Last train to "Rebaudengo Fossano": the case of some names in avatar translation

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Abstract

In this study, we present an unorthodox case study where cross-linguistic and cross modal information is provided by a "non-manual" channel during the process of automatic translation from spoken into sign language (SL) via virtual actors (avatars). Specifically, we blended written forms (crucially, not subtitles) into the sign stream in order to import the names of less-known train stations into Italian Sign Language (LIS). This written Italian-LIS blending is a more effective compromise for Deaf passengers than fully native solutions like fingerspelling or using the local less-known SL names. We report here on part of an ongoing project, LIS4ALL, aiming at producing a prototype avatar signing train station announcements. The final product will be exhibited at the train station of Torino Porta Nuova in Turin, Italy.

Keywords: Sign Language, Automatic translation, avatar

1. Background

Avatar technology is becoming more and more popular as a tool to implement automatic translation into sign language. Current projects investigate relatively small domains in which avatars may perform decently, like post office announcements (Cox et al., 2002), weather forecasting (Verlinden et al., 2002), the jurisprudence of prayer (Almasoud and Al-Khalifa, 2011), driver's license renewal (San-Segundo et al., 2012), and on train announcements (e.g. Braffort et al., 2010, Ebling and Glauert, 2013).

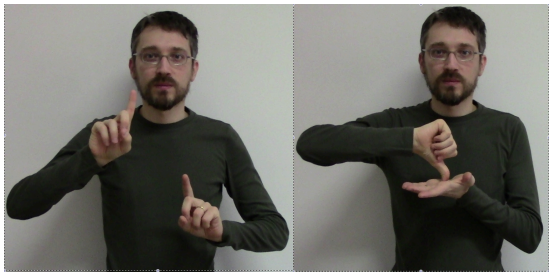
LIS4ALL is a project of automatic translation into LIS where we faced the domain of public transportation announcements. Specifically, we are developing a system of automatic translations of train station announcements from spoken Italian into LIS. The project is the prosecution of ATLAS, a project of automatic translation into LIS in the domain of weather forecasting (http://www.atlas.polito.it/index.php/en). We are using the same symbolic (rule-based) translation architecture to process the italian input and generate the final LIS string. In particular, we are enlarging the types of syntactic constructions that the avatar can translate and we are also enlarging the electronic lexicon built for ATLAS (around 1500 signs) by adding new signs specific of the train station domain. Indeed this latter was one of the most challenging aspect of the project especially once the domain of train stations is addressed. Prima facie this issue would look like a special case of proper names, something that should be easily addressed by generating specific signs (basically one for every station). However, the solution is not as simple as it seems. Indeed, several problematic aspects are hidden once looking at the linguistic situation of names in LIS (and more generally in SL).

1.1 Lexical issues

The linguistic situation of names is quite heterogeneous in LIS and can be summarized as follows:

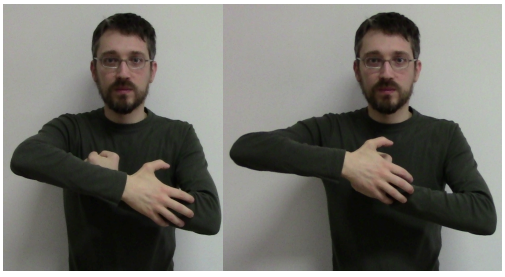
1. Sign names fully acknowledged by the Italian Deaf communities.
2. Sign names only acknowledged by (part of) the local Deaf community.
3. There is no sign name even within the local community.

The first option illustrates the case of most main stations in big cities. Normally, the name of the station is semantically transparent, as in (1a) or it involves the name of some prominent character of the Italian history, as in the case of "Milano Porta Garibaldi" (Garibaldi was the hero of the Italian unification).



(1) MILANO CENTRALE

Unfortunately, however, most of the trains go to and stop at anonymous locations. In some cases, local dialects have a specific sign for those stations (normally, the name of the town where the train stops) as in (2).



(2) CASTELVETRANO

Finally, there are Italian names for which not even the local Deaf community has already developed a local sign name. In those cases, human signers adopt the last resorts at their disposal, namely either they fingerspell the name, or they labialize it, as in the case of "Rebaudengo Fossano", a small village outside Turin.
Fingerspelling is the typical way in which borrowings from spoken languages are realized (Brentari, 2000). However, this practice is not fully adopted by the Italian Deaf communities yet. Indeed, old signers may not know the manual alphabet and in some cases they even refuse to use it, rather preferring labializing the forms in spoken Italian (Volterra, 1987 and Caselli et al., 1996).
Once we leave the domain of human signers and enter the world of avatar signers, additional issues are raised which are specifically connected to the fingerspelling and labializing strategies. Clearly, labialization is a solution that cannot be usefully pursued for practical reasons: The avatar technology is designed to be portable on different devices including smartphones. Within this framework, lipreading would be almost impossible for most users of the service. Furthermore, working in the domain of public transportation announcements, the timing issue is not trivial. Announcements are normally broadcasted and fingerspelling would introduce additional delay to the sign production, which normally is more time consuming than speech.

2. A non-manual practical solution

After having preliminarily consulted some members of the local Deaf Association of the city where the automatic translation system will be first released (ENS Torino), a twofold solution is going to be adopted:

1. Sign names fully acknowledged by the Italian Deaf communities will be maintained by the signing avatar.
2. Blended written Italian-LIS sign forms will be used.

While names of main stations in big cities are preserved in their original LIS forms, as in (3), a new strategy is developed for less-familiar stations and gaps in the vocabulary. The avatar will play a classifier sign indicating a wide board while the name of the station will appear in written Italian "centered on the board", as shown in (4).

(2) MILANO CENTRALE

This technical solution blends a manual sign (a generic classifier) with a non-manual component. However, rather than using the standard non-manual channels (facial expressions or body postures), this solution adopts a tool which is not internal to sign language, namely the written form of the dominant language. From the communicative perspective, this solution is much more performative than standard fingerspelling for at least three reasons:

1. It allows a faster assessment of the lexical item since the written input is produced simultaneously and not letter by letter
2. It does not overload the processing of the entire sentence
3. It is accessible to all signers, even those with lower levels of literacy.

From the timing perspective, blended forms are much quicker to perform than fingerspelling making the entire announcement more alignable with its spoken counterpart. An issue to be developed further is how long the blended form must last on the screen. We are planning to use knowledge from reading times in Deaf subjects with low literacy to determine it. At the moment we do not exclude the possibility that longer names will display longer than shorter ones.

(3) REBAUDENGO FOSSANO

3. Technical issues

We are developing our idea for station names inside the ATLAS architecture (Mazzei et al. 2013). The ATLAS project concerned the translation from Italian to LIS in the specific application domain of the weather forecasts. The ATLAS system is a knowledge-based and restricted-interlingua translation system, since it uses extra-linguistic information and deals with only two languages.
The system is a pipeline composed by five distinct modules (Figure 1). The modules are: (1) a dependency parser for Italian; (2) an ontology based semantic interpreter; (3) a generator; (4) a spatial planner; (5) an avatar that performs the synthesis of the sequence of

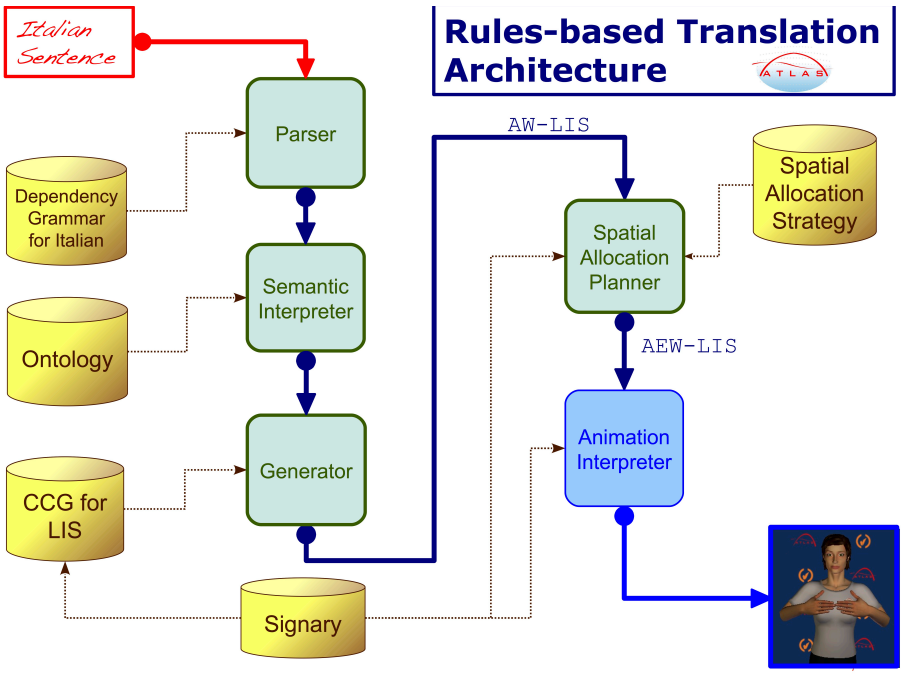


Figure 1: ATLAS architecture

signs, i.e. the final LIS sentence.

n order to integrate our solution in the ATLAS architecture, we need to modify the generator and the avatar. The ATLAS generator is composed by two submodules: the SentenceDesigner microplanner and the OpenCCG realizer (Mazzei 2012). The SentenceDesigner is an expert system that decides about the syntactic organization and which signs to use in the generation. In contrast, the realizer decides about the signs order and their inflections. So, we need to implement a double access procedure to the signing lexicon in SentenceDesigner. In a first attempt, SentenceDesigner will search in the lexicon for a direct translation of an Italian station name into LIS (see above "Milano centrale"). If at least one translation is found, then the avatar follows the standard ATLAS communication pipeline and performs the (sequence of) sign(s). In contrast, if this procedure does not produce results, for instance when there is a lexical gap in the LIS dictionary for the station name, SentenceDesigner commands the avatar to produce the Italian-LIS blending for that specific station name in real time. Moreover we need to augment the avatar to allow for the production of a real time Italian-LIS blending from a string (up to 40 characters). Finally, we need to augment the communication protocol between SentenceDesigner and the avatar, by adding a new tag to the AEWLIS (ATLAS Extended Written LIS), i.e. to the XML language in use for the communication between the generator and the avatar.

4. Social issues

Last but not least, we are also concerned with the impact of our choices for the broad Deaf communities. On the one hand, the use of written forms blended along with the sign stream is a technical solution to a practical problem. On the other hand, for the Deaf communities the risk exists that a wrong message is sent that sign languages are not fully adequate to all communicative situations. We are planning to assess these aspects with an on-line questionnaire in which we ask the Italian Deaf communities i) which form they prefer for both famous and less-known destinations: Sign name, Fingerspelling or written blending; and ii) whether they feel the blending solution as dangerous for their sign language.

5. Conclusions

One of the most challenging aspects of avatar translation from spoken into SL is how to implement NMM, which are normally exploited by signers during the sign stream. This is true both for lexical NMMs and those with phrasal scope (Van Zijl and Combrink, 2006). While this domain opens several research questions, most of which without a clear solution (Ong and Ranganath, 2005), we showed that an additional non-manual option is made available by current technologies, which avatars may resort to when the contextual situation requires it. Written text blending is an economic solution to a practical problem posed by the timing of public transportation announcements.

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