



AMBIENT INTELLIGENCE (AMI)

ASSIGNMENT ON

Ontology in Ambient Intelligence

Master of Science Robotics Engineering

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Submitted to

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Preface

The work is based on Ontology which involves the topic in Ambient Intelligence (AmI). This will deals with Ambient Intelligence application.

Acknowledgements

I take this opportunity to express my sincere thanks to Prof. ANTONIO SGORBISSA for his guidance and support. I would also like to express my gratitude towards him for showing confidence in me. It was a privilege to have a great experience working under him in a cordial environment. I am very much thankful to the *University of Genoa*, for providing me the opportunity to pursue *M.Sc in Robotics Engineering* in a peaceful environment with ample resources. In the end, I would like to acknowledge my parents, friends. Without their support, this work would not have been possible.

Abstract

*This assignment report is about the **Ontology in Ambient Intelligence** to determine about the **Ambient Intelligence application**, in the Ambient Intelligence (AmI) world. The goal in this case is that to focused on environmental intelligence rather than "robots." Also, focused on people and how they can interact with the environment and/or take benefit from it which includes sensors in the AmI. In this ontology, **TBox** and **ABox** are defined, Object and Data properties were also included and used in the TBox, individual and property assertions taken in consideration which were added to ABox, and last but not the least SWRL rules also invloved in this ontology preparation.*

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1 Introduction

This report introduces *Protégé 5* for creating *OWL ontology* as well as various plugins. Here, **Ambient Intelligence (AmI)** based **Smart Book Store Ontology** is prepared and discussed in this report. The idea is to create a smart AmI environment where readers can buy books in a fast and delight way. The objective behind this Ambient Intelligence application is that buyers encountered with many issues while buying books from the libraries or general book store. This incurs in the waste of time for the readers. the seller in the store or library is not full of knowledge for all the books and buyers deals with them in long queries to get the more information about the books. Also, in these libraries and stores the supervision is irregular and having the chance of stealing the books and vandalized the property. To overcome these problems, Ambient Intelligence (AmI) application is proposed in this *OWL ontology*. The problems were solved by this ontology are as follows:

- Due to the lack of knowledge of the seller in the store or libraries, buyer can simply scan the bar-code which is on the book cover, and this bar-code is embedded with the RFID antenna. Also, this RFID antenna easily scan by the buyer's cellphone.
- In many book stores or libraries there were no connection between the rooms and book shelves. To resolve this problem, a good connection between the rooms is included in this Ontology. Furthermore, buyers can directly search the book of their own choice which they want to buy and directly reach to that particular shelves. This is done by a stereo camera that capture buyer's image, elaborates data and send them to a computer that through an algorithm displays which room is in line with the buyers. The choice is done by selecting the icon on a screen at the door. Once selected the room, buyers can go directly to the wished one. Lastly, at the door there is a switch which is used for open it.
- Some unwanted activities such as robberies, vandalism, book's placed on incorrect shelves, and so can be incurred in any store or library. To conquer this issue stereo camera and PIR sensor is installed for the observation which will reacts to humans who are part of such kind of activities. Cases are mounted on shelves that can be opened only by switching an interrupt near them.

2 Methodology

As aforementioned all rooms in the store or library were interconnected with each other. In the starting at the entrance all the rooms were closed. Here, all the rooms having different colours of book shelves to categorize different books. Also, at the main entrance PIR sensor and Stereo Camera sensor were installed. Therefore, buyer will imitates the purchasing process from the entrance of the store or library. As mentioned above the PIR sensor and Stereo Camera will monitor the entrance of the buyers. The camera will grabs the picture of the person who entered the store or library. This will not only helps in security measures but also helps in guiding the person which room is vacant and which room is containing which type of books and in which shelf is is placed. Once near it, the person selects the place and will open the door by switching the button on the side; in this way also the selected room's door is opened, drawing a path to the desired chamber. In the room the buyer can browse book and buy them according to its need. This activity will be done by reading the bar-code from their cellphone.

Requirement for the assignment:

- At least 3 top Classes are required in the TBox (i.e., immediately below Thing).
- At least 4 Object Properties and 4 Data Properties should be created and used in the TBox.
- At least 6 Individual Assertions and 6 Property Assertions should be added in the ABox.
- Add at least two SWRL rules to try how rules work.

Architecture of the Ontology: Below shows the architecture of the proposed ontology. It comprises of TBox with top classes, classes with their sub-classes, some sub-classes having their sub-classes, and so on. These are defined below in the figure 1.

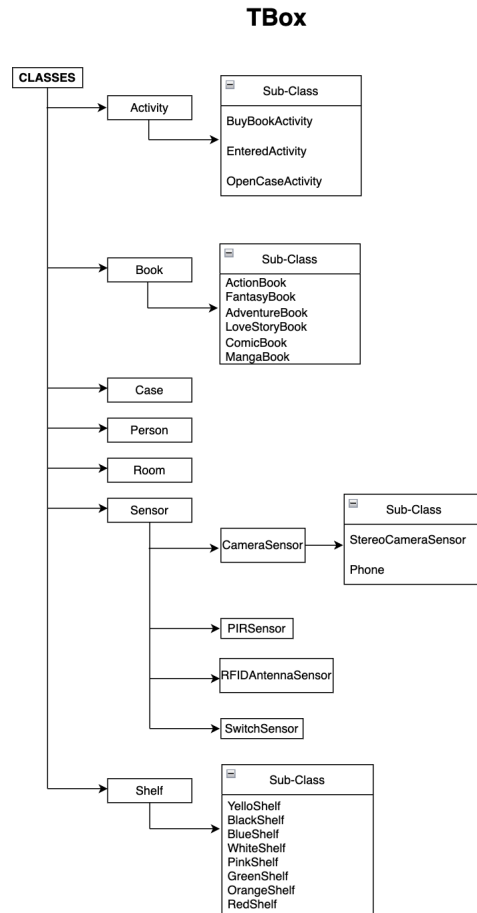


Figure 1: TBox Architecture

Figure 1 highlights the proposed architecture which consists of TBox. The figure 2, below describes the object and data properties of the proposed ontology.

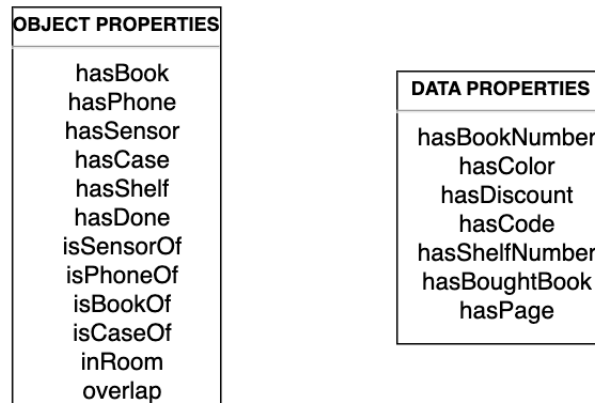


Figure 2: Properties of Ontology

SWRL RULE

For avoiding an huge enhancement of the ontology **SWRL** rule is implemented in this proposed ontology. After considering a real scenario, it is possible to has a discount of 10% on books, if a person can buy more than two. For instance, ***Person(?p) ∧ hasBoughtBook(?p, ?nb) ∧ swrlb:greaterThan(?nb, 2) -> hasDiscount(?p, 0.1)***.