Schema.org Annotation for the Interactive Map of General Solution

Abstract: Interest in semantic annotations and providing structured, well-formed and semantically consistent content data is rapidly growing. With this, the development of artificial intelligence, semantic technologies and applications based on semantic content is intensifying. Traditional websites are becoming increasingly difficult to find on the web and are therefore losing importance. To gain a certain visibility and be found in chatbots and personal digital assistants, such as: Facebook Messenger chatbots, Amazon Alexa, Cortana, Google Home, Siri and so on, the best option is to use modern technologies and semantic annotations. With schema.org annotations the visibility of the website increases through search engine optimization (SEO) and the website content becomes usable for third-party software (assistance systems) and therefore valuable.

2 http://schema.org/
Contents

1 Introduction ........................................................................................................................................3
2 What is schema.org? ........................................................................................................................3
3 Why annotate with schema.org? ......................................................................................................5
4 The use case of semantic annotations for General Solution ..................................................7
  4.1 Winter and summer sports activity ...............................................................................................8
  4.2 Ski resorts, ski slopes, ski lifts and ski schools ........................................................................9
  4.3 Accommodations ........................................................................................................................10
  4.4 Food establishment .....................................................................................................................10
  4.5 Infrastructure services .................................................................................................................11
  4.6 Events ........................................................................................................................................11
  4.7 Points of interest .........................................................................................................................11
  4.8 Annotations with multiple types .................................................................................................12
5 Intelligent Personal Assistants ......................................................................................................13
6 Chatbots ..........................................................................................................................................14
1 Introduction

At the present time, a radical change is taking place on the Internet: search engines relay on the semantics (i.e. the true meaning, relevance and context of a search) and digital assistants are turning into the main interaction between man and machine. Various tourism related information can be found at different information sources including geographical data which are usually presented on maps. Therefore, to be visible for users, service providers need to provide information and data on the web in a machine-readable and structured manner. A way to overcome data representation disparity is through semantic annotation. Semantic annotations are specifications that define the meaning of an object. They are often encoded in the form of a relationship that links the object to concepts from a vocabulary. In this paper we want to show how to annotate different touristic services, presented on the map, using the schema.org vocabulary and demonstrate how semantic annotation can be recognized by different automated agents (e.g. search engines, chatbots or personal assistant systems).

The remainder of the paper is structured as follows: Section 2 introduces schema.org vocabulary, Section 3 shows examples of using schema.org, Section 4 presents the use cases for semantic annotations, Section 5 describes Intelligent Personal Assistants and shows the example of Alexa Skill for hiking in Tyrol and Section 6 presents the Chatbot, based on annotations for Seefeld and Mayrhofen maps. Section 7 concludes the work.

2 What is schema.org?

In 2011, the four “big players” in the search engine market – Bing, Google, Yahoo! and Yandex – formed a union to make better structured content on the web and make it readable and understandable for search engines. The resulting initiative – schema.org – defines a collection of terms, and their syntax and semantics, to describe “things” on web pages. Since these so-called annotations are not visible to the user of the website, one often speaks here of “metadata” which are
integrated into the source code. As a result, search engines are increasingly becoming “answer machines”. In addition to preparing links to other websites, they can extract their content, understand it, and respond directly to a user’s request. The use of schema.org is essential for increasing the visibility of the website and returning better search results, and in the future the only way to make the content understandable to different automated agents (e.g. search engines, chatbots or personal assistant systems)\(^3\).

---

\(^3\) https://general-solution.sti2.at/
3 Why annotate with schema.org?

The reasons why schema.org should be used on every website are many and varied. Semantic SEO, for example, is concerned with making the content of web pages machine-readable by enriching the HTML code. Then search engines are able to understand the content, contextualize it and present it in a more structured and intuitive way. Rich snippets are small snippets of information that Google uses to enrich search results. Google currently offers such additional information for events, products and recipes, for example.

When looking for a room in tourist accommodation, the guest, with just a glance at the search results, can see what average rating other guests have given this property. The information that enriches the rich snippets comes from structured / annotated content of the corresponding web pages. Rich cards work the same as rich snippets, but use an even more graphical representation of the content.

Figure 2: Google Search features.
The vocabulary of schema.org is integrated into the HTML code of the website. Schema.org consists of types and properties. A type represents a crowd, such as hotels or people, or events such as events, as well as more abstract things like addresses. Properties describe elements of the set represented by a type.

Figure 3: Annotation of a hotel website in the Google Structured Data Testing Tool and Rich Card Preview.

The vocabulary of schema.org is very effective for annotating things like organizations, people, events, books and movies, accommodation and hotels, and their offers in a very detailed way, as well as fact-check reviews, courses, and food establishment menus. With schema.org annotations, data on the web get the structure and meaningfulness to be consumed by different automated services, e.g. chatbots and intelligent personal assistants.

---

4 https://search.google.com/structured-data/testing-tool
4 The use case of semantic annotations for General Solution

In this section, we discuss results from our work of annotating touristic data available in the Contwise Maps of General solutions. The Interactive Maps of the TVB Mayrhofen-Hippach\(^5\) and Seefeld\(^6\) contain a variety of tourism-related information, including hiking or biking routes, accommodation, infrastructure and so on. Besides information about geodata objects, the maps also contain metadata information about points on the map, for example, a contact point for a store, the distance or altitude of a hiking route, or real-time bus schedules at a given bus stop.

![Image of a map with various markers and information]

Figure 4: An example of the biking trail

The annotation of a tourist region presented on the interactive map covers a wide variety of areas, which are defined here:

1. Winter and summer sports activity.

---

\(^5\) [https://maps.mayrhofen.at/](https://maps.mayrhofen.at/)

\(^6\) [https://maps.seefeld.com/](https://maps.seefeld.com/)
2. Ski resorts, ski slopes, ski lifts and ski schools.
3. Accommodations.
4. Food establishment.
5. Infrastructure services.
6. Events.
7. Points of interest.
8. Annotations with multiple types.

Each tourist object from the map belongs to an object type and categories and may have some subcategory. Each category and sub-category we mapped to the types from schema.org with a defined set of properties. We provided about 200K annotations for tourism services from two maps, using about 110 different types. On the Figure 5 is shown the type distribution of the common tourist objects on the maps. [1].

![Figure 5: Type distribution of tourist objects in the Maps of TVB Seefeld and Mayrhofen](image)

**4.1 Winter and summer sports activity**

A winter sports activity is a recreational activity or sport which is played on snow or ice. Most such sports are variations of skiing, snowboarding, ice skating,
sledding, ice skating, ice hockey, curling and so on. There is no specific type in schema.org for annotation winter related sport, so type `SportsActivityLocation` is used.

<table>
<thead>
<tr>
<th>Types</th>
<th>Seefeld</th>
<th>Mayrhofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>BowlingAlley</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>ExerciseGym</td>
<td>36</td>
<td>10</td>
</tr>
<tr>
<td>GolfCourse</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>PublicSwimmingPool</td>
<td>44</td>
<td>4</td>
</tr>
<tr>
<td>SportsActivityLocation</td>
<td>2162</td>
<td>758</td>
</tr>
<tr>
<td>SportsClub</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>TennisComplex</td>
<td>20</td>
<td>8</td>
</tr>
</tbody>
</table>

*Table 1: Distribution of sports activity related types for Mayrhofen and Seefeld maps.*

A summer sports activity is represented on the map as hiking, running, biking, climbing trails, paragliding, horse riding and etc. They are annotated with the type `SportsActivityLocation`. Other types of sport have specific types, such as: `BowlingAlley`, `ExerciseGym`, `GolfCourse`, `PublicSwimmingPool`, `SportsClub`, `TennisComplex`.

### 4.2 Ski resorts, ski slopes, ski lifts and ski schools.

A ski resort is a self-contained commercial establishment that developed for skiing, snowboarding, and other winter sports and endeavors to provide most of a vacationer's wants, such as food, drink, lodging, sports, entertainment, and shopping, on the premises. In schema.org `SkiResort` has the properties inherited from `LocalBusiness`, `Place`, `Organization` and `Thing` and is a subtype of `SportsActivityLocation`.

A ski slope is a sloping surface which you can ski down, either on a snow-covered mountain or on a specially made structure. There is no specific type in schema.org for annotation, so type `SportsActivityLocation` is used.

A ski lift is a mechanism for transporting skiers up to the slope. There are no specific schema.org class for lift, that’s why types `CivicStructure` and `SportsActivityLocation` are used for annotation.
A ski school is an establishment that teaches skiing, snowboarding, typically in a ski resort. Usually ski schools represented with schema.org types LocalBusiness and EducationOrganization.

### 4.3 Accommodations

A lodging business, e.g. a hotel, hostel, resort, or a camping site, is essentially the place and local business that houses the actual units of the establishment (e.g. hotel rooms). The lodging business can encompass multiple buildings but in most cases is an individual location. The following terms describe the accommodation companies as LodgingBusiness: BedAndBreakfast, Campground, Hostel, Hotel, Motel and Resort.

<table>
<thead>
<tr>
<th>Types</th>
<th>Seefeld</th>
<th>Mayrhofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>BedAndBreakfast</td>
<td>655</td>
<td>554</td>
</tr>
<tr>
<td>Campground</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>Hostel</td>
<td>105</td>
<td>82</td>
</tr>
<tr>
<td>Hotel</td>
<td>1263</td>
<td>392</td>
</tr>
<tr>
<td>LodgingBusiness</td>
<td>1614</td>
<td>1138</td>
</tr>
<tr>
<td>Resort</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

*Table 2: Distribution of lodging business related types for Mayrhofen and Seefeld maps.*

### 4.4 Food establishment

FoodEstablishment is a food-related business, and it has in schema.org following subtypes: Bakery, BarOrPub, Brewery, CafeOrCoffeeShop, FastFoodRestaurant, IceCreamShop, Restaurant and Winery.

<table>
<thead>
<tr>
<th>Types</th>
<th>Seefeld</th>
<th>Mayrhofen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bakery</td>
<td>64</td>
<td>12</td>
</tr>
<tr>
<td>BarOrPub</td>
<td>496</td>
<td>154</td>
</tr>
<tr>
<td>Brewery</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>CafeOrCoffeeShop</td>
<td>368</td>
<td>174</td>
</tr>
<tr>
<td>FoodEstablishment</td>
<td>28</td>
<td>0</td>
</tr>
<tr>
<td>IceCreamShop</td>
<td>28</td>
<td>13</td>
</tr>
<tr>
<td>Restaurant</td>
<td>865</td>
<td>468</td>
</tr>
<tr>
<td>Winery</td>
<td>16</td>
<td>0</td>
</tr>
</tbody>
</table>
Table 3: Distribution of the food establishment types.

4.5 Infrastructure services

The infrastructure of a tourism region is manifold. Examples are transportation car rental and repairs, banks, body care, medical services, shops, ski and snowboard rental/schools.

![Infrastructure service types distribution](image)

*Figure 6: Distribution of the infrastructure service types for Mayrhofen and Seefeld maps.*

4.6 Events

*Event* is happening at a certain time and location, such as: a concert, lecture, festival and so on. Ticket information may be added via the offers property.

4.7 Points of interest

Points of interest, so interesting places in a tourism region can be very diverse. This includes a museum as well as a historical event, a beautiful vantage point or the venue of a particular event. For the semantic annotation of these reference
points are used CivicStructure, Landform, TouristAttraction, LandmarksOrHistoricalBuildings types and their subclasses.

Figure 7: Distribution of the points of interest.

### 4.8 Annotations with multiple types

A multi type entity will be required whenever the entity can’t be represented with a single type. This situation leads us to identify types that are not covered by schema.org yet, as well as to find types that share similar properties.
5 Intelligent Personal Assistants

The advance of artificial intelligence has produced many possible applications of Semantic Web. Currently one of the most widely used application are digital assistance systems, known as Intelligent Personal Assistants (IPAs). Digital assistance systems are automated programs with which the user can communicate to get questions answered, make purchases and so on (e.g. Siri, Amazon Alexa, Google Home). Most IPAs use online resources, including semantic annotated content, to answer user's questions and perform actions via voice commands using a natural language user interface. Digital assistants continue to be adopted by many people for their personal and professional lives. For example, you can stream music, get the weather and news report, dictate text messages, request an Uber ride or do some voice shopping.

Many IPAs allows developers to build and publish their own skills that enable customers to create a more personalized experience. Once the skill is published, it is available across IPA-enabled devices. There is a great opportunity, especially in the tourism sector, to make content, data, and services visible through semantic annotation to such intelligent assistance systems.
An example is the Alexa skill “Hiking in Tyrol”, which helps users to get information about different hiking trails. Users can get answers to questions about the name, location, description, length and difficulty of the road, hiking time and receive detailed information with pictures in order to help them to easily plan the trip.

6 Chatbots

A Chatbot is a computer program which is designed to simulate conversation with users via interface. Chatbots are typically used in dialog systems for various practical purposes including customer service or information acquisition. Some chatbots use semantic annotations and natural language processing systems, but many simpler systems scan for keywords within the input, then pull a reply with the most matching keywords, or the most similar wording pattern, from a database.

---

7 http://general-solution.sti2.at/#IPA
Chatbots can improve e-tourism processes especially for online marketplaces offering different services (e.g. destination management organizations, DMO), where new services can be included mostly with the cost of having semantically annotated structured data and web services. Chatbots for General Solution\(^8\) and DMOs provide information about accommodations providers, infrastructure services (e.g. restaurants, shops, gas stations, etc.), events, as well as ski and outdoor activities for that particular touristic area. Most of the answers provided by these bots are based on dynamic contents and services integrated in Onlim from various data and service providers, notably Feratel.

![Onlim chatbots for DMOs and General Solution.](image)

**Figure 11:** Onlim chatbots for DMOs and General Solution.

### 7 Conclusion

In this paper, we presented a work on the annotation of touristic services available on interactive maps of General Solutions using Schema.org. Our

---

\(^8\) [http://general-solution.sti2.at/#GSpotchatbot](http://general-solution.sti2.at/#GSpotchatbot)
intention was to provide description to all identified points of interest such that can be consumed by intelligent application, such as search engines, personal digital assistants and chatbots. In our work we analyzed data source and format, identified types and categories (including sub-categories) of available objects. For semantic annotations we used schema.org vocabulary, as it is widely adopted vocabulary which is supported by the most common search engines – Bing, Google, Yahoo! and Yandex. We produced about 200K annotations for data obtained from two maps, utilizing about 110 different types. We demonstrate examples of applications built upon semantic annotations that can be easily used by users.

References