Identifying objects in English and German:

A contrastive linguistic analysis of spatial reference

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Abstract

In Tenbrink (2005a), I presented the results of a web study addressing English native speakers' strategies in a scenario that enhances reference via spatial contrast. The present study compares the results for English with those obtained for German, focusing on speakers' linguistic preferences concerning syntactic forms and modifications. Results confirm previously identified communicative principles underlying speakers' choices, and additionally point to a number of systematic differences in speakers' choices, which can in part be explained by differences in language structure.

1. Introduction

The semantics and applicability of spatial projective terms such as left, right, front, back, above, and below have been of interest for researchers in the field of spatial cognition for several decades. These linguistic items provide insights into speakers' conceptualizations of spatial settings and their preferences in describing them linguistically. Their application involves a range of concepts, for instance, reference systems (Levinson 2003) and spatial templates (i.e., applicability areas; Logan & Sadler 1996, Carlson-Radvansky & Logan 1997), and is influenced in a number of ways by contextual factors such as the functions of the objects involved (Carlson & van der Zee 2005, Coventry & Garrod 2004) as well as speakers' discourse strategies (Herrmann & Grabowski 1994). A thorough and systematic overview of related findings is presented in Tenbrink (2005c). In the present approach I abstract from many factors known to influence applicability and also do not discuss choices of
perspective and reference system, but focus on the impact of changes in the configuration on the linguistic
choices that English and German speakers prefer or disprefer.

A major part of earlier research on projective terms has focused on one specific, central kind of discourse
task, namely, one in which the position of one known object in relation to another is to be described, as in
answering a question like "Where is the object?". In Tenbrink (2005a), I present the results of a web-based study in
which a different kind of discourse task is explored with English native speakers, namely, that of referential
identification as in answering a question like "Which object do you mean?". This kind of discourse task is
prominent in a part of the human-robot interaction scenarios targeted in our research project (SFB/TR 8 on Spatial
Cognition). In these scenarios, an object needs to be identified out of a range of competing objects. Here, the level of
granularity chosen for the description depends on the presence and placement of the other candidates. Previous
experiments also involving referential identification are reported, for example, in Schober (1993) and Mainwaring
et al. (2003), focusing mainly on perspective choice. However, Mainwaring et al.'s results also show how
differences in the discourse task influence perspective choice, usage of distance terms rather than projective
expressions, and the degree of redundancy. One recent study in which linguistic choices in spatial referential
identification are addressed in considerable detail is presented in Gorniak & Roy (2004). Results show that a very
frequent strategy is "to refer to spatial extremes within groups of objects and to spatial regions in the scene" (p.
439). This is done, for example, by terms of distance such as closest, or by projective terms such as in the front or
on the left side. As indicated by the authors' interpretation of such terms as "spatial extremes", such expressions,
though linguistically unmodified, refer to the object that is situated at the most extreme position as compared to
other objects that may also be situated in the same spatial region, e.g., within the left half of the picture. Another
possibility is to refer to the extremum using a projective superlative such as leftmost. Altogether, the results show
the considerable degree of flexibility and creativity in speakers' spontaneous spatial descriptions in complex
scenarios.
The present study presents a comparison of the results reported in Tenbrink (2005a) with results gathered for the German language. I will describe to what extent German speakers adhere to similar discourse strategies as English speakers do, and analyze in detail in what ways the linguistic representations diverge. As will be shown, a number of systematic differences can be accounted for by differences in language structure. However, the general principles of spatial referential identification can be identified in similar ways in both languages; as shown in detail in the previous study these are in accord with earlier findings on contrastive reference (e.g., Herrmann & Deutsch 1976).

Language-specific differences in spatial reference have previously been addressed most systematically by the MPIP research in Nijmegen (Levinson 2003), which aims at proving correlations between language and cognition based on detailed comparative research in many different cultures, using "Where" tasks and focusing on conceptual aspects. Further authors comparing English and German spatial reference (e.g., Carroll 1997 and Weiß et al. 1996) also investigate differences in the choice of reference frames. Herskovits (1986) (for English), Wunderlich & Herweg (1991), and Eschenbach (2005) (for German) present overviews of the syntactic repertory of projective terms, together with detailed semantic analyses and further suggestions concerning applicability. The present approach, in contrast, addresses a detailed contrastive linguistic analysis of speakers' spontaneous choices in relation to a range of simple spatial configurations, using a "Which" (referential identification) task.

2. Empirical study: Method

In contrast to the more selective account in Tenbrink (2005a), the present study incorporates results of the entire web-based empirical study. The study was made accessible at the "Portal for Psychological Experiments on Language", maintained by Frank Keller, at www.language-experiments.org for two periods of time: the English version was online between Sept. 23rd and Dec. 31st, 2003; after that, the German version was online until Oct. 4, 2004. Participation was voluntary and not paid for. Age effects are not tested for; the participants were predominantly between 15 and 50 years old.
Each of the participants answered 15 different randomly assigned questions in randomized order out of a pool of 29 possible tasks which cover a range of different scenarios. The decision to limit the number of tasks for each participant to 15 was taken in order to minimize the time and effort required for participation. Effects of order are not addressed in the present analysis, since they are regarded as a non-trivial additional factor that needs to be treated with specific care. Randomization guarantees a fairly even distribution of task positions. The only constraint with respect to the participants' contributions was that they were asked not to use counting, in order to avoid collecting a large corpus of linguistic utterances that rely solely on counting rather than projective terms. 28 of the 29 tasks belong to three conditions explained below that differ with respect to the possible perspectives on the configurations. Each participant received 4 questions in each of conditions 1 and 2, and 6 questions in condition 3. Randomization of task assignment and order applies only inside conditions. The final task (a route instruction task) is not analyzed here. After finishing the tasks, all participants were asked to answer some questions about their person.

In each condition, the same set of basic configurations of elements is shown, as represented in the Appendix; the choice of configurations is motivated in Tenbrink (2005a). S (situation) 6 and S7 were only added to the study at a later time. Therefore, there are no contributions by native English speakers for these situations, and only approximately one-third of the general average number of contributions by German speakers. The situations were added in order to gain information about the vertical and frontal axes, since most of the other pictures produce a bias towards the employment of the lateral axis for reference. Altogether, the 7 basic configurations offer a range of spatial relationships that can be conceptualized and referred to in various ways. The variability offered by the different configurations is further enhanced by the options of perspective, which are varied by the three conditions as follows.

In the first condition, participants were presented with pictures that only contain squares and circular elements (see Appendix, Figure 1). In each picture, one of the elements is marked by a circle. The question to be answered by the participants was simply (in the English version),
"Which element of the picture is marked with a circle?"

In the second condition, an X appears in the picture in addition to the elements (Appendix, Figure 2). The English instruction was:

"Now imagine that you are looking at the figures from the position marked X. How do you describe now which element is marked with a circle?"

The third condition was designed to simulate a real world setting as much as possible in order to enable a comparison to the human-robot interaction settings that we use in our project (e.g., Moratz & Tenbrink, in press), where basically the same set of configurations was used. Here, the position of an interaction partner, Y, is added to the pictures. Additionally, both X and Y are assigned a view direction. For each of the scenarios, there were two possibilities for the positions of X and Y (cf. condition 3A, Figure 3, vs. condition 3B, Figure 4 in the Appendix) so that the number of configurations is twice as high in condition 3 as compared to conditions 1 and 2. In each case, the participants read:

"Finally, please imagine that the figures are real world objects. You are located at X, and now your task is to instruct person Y to go to the object marked with a circle. A star shows the direction each of you is facing in."

Thus, in this condition view directions are given explicitly, and the participants are asked to imagine a dialogue situation. However, since there is no real interaction and no feedback from the interaction partner, grounding and alignment processes such as those described in Clark (1996) and Pickering & Garrod (2004) are ruled out, similar to imagined-partner experimentation as reported in Herrmann & Grabowski (1994). The instructional task differs slightly from the previous ones. This situation requires a lot of imagination by the participants; therefore, tasks in condition 3 are presented only after the first two conditions.

A total of 2,332 German utterances produced by approximately 180 (self-assessed) native speakers of German, plus 1,480 utterances produced by approximately 200 native English speakers were analyzed. The contributions were extracted out of the collected pool of data, annotated using the text markup tool Systemic Coder

version 4.5, and analyzed linguistically. For each situation, the preferred linguistic options were identified and analyzed in detail (see Tenbrink 2005a for more details on motivation and research questions). The basic question underlying the analysis of each configuration is, *What linguistic options do speakers of the two languages prefer?*

Differences between situations were examined by comparing frequencies of linguistic categories, and explained on the basis of features of the configurations. Hypotheses generated in this way were tested further by comparing groups of situations sharing critical features, and examining the relevant features of the linguistic contributions. This procedure is regarded as a suitable and necessary preparation for ensuing experiments (using, for example, psycholinguistic methods), testing the hypotheses gained directly by varying configurations in the relevant ways, and supporting them statistically. The present work does not include this step, but broadly explores the field, predominantly on a qualitative basis, but supported by relative frequencies, in line with established methodology in corpus linguistics. Thus, the data collected in the web-based study are treated as a linguistic corpus rather than conforming to the standards usually established in the field of psycholinguistics.

3. **Results of the Empirical Study**

**Overall strategy.** Speakers of both languages could choose to use strategies other than referring directly to the target object in order to obtain their communicative goal. Specifically in Condition 3, a considerable proportion of speakers described the path towards the goal, as in "Walk ahead a few paces. Turn left and walk ahead to the square", rather than simply identifying the goal square, as in "Go to the square on your left", which was also frequently done. Some people did not mention the goal square at all. However, reference to the goal object was the most frequent option in both languages in all conditions.²

**Ways of referring to the goal object.** In some situations, apart from using projective terms, speakers choose different kinds of spatial expressions for referring to the goal object. Among these, the terms that were used most frequently expressed either in-between relations (such as *middle*) or distance (such as *close*). The data show

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² The overall average of goal-based descriptions is 92.5% in German and 78.0% in English; the difference may be due to slight discrepancies in the instructions to the participants.
clearly that, if an in-between relation is available for reference, this option will be used frequently by speakers. This is the case even in situations where the goal object is not situated directly between two other objects of the same kind, as in S4(C1) (see Appendix, Figure 1): speakers do not necessarily account for digressions from this prototypical configuration linguistically. Altogether, the (weighted) average of utterances relying on in-between relations in the relevant scenarios is 28.0% in the German version and 17.2% in English, as opposed to (almost) zero utterances using this relation in other scenarios. Similarly, distance-related expressions are used considerably more often in situations exhibiting a clear distance differentiation. However, whether or not they are indeed used for reference apparently interacts with other factors, such as the ease of application of projective terms. Apart from in-between and distance relations, further options used infrequently by both English and Germans are class names, temporal order, comparative height, compass directions, and clock directions. Contrary to some previous expectations regarding native English speakers’ usage of compass expressions, the percentage was in no situation higher than 3.4% (overall average: 1.4%). Although this result is certainly higher than in the German data (where only one utterance used compass directions at all), it is not the case that English native speakers use compass directions with a high frequency (in the present scenario).

In the following, I will concentrate on utterances containing projective terms in goal-based utterances. Percentages of frequencies relate to this category only, neglecting the other kinds of strategies just discussed. **Linguistic variability.** Whenever projective terms are used for identifying the goal object, speakers employ a considerable range of syntactic variability. However, the variety of linguistic forms is much broader in English than it is in German, especially in conditions 1 and 2. In the German data, almost exclusively adjectives and adverbs were used, with some exceptional occurrences of prepositions. In English, usages varied between adjectives, nouns in prepositional phrases, preposition groups, handedness terms, and indeterminate forms (i.e., stand-alone terms such as *left* that could either be adjectives or adverbs). The main difference identified by the comparison of the linguistic variability is a much more frequent usage of nouns in prepositional phrases (such as *to my left/* zu meiner Linken) in English throughout the data (42.7% for English, 1.3% for German). Also
handedness terms (occurring with an overall frequency of 3.8% in English, showing great differences depending on the configuration: the highest frequency is 11.8%) are fairly exceptional in German (0.2% on average).

In condition 3, the variability of English choices is diminished somewhat. Here, the German and English versions are less differentiated, at least with respect to range of variety. Now, in some situations speakers settle almost unambiguously for nouns in prepositional phrases in English (and in some situations preposition groups, depending on axis), neglecting other options. German speakers then often use adverbs and in some cases adjectives or prepositions.

**Table 1.** Overview of syntactic forms in English and German

<table>
<thead>
<tr>
<th>Syntactic form</th>
<th>English</th>
<th>German</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>lateral</td>
<td>frontal</td>
</tr>
<tr>
<td>adjective</td>
<td>right</td>
<td>front</td>
</tr>
<tr>
<td>noun in prep. phrase:</td>
<td>left</td>
<td>back</td>
</tr>
<tr>
<td>[prep] + [det / pronoun]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>handedness term</td>
<td>(to the)</td>
<td>in front</td>
</tr>
<tr>
<td>(right/- left- hand (side))</td>
<td>right</td>
<td>back</td>
</tr>
<tr>
<td>adverb(ial group); pos-</td>
<td>left</td>
<td>in front</td>
</tr>
<tr>
<td>nominal modifier</td>
<td></td>
<td>back</td>
</tr>
<tr>
<td>preposition (group)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>indeterminate form</td>
<td>right /</td>
<td>front /</td>
</tr>
</tbody>
</table>

Table 1 shows a comprehensive table of syntactic forms of English and German projective terms. Here, choices that in the present study occur specifically frequently are set in italics (only lateral axis, as the other axes were not in focus). With respect to the prepositions used in the construction here called "nouns in prepositional phrases", it can be added that, in German, only zu *(meiner Rechten)* is possible, while in English, there is a broad and flexible repertory containing at least *to, on, at, in, towards, near, and from* *(the/my right)*, of which the first
two are the most frequent in the present scenarios. In English, this kind of construction is preferred in many situations; the only constraint here is that to is not used for internal relationships, which occur most frequently in condition 1 if the picture is used as relatum.

**Modifications and combinations of projective terms.** In German, lateral adjectives like *recht-* are not available as a superlative; therefore, projective superlatives in German are restricted to the frontal (e.g., *vorderst*) and vertical (e.g., *oberst*) axes. In English, in contrast, projective superlatives are straightforwardly used with the lateral axis (as in *leftmost square*). Since most configurations enhance contrast on the lateral axis, the overall proportion of superlatives is therefore higher in English (11.1%) than it is in German (5.7%; where most occurrences belong to the 'vertical' scenarios which were not used in the English part of the study). But not all scenarios allow for the usage of superlatives at all, since the application seems to require that the goal element is situated at an extreme position on an axis relative to at least two other elements, which is not the case in all scenarios. This scenario-related fact accounts for the relatively low overall proportion of superlatives in English even though the language itself does not restrict application on the lateral axis, the way it does in German.

Furthermore, modifiers of distance are seldom used in German, except in two situations (S2(C3B): 11.1%; S4(C3A): 8.3%) in which specification of distance alone is also often used as a description because the goal element is very close to the interaction partner. In all other situations, the proportion of distance modifiers is never higher than 7.1%. In English, in contrast, distance modifiers (such as *furthest to your left*) are often used to denote an extreme position on an axis, similarly to superlatives, in some scenarios in as many as 35.3% of utterances (S5(C3A)).

With respect to precisifying modifiers, the overall frequency in the German data throughout all scenarios is 15.1%, while in English, it is 6.4%. While this overall difference is not large, the distributions of precisifiers are very different. In the English data, in condition 1 no precisifiers occur at all, while in German, specifically in S1(C1) and S2(C1) they are fairly frequent (20.9% and 19.2%). In condition 2, in English they predominantly occur in S5(C2) (22.9%), while in German, they are used fairly frequently in all situations except S3(C2). Thus,
English precisifiers are typically expressions such as *directly* which emphasize a *typical* relationship on a focal axis, and in some cases expressions that point to a *digression* from that axis, such as *a little to the right* and *diagonally to the left*. In German, similar expressions are *direkt* and *schräg links*. But in addition, the German data show frequent usage of precisifiers that emphasize an *extreme position* on a focal axis, such as *ganz rechts* or *rechts außen*. This category seems to be missing entirely in the English data. One candidate for a corresponding expression in English is *all the way on the left*, which occurs once in a path-plus-goal description (in S5(C3B)). Otherwise, such relationships are in English expressed not by precisifying adverbs, but by projective superlatives, distance modifiers, and unmodified expressions that may serve the same purpose.

**Choice of reference axis.** In both languages, speakers prefer the mention of only one axis in most cases, except if one axis is either not discriminative, or if two axes are equal candidates for reference. Otherwise, digressions from the prototypical axial direction usually do not induce mention of a second axis. As the overview of linguistic forms for each axis in Table 1 above shows, the choice of axis has direct consequences on the range of linguistic variability available. Furthermore, in some cases specific kinds of modifications become impossible, such as German superlatives for lateral terms, as described above. Thus, axes are not neutral with respect to linguistic choice.

4. **Discussion**

Generally, participants use a broad spectrum of variability on all scales. The analysis shows that linguistic choices depend heavily on the spatial situation, i.e., the presence and placement of other objects and (imagined) persons, and the available kinds of perspective. Therefore, generalized predictions are difficult to formulate on a linguistic surface level. These results are further complicated by a number of language-specific differences, as spelled out in the previous section. Many of the differences identified relate to the structure of the languages involved, as English speakers have a different repertory of forms at their disposal than do German speakers. But they have also different preferences for using and applying this repertory. Notably, for example, nouns in
prepositional phrases are a very common way of applying projective terms in English, which is not the case in German, although the form does exist. In German, adjectives are clearly preferred; these are also available in English but much less frequently employed. Furthermore, some differences arise with respect to which forms can be used with which kind of axis.

With respect to the usage of modifications of projective terms, the following patterns could be identified. In both languages, projective terms are preferentially not modified if the goal element is the only one on a half plane with respect to an obvious relatum, regardless of whether the spatial relationship between the referent and the relatum is prototypical or not. This result represents a strong contrast to previous results on applicability in other kinds of discourse tasks where gradedness of application plays a major role (mostly, "Where" instead of "Which" tasks, e.g. Vorwerg 2001). However, if the spatial situation is conceptualized as specifically complex, several kinds of modifications are combined in one utterance, and linguistic representations get to be fairly heterogeneous. This pattern is related to the principle of redundant verbalisation identified by Herrmann & Deutsch (1976).

Modifications of projective terms occur in a number of different ways, depending on the spatial situation as well as the language-specific repertory. If two axes are equally good candidates for a spatial description, two projective terms will be combined more often than otherwise. If the goal object is at the most extreme position on the lateral axis, in English either superlatives (e.g., leftmost) or distance modifiers (e.g., far right) will be used more frequently than otherwise. In German, precisifying adverbs (e.g., rechts außen) are used instead in such situations, which are not used in this way in English. The German usage may partly be due to the fact that, in German, the lateral projective terms cannot be realized as superlatives. In both languages, however, also unmodified projective terms can be used to express an extreme position on a spatial axis, similar to the findings by Gorniak & Roy (2004). If the goal object is specifically close to the relatum, in both languages a distance or precisifying term may be used in addition to the projective term. If the goal object is situated roughly between two other objects, an in-between relation may be expressed in addition to the projective term (e.g., middle right). If the goal object is
situated directly on a focal axis, a precisifying modifier will frequently be used in both languages to emphasize this relationship (e.g., the one right in front of you).

Thus, the present research has led to the identification of different preferences for syntactic forms for speakers of the two languages in relation to subtle differences in the spatial configuration. Since former investigations have typically focused either on the choice of reference systems or on the variability in language structure, the results gained here represent a new approach towards identifying and contrasting application preferences in a referential identification situation in two languages.

With respect to the underlying principles and preferences for applying projective terms, some tendencies could be identified that hold for both languages alike, abstracting from language-specific differences. These are in accordance with previous research, and the general strategies worked out in detail in Tenbrink (2005a) could overwhelmingly be confirmed for German as well. Three major principles, at least, seem to be at work, influencing speakers’ choices: The principle of contrastivity ensures that the goal object can be identified among the competing objects. The principle of minimal effort leads, on the one hand, to the omission of information that is redundant or easily inferable, and on the other hand, to linguistic and conceptual choices (including projective terms versus other kinds of spatial expressions, relata, and spatial axes) that enable referential identification with a minimum of additional information encoded as linguistic modifications. The principle of partner adaptation seems to be chiefly responsible for the choice of perspective (see Tenbrink 2005a,b). All of these principles that together explain the speakers’ preferred choices to a high degree are in accord with earlier, more generalized findings in the literature (e.g., Herrmann & Deutsch 1976, Clark and Wilkes-Gibbs 1986, Schober & Brennan 2003). This result supports the assumption (motivated in more detail in Tenbrink 2005a) that web-based studies, in spite of all their obvious drawbacks (see e.g. Reips 2002), can be useful for the analysis of speakers’ choices and preferences in a discourse task that is not exactly natural but still less controlled than a laboratory situation.

3 Although perspective choice is not discussed in detail here, note that the German results basically mirror the findings for English in that typically the interlocutor’s point of view is adopted if available. Systematic differences concern explicitness.
Therefore, the conclusions drawn here that pertain to the comparison of English and German will hopefully serve as useful starting positions for focussed and more controlled empirical approaches.

5. Conclusion

The present study has offered an exploration of natural language produced in an open (though artificial) setting by unbiased native speakers of English and German. This has led, on the one hand, to an assessment and comparison of the diversity in the linguistic choices of speakers of the two languages in a range of situations allowing for different interpretations and viewpoints, and on the other hand, to the identification of systematic conceptual and communicative principles and strategies underlying speakers' choices, which overwhelmingly seem to be language-independent. The results partly spell out previous approaches in detail for a contrastive spatial referential situation, and partly point to interesting language-specific differences in speakers' linguistic preferences that have not been addressed systematically before.

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Appendix: Configurations

Figure 1. Configurations in condition 1
Figure 2. Configurations in condition 2
Figure 3. Configurations in condition 3A
Figure 4. Configurations in condition 3B