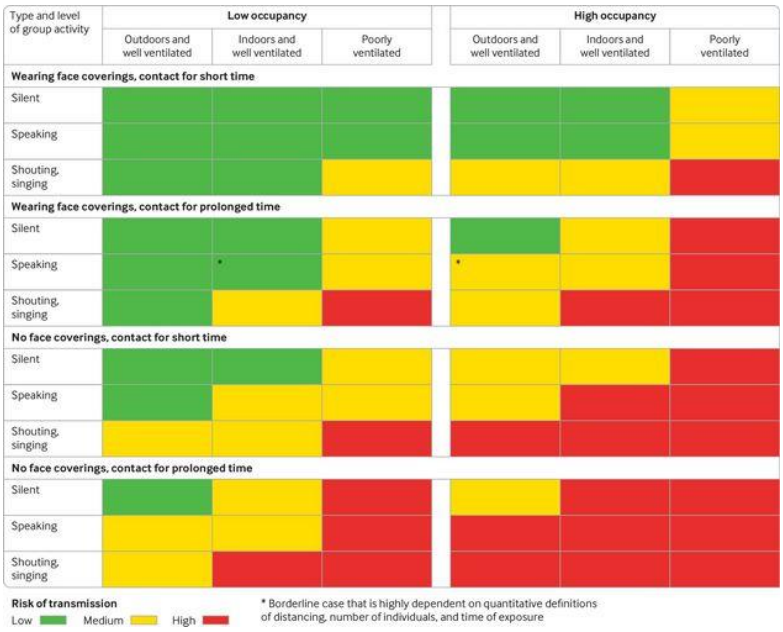
Description of our ontology and a problem it solves

As we have just explained in the introduction, our ontology fits into one main subject, the Covid-19 health crisis. Protection of population from the virus is the highest priority and, nowadays, it has become the centre of our concerns. One thing that can help to prevent spreading of the virus as much as possible is to raise awareness of responsible behaviour so that the population is aware of the dangers. The identification of the places and clusters of contamination as well as their level of dangerousness is a key element in the fight against the virus. We assume here that we have the GPS data of the individuals as well as their status in relation to the Covid (positive or not). This ontology will therefore respond to the following problem, identification of potential contamination sites, as well as the level of risk for each site declared as potentially contaminating, according to the characteristics of the site.

Justifications of our ontology design decisions

We have tried to reproduce a real environment. We consider a group of 15 people (than can constitute a cluster), each of whom carries out different activities in different parts of his or her place of residence (of course, we consider that these 15 people live in the same town). So first we have a class *Person* with several persons in it and the first reasoning will be whether a person is dangerous (in the contaminating sense or not). In order to do so, we reasoned by grouping together all the people who are positive or who do not respect the barrier actions as potentially negative people.

Then we have a class *Place* with subclasses (indoor_places, outdoor_places…) and we considered a property between places and person allowing to see whether a person visited a place or not and we naturally reason as follow, each place visited by a person who did not respect the barrier gestures or was positive to Covid, will be considered as an unsafe place and therefore a potential cluster place for the covid.



Finally, based on the studies provided in these resources:
• https://www.huffingtonpost.fr/entry/coronavirus-situation-plus-ou-moins-a-risque- tableau_fr_5f4955abc5b64f17e13d7bd8
• https://www.gov.uk/guidance/new-national-restrictions-from-5-november
• https://www.gouvernement.fr/info-coronavirus#:~:text=Dans%20le%20cadre%20du%20confinement,kilom%C3%A8tre%20autour%20de%20son%20domicile,
we have carried out a reasoning that estimates the level of dangerousness of each place, and to what extent these can be the origin of the cluster.
Notice two things:

- We perform reasoning in order to "classify" places in a general way, (very low, low, medium…) in the classes we have formed based on sources from different countries (as it can be seen above).

- The characteristics of the places initially instantiated are made again according to logic and sanitary restrictions and law implemented in the country (for example you need to wear face coverings at work in many countries nowadays). However, our ontology is enough robust to still characterize and give a level of risks, in a lot of situations where places are not following the common rules imposed by place (for example if we have a work place not respecting the face coverings rule) the reasoning will still allow to give a risk for this place which will be higher than expected in this place) as we have generic classes and reasoning to handle that.

Using ontology as described and implemented here, we were a able to perform a reasoning in order to define places that are more (or less) likely to be the origin of a certain cluster in the population, but also to understand which are the risky places to tell the population.

UN SDG problem

The Sustainable Development Goals are the blueprint to achieve a better and more sustainable future for all. They address the global challenges we face, including poverty, inequality, climate change, environmental degradation, peace and justice. There are 17 different goals and one of them (the 3rd one) is *Good Health and Well-Being.* Its aim is to ensure healthy lives and promote well-being for all at all ages. It is not hard to notice that our problem (the problem which we are trying to address with our ontology) falls into this category as it completely aligns with the goal's area and aim.

Fixing ontology pitfalls found with OOPS! tool

We have run our ontology implementation through OOPS! – online ontology scanner and we did have some pitfalls that were marked as important. All 4 of them stated that there were object properties without domain or range (or none of them) included in the ontology. After analysing we found which four properties were and the problem and added missing domains and ranges for them (modifier_property, person_property, place_property and visit_property). Other than these there are just minor pitfalls that, as stated on the website, are not really a problem and would just make the ontology look nicer if fixed.

MIRO facts

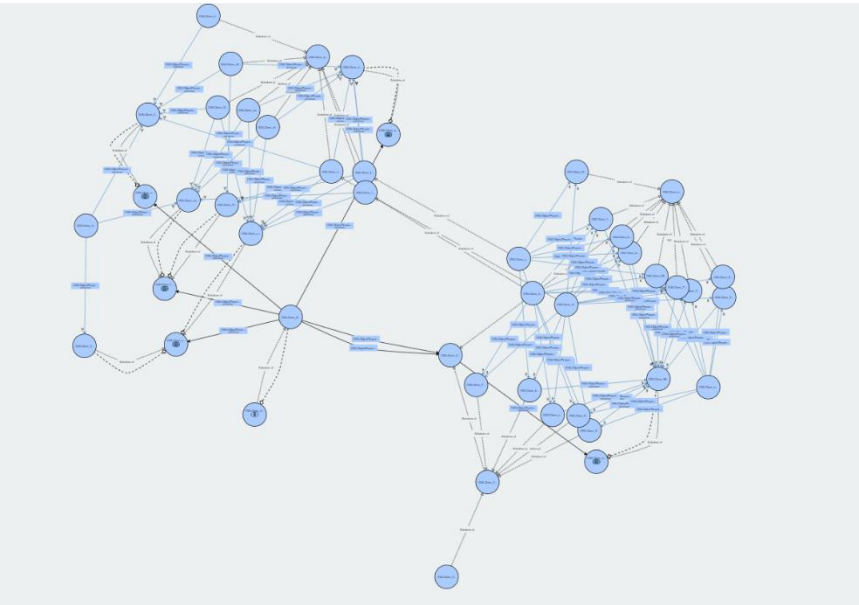
We present here a table with MIRO facts for our ontology.

Basics	
Ontology name	Assessing the Dangerousness of Places for Covid-19 Ontology (ADOPC), v1.0

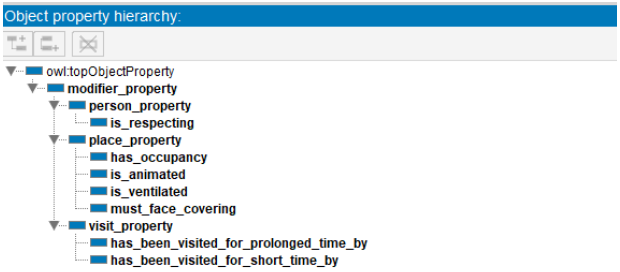
Ontology owner	CALDAS Louis, MAZEAU Brice, MARUSIC Aleksa - Institut Polytechnique de Paris
Ontology license	MIT License
Ontology URL	https://github.com/aleksamarusic/IA301-Ontology-project/blob/main/IA301Exam.owl
Ontology repository	https://github.com/aleksamarusic/IA301-Ontology-project
Methodological framework	• defining the topic • comming up with a detailed representation of ontology • agreeing on the representation and developing the ontology in Protege
Motivation	
Need	With the current situation and health crisis linked to COVID-19 this ontology is playing a big part in assessing the dangerousness of places according to different factors and tracking the spread of the virus in order to protect the population.
Target audience	Everyone. It is essential that as many people as possible use the application so the spreading of virus can be tracked more efficiently
Scope, requirements, development community	
Scope and coverage	Health, Covid-19
Development community	This ontology is developed as a group project on Logic and Symbolic AI subject at Institut Polytechnique de Paris
Communication	aleksamarusic@gmail.com louis.caldas@telecom-sudparis.eu brice.mazeau@telecom-sudparis.eu
Ontology content	
Knowledge Representation language	OWL version 4.5
Development environment	Protégé
Ontology metrics	Number of classes : 88, properties : 13, axioms and types of axioms : 549 + 349 + 99
Dereferenceable IRIs	http://www.semanticweb.org/calda/ontologies/2020/10/IA301-Ontology
Quality Assurance	
Testing	We consider a group of 15 people (than can constitute a cluster), each of whom carries out different activities in different parts of his or her place of residence (of course, we consider that these 15 people live in the same

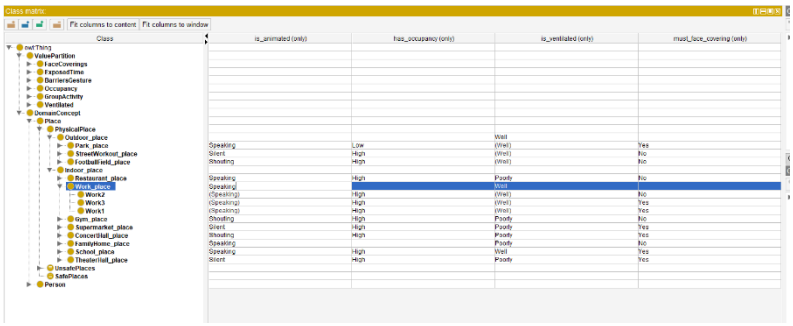
	town). In this way we simulate the real world cluster and try to see whether is out ontology working. It shows that it is logically consistent and the results are as expected.

Graph (we could not make it more clear)



Classes, data properties and object properties





Power of our ontology: