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THE KICKTIONARY

Combining corpus linguistics and lexical semantics for a multilingual football dictionary

This paper presents the Kicktionary, a multilingual (English – German – French) electronic lexical resource of the language of football. In the Kicktionary, methods from corpus linguistics and two approaches to lexical semantics – the theory of frame semantics and the concept of semantic relations – are combined to construct a lexical resource in which the user can explore relationships between lexical units in various ways. This paper explains the theoretical background of the Kicktionary, sketches the data and methods which were used in its construction, and describes how the resulting resource is presented to users via a set of hyperlinked webpages.

1. Introduction

As the contributions to this workshop demonstrate, the language of football offers many rewarding topics for linguistic research. One such topic is the lexicographic analysis of football vocabulary. Since, on the one hand, a football match is made up of a relatively small number of ever-recurring events (shots, passes, referee interventions etc.), but, on the other hand, myriads of texts (written reports, spoken commentary etc.) are produced every day which describe these events, a vocabulary has been developed in many languages which abounds with synonyms, with fine-grained semantic distinctions and with subtle stylistic variation. To analyse, describe and make accessible some aspects of this vocabulary is the aim of the Kicktionary presented in this paper.

The Kicktionary is an electronic multilingual (English, German, French) lexical resource of the language of football. Its main idea is to combine methods from corpus linguistics and different approaches to lexical semantics in order to construct a dictionary which is better (or: good in a manner different from) traditional paper dictionaries. The lexical resources constructed by the FrameNet (Fillmore 2003) and WordNet (Fellbaum 1990) projects were used as a starting point for this task.

This paper explains the design and construction of the Kicktionary. It is structured as follows: section 2 introduces the concepts of frame semantics and semantic relations which constitute the theoretical background to the analyses carried out for the Kicktionary. Section 3 describes the empirical basis of the analyses – a multilingual corpus of football match reports – and explains the analysis method as well as the general architecture of the resource. Section 4 then demonstrates how the resource is presented to users on a website. Section 5, finally, sketches some plans for future developments.

[1] The work presented here was carried out during my stay as a guest researcher with the team of the FrameNet project at ICSI in Berkely, with the help of a research grant by the German Academic Exchange Service (DAAD). I am grateful to the FrameNet team (Charles Fillmore, Collin Baker, Michael Ellsworth, Josef Ruppenhofer) and its visitors (Kyoko Ohara, Jan Scheffczyk, Carlos Subirats) for their support. I owe the original idea for this project to Seelbach's (2003) and Gross's (2002) work on the lexicography of football language in the lexicon grammar framework.

Owing to space limitations, this paper can only give a brief overview of the Kicktionary and the ideas behind it. The interested reader is referred to Schmidt (2007) for a more comprehensive account of the lexicographic analysis of football language and the challenges it poses to frame-semantic theory. The more practical matters, on the other hand, are of course best studied by a look at the Kicktionary website itself (www.kicktionary.de).

2. Linguistic Background

2.1. Scenes and Frames in Football

Frame Semantics, as defined and developed by Fillmore (e.g. Fillmore 1977 and 2003), is a means of relating linguistic items to one another through knowledge about prototypical event structures. The entities in which this knowledge is represented are called scenes and frames. The domain of football is very well suited to illustrate and apply frame semantic theory. As an example, consider the following set of sentences:

1a) [*Zahovaiko*]$_{\text{OPPONENT\_PLAYER}}$ **challenged** [*Manou Schauls*]$_{\text{PLAYER\_WITH\_BALL}}$ [*in the penalty area*]$_{\text{AREA}}$.

1b) [*He*]$_{\text{PLAYER\_WITH\_BALL}}$ *turned inside to* **take on** [*Roma*]$_{\text{OPPONENT\_PLAYER}}$ *and finish with his left foot from close range.*

1c) [*Hector Font*]$_{\text{PLAYER\_WITH\_BALL}}$ *tried to* **nutmeg** [*Ioannis Skopelitis*]$_{\text{OPPONENT\_PLAYER}}$.

1d) [*Ronaldo*]$_{\text{OPPONENT\_PLAYER}}$ **dispossessed** [*Wisla goalkeeper Radoslaw Majdan*]$_{\text{PLAYER\_WITH\_BALL}}$ [*on the edge of the box*]$_{\text{AREA}}$.

What the words *challenge*, *take on*, *nutmeg* and *dispossess* in these examples have in common is that they all apply to the same prototypical situation in a football match, namely a one-on-one situation. A general description of this situation could look as follows: A player in possession of the ball (PLAYER_WITH_BALL) is attacked by an opponent (OPPONENT_PLAYER) at some location (AREA) on the field. The outcome of the situation is that the PLAYER_WITH_BALL either keeps or loses possession of the ball.
The words differ, however, in the perspective they put on this event. Thus, in (1a) and (1b), the temporal focus is on the event itself, while (1c) and (1d) relate the event from the perspective of its outcome. Similarly, (1a) and (1d) foreground the point of view of the opponent player, while (1b) and (1c) focus on the player in possession of the ball.

In frame semantics, such a prototypical event is called a *scene*; the different ways of taking a perspective on it are called *frames*; the actors and props taking part in the scene and frames are called *frame elements*; and the linguistic means used to describe scenes and frames (which, in Fillmore's terminology, "evoke" a frame) are called *lexical units* (LUs).

Usually, a frame contains more than one lexical unit. Thus, just like the LU *nutmeg*, the LUs *beat*, *outstrip* or *sidestep* describe the successful outcome of a one-on-one situation from the perspective of the player with the ball. All these LUs are therefore assigned to the same frame 'Beat'. Likewise, the verbal LU *tackle* and the nominal LU *sliding tackle* share their perspective on the one-on-one scene with the verb *challenge.* These LUs are therefore all assigned to the same frame 'Challenge'.

This latter case also shows that frames can accommodate lexical units from different parts of speech.

Furthermore, scenes and frames are not language specific. It can be expected that a speaker of German has the same or very similar knowledge about prototypical events of a football match and of ways of taking a perspective on them as a speaker of English. When it comes to constructing a multilingual dictionary, frames can therefore be used to meaningfully group lexical units from different languages. Thus the German verb *tunnel* and the French verb *mystifier* exhibit the same scene-and-frame characteristics as the English verbs *nutmeg*, *beat*, *outstrip* and *sidestep*:

2a) [*Ailton*]$_{\text{PLAYER\_WITH\_BALL}}$ **tunnelte** [*Chris*]$_{\text{OPPONENT\_PLAYER}}$ *und spielte Klasnic frei.*

2b) [*Giggs*]$_{\text{PLAYER\_WITH\_BALL}}$ *lui répondait* **en mystifiant** [*deux défenseurs*]$_{\text{OPPONENT\_PLAYER}}$.

All of these lexical units (and potentially, LUs from an arbitrary number of additional languages) can therefore be assigned to the same frame.

2.2. Semantic relations

Scenes and frames are a very helpful means of structuring a domain vocabulary according to onomasiological criteria. They group lexical units with similar meanings and lexical units which denote different aspects or different variants of the same concept and thus create a structure which should be transparent to and exploitable by a dictionary user. However, a scenes-and-frame structure on its own fails to cater for a number of more basic tasks which a dictionary should fulfil: it does not tell the user which lexical units are actually synonymous and which are in a more complex semantic relation to one another. In the multilingual case, it also fails to provide the user with translation equivalents of a given lexical unit. As an example, consider the following list of lexical units all of which are members of the 'Shot' frame in the 'Shot' scene (i.e. they all describe a shot from the shooter's point of view):

3a) *shot, drive, thunderbolt, volley, bicycle kick, overhead kick, header, diving header*

3b) *Schuss, Torschuss, Hammer, Volley, Direktabnahme, Fallrückzieher, Kopfball, Kopfstoß, Flugkopfball, Kopfballtorpedo*

3c) *tir, frappe, boulet de canon, vollée, retourné, tête, coup de tête, tête plongeante*

Among others, the following semantic relations can be established between individual members of this frame:

- The LUs *Kopfball* (*'head ball'*) and *Kopfstoß* (*'head kick'*) are synonymous, as are *bicycle kick* and *overhead kick*, as well as *tête* (*'head'*) and *coup de tête* (*'head kick'*).
- A *thunderbolt* is a special kind of *shot*, specifically, a very powerful one. The same hyponymy relation holds between the German LUs *Hammer* (*'hammer'*)

and *Schuss* (*'shot'*) and the French LUs *boulet de canon* (*'cannon ball'*) and *tir* (*'shot'*).

- The German LU *Volley* and the French LU *vollée* are both translation equivalents of the English LU *volley*. Likewise, *Fallrückzieher* and *retourné* are translation equivalents for both *bicycle kick* and *overhead kick*.

The WordNet project (Fellbaum 1990) has developed methods for representing such semantic relations in a network like structure. The basic unit of a WordNet is a synset, i.e. a set of synonymous lexical units. In the Kicktionary, this concept is extended to not only include synonymy in one language, but also translation equivalence between different languages. The set {*bicycle kick*; *overhead kick* / *Fallrückzieher* / *retourné*} is an example of such a multilingual synset. Other semantic relations like hyponymy/hypernymy, holonymy/metonymy and troponymy are then represented not as assignments between individual lexical units, but as relationships holding between two synsets. For example, a hyponymy relation holds between {*thunderbolt* / *Hammer* / *boulet de canon*} and {*shot*; *drive* / *Schuss* / *tir*; *frappe*}. Since semantic relations are transitive (if a relation holds between A and B as well as B and C, it will necessarily also hold between A and C), they can be used to construct hierarchies of synsets. The following is an example of such a concept hierarchy constructed on the basis of the hyponymy/hypernymy relation (LUs on a lower level are hyponyms of LUs on a higher level):

4) {*player* / *Spieler* / *joueur*}
{*goalkeeper*; *custodian* / *Torhüter*; *Torwart* / *gardien* }
{*defender* / *Verteidiger*; *Abwehrspieler* / *arrière*; *défenseur*}
{*central defender* / *Innenverteidiger* / *défenseur central*}
{*sweeper* / *Abräumer* / }

3. Constructing the Kicktionary

The Kicktionary was constructed on the basis of a corpus of football match reports from specialised websites. English, French and German texts were taken from the UEFA website (www.uefa.com). For German, additional material was acquired from the online edition of the Kicker journal (www.kicker.de); a small number of transcribed radio commentaries (from the NDR and SWR broadcasting stations) were also added to the corpus. Table 1 gives an overview of the corpus.

Language	Source	# texts	# words	Mode
English	uefa.com	535	ca. 230,000	written
French	uefa.com	482	ca. 240,000	written
German	uefa.com	486	ca. 200,000	written
German	kicker.de	1,242	ca. 700,000	written
German	German Radio	9	ca. 10,000	spoken

Table 1: Details of the Kicktionary corpus

Candidates for lexical units were initially selected from a wordlist of the whole corpus without considering their membership in a specific frame or scene. Only in a later stage of the analysis, when a relatively stable scenes-and-frames hierarchy had been established, was the choice of new lexical units guided more directly by the existing structure of the resource. This manner of proceeding was intended to ensure that the scenes-and-frames hierarchy evolves on the basis of an empirical process

rather than predetermining the empirical analysis by an "introspective" postulation of frames which are then to be "filled" with lexical material. The assignment of lexical units to synsets and the analysis of semantic relations between synsets were done only after the scenes-and-frames analysis had been more or less completed.

The analysis was carried out with the help of a combined concordancing and annotation tool. For each lexical unit, a KWIC concordance was first created. Suitable example sentences were then selected from this concordance, and the lexical units in these sentences, as well as the frame elements, were marked and annotated with appropriate labels. Example 5 shows different annotations for the lexical unit *pass*. Note how these examples document different options for realizing frame elements with the LU – the 'recipient' frame element is realized in 5a and 5c, but not in 5b which has the 'ball' and 'target' frame elements instead; the prepositional phrase which describes the 'recipient' frame element is headed by 'to' in 5a, but by 'for' in 5c, and so on:

5a) *After just three minutes,* [*veteran striker Gert Verheyen*]$_{\text{PASSER}}$ […] *passed* [*to team-mate Rune Lange*]$_{\text{RECIPIENT}}$. [79240 / p3]

5b) […] *and with three minutes remaining* [*substitute Marcelo Zalayeta*]$_{\text{PASSER}}$ *passed* [*the ball*]$_{\text{BALL}}$ [*into the middle*]$_{\text{TARGET}}$ *where the unmarked Trezeguet made it 4-1.* [79345 / p7]

5c) [*He*]$_{\text{PASSER}}$ *then passed* [*for Zé Roberto*]$_{\text{RECIPIENT}}$ *to increase their lead* […]. [1077165 / p2]

Regarding the cross-lingual part of the analysis, the partly parallel nature of the corpus could be exploited – for about half of the texts from the UEFA website, it was possible to automatically detect that they are direct translations of one another and to establish a cross-lingual alignment of these translations on the paragraph level. During the analysis, this alignment could then be used to discover and compare translation equivalents.

The result of this process is a lexical resource whose basic entity is the lexical unit together with a set of annotated example sentences, each of which can be reconnected to the corpus from which is was extracted. Two structures are built on top of the list of LUs: On the one hand, each LU is assigned to a frame, and each frame becomes part of a scene. On the other hand, the list of LUs is partitioned into synsets, and synsets are related to one another via semantic relations, yielding a number of concept hierarchies. The scenes-and-frames hierarchy and the concept hierarchies are thus based on the same lexical material, but are otherwise independent of one another.

The Kicktionary in its present state contains altogether 1926 lexical units (599 English, 792 German, 535 French) with a total of 8164 example sentences. A total of 16 scenes were defined consisting of altogether 104 frames. The LUs were partitioned into 552 synsets, and these synsets are organised in 36 different concept hierarchies.

4. Presenting the Kicktionary

Since the Kicktionary is mainly intended as a lexicographic resource for human users, great attention was paid to an adequate, human-readable presentation of

lexical units and their structural organisation. The resource is presented as a website on www.kicktionary.de.[2]

Figure 1: Homepage of www.kicktionary.de

4.1. Presentation of Lexical Units

Figure 2 depicts an exemplary entry for the lexical unit *bicycle kick*. The entry starts by indicating the lexical unit's scene and frame assignment, followed by a list of frame elements which were encountered with the LU. After this, the annotated example sentences are listed in two different forms – once as full text and once in a schematic overview which is intended to facilitate the discovery of regularities with respect to the realisation of frame elements. Below the example sentences other synset members (i.e. synonymous lexical units and translation equivalents) are given as well as superordinate synsets with hypernyms or holonyms.

To support dictionary navigation, each component of this presentation is hyperlinked to the corresponding other parts of the resource. For instance, clicking on the name of the scene will take the user to a description of that scene, and clicking on a synonym will display the corresponding entry. Likewise, examples are linked to the corpus text from which they were taken, and the synsets are linked to a presentation of the corresponding concept hierarchies.

[2] The site is password-protected. Interested users can request a free account to view the data.

bicycle-kick.n Scenario Shot Frame Shot

SHOOTER [Player]

1. Not content with that, [Crespo]$_{SHOOTER}$ then attempted a **bicycle kick** only for Laštuvka to produce a reflex save to deny him a second goal. [1077219 / p9]
2. Cazorla shot narrowly wide from distance on the half-hour mark and Luciano saw [his]$_{SHOOTER}$ **bicycle-kick** saved by Vasili Khomutovski five minutes later before José Mari shot wide. [80107 / p3]
3. The Danish forward headed Pirlo's long pass into the path of Shevchenko who latched on to the ball but saw his shot cleared by [Celtic defender Dianbobo Balde's]$_{SHOOTER}$ spectacular **bicycle-kick** . [1077172 / p6]

Support	LU	SHOOTER
attempted	**bicycle kick**	Crespo
	bicycle-kick	his
	bicycle-kick	Celtic defender Dianbobo ...

Synonyms	Fallrückzieher.n overhead_kick.n bicycle-kick.n retourné.n
Hypernyms [Moving_Balls]	Torschuss.n Schuss.n shot.n drive.n strike.n tir.n frappe.n

Figure 2: Presentation of the LU 'bicycle kick' and its examples

4.2. Presentation of Scenes

As explained above, a scene, by definition, corresponds to a kind of knowledge which is not (or not exclusively) linguistic in nature. From the point of view of dictionary design, this means that a textual description, a short film or a schematic diagram may all be equally adequate representations of a scene. In fact, if one is interested in using scenes as language-independent entities in the organization of a multilingual vocabulary, there are even good reasons to prefer non-linguistic forms of presenting a scene over linguistic ones – scenes can thus become a common point of reference for dictionary users with different language backgrounds.

The Kicktionary therefore illustrates most scenes with one or more schematic diagrams such as the following one from the 'Shot' scene:

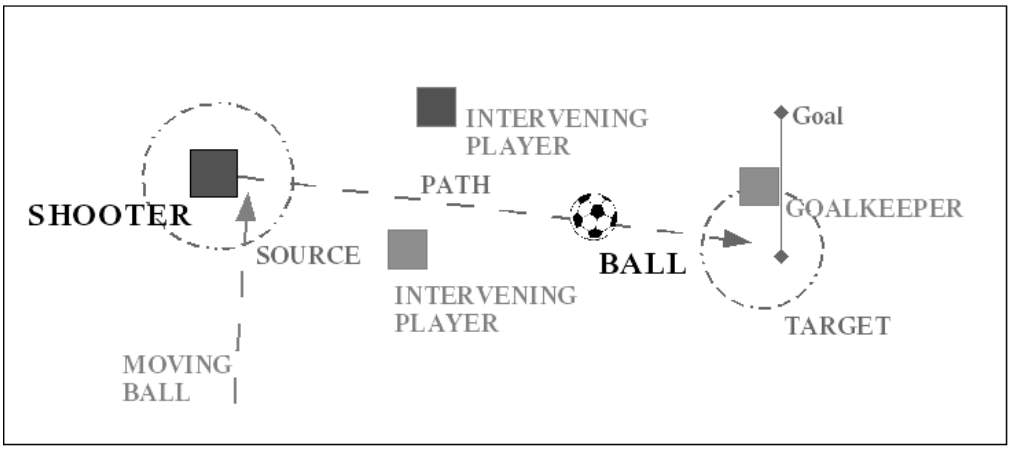

Figure 3: A diagram illustrating the 'Shot' scene

This graphic information is usually supplemented with a prose description of the scene which lists the frame elements, explains their roles in the action, and sketches the typical course of events in the scene. After the scene is explained in that way, the user is given links to the various corresponding frames which, in turn, refer to the presentation of individual lexical units as described above.

The **Shot** scene is centred around the event of a player directing the ball to a target on the field. Typically, the target is the opponent's goal, and the shot is carried out with the intention of scoring a goal. The main protagonist of the scene is the SHOOTER. Using a PART OF HIS BODY, the shooter directs the BALL towards the opponent's goal. The ball moves from the SOURCE location on the field along a PATH to a TARGET location. In some cases, the MOVING BALL (typically a pass from a team-mate) that brought the shooter into a position to carry out the shot can be mentioned. Sometimes, a shot is construed as the final stage of a MOVE by the shooter's team.

The frame `Shot` contains LUs which describe a shot from the shooter's point of view. The `Finish` frame contains LUs that construe a shot as the last stage of a move by the shooter's team. […]

Figure 4: A textual description of the 'Shot' scene

4.3. Other elements of the presentation

In addition to the information outlined above, the web version of the Kicktionary provides a separate visualisation of the organisation of LUs into hierarchies of synsets. There is a two-way-link between these representations and the representations of individual LUs so that a user can navigate from a given LU to one of its hyponyms or co-hyponyms via such a hierarchy, as illustrated in Figure 5.

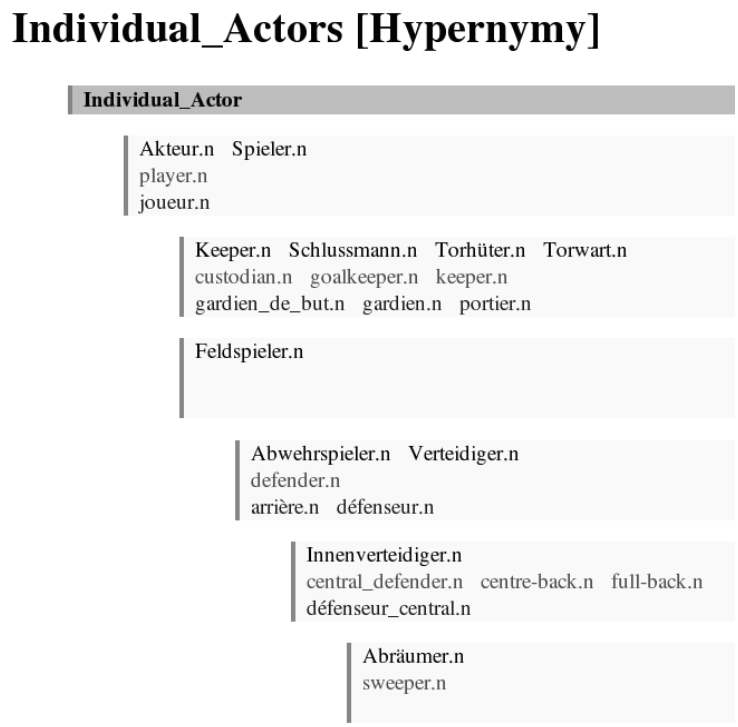

Figure 5: Presentation of the 'Individual_Actors' concept hierarchy

The Kicktionary also provides a full-text display of the corpus texts, which can be accessed via the link provided in the example section of the LU presentation (see Figure 2 above). This allows users to study the larger context in which the annotated example sentences appear. Finally, several means for top-level navigation provide the user with points of entry to explore the full list of LUs and their various forms of organisation. For top-down access, the user can either start with an overview of scenes and frames or with a list of concept hierarchies. For a bottom-up access to the Kicktionary, a simple alphabetical list of LUs, separated by language, is provided. Alternatively, users can start with an annotated parallel text in which occurrences of LUs are linked to the respective entries in the resource, as is shown in Figure 6.

English text

Barcelona glee in Glasgow

Tuesday , 14 September 2004
By Alex O ' Henley at Celtic Park

FC Barcelona became the first visiting team to win a UEFA Champions League match at Celtic FC as goals from Deco, Ludovic Giuly and the homecoming Henrik Larsson secured maximum points in their Group F opener .

Larsson clincher

Larsson's goal, on his return to the club where he scored 242 goals in a seven-year spell, sealed a victory which had looked in doubt after Chris Sutton grabbed a dramatic equaliser for Celtic just short of the hour mark . Barcelona coach Frank Rijkaard had named Larsson as a substitute with Brazilian ace Ronaldinho coming in to form a front three with Ludovic Giuly and Samuel Eto ' o.

German text

Barcelona mit historischem Sieg

Dienstag , 14. September 2004
Von Alex O ' Henley aus dem Celtic Park

Der FC Barcelona hat als erste Mannschaft ein UEFA Champions League-Spiel bei Celtic FC gewonnen. Beim 3:1-Erfolg im Celtic Park trafen Deco, Ludovic Giuly und "Heimkehrer" Henrik Larsson und sicherten so den Katalanen zum Auftakt in der Gruppe F drei Punkte.

Entscheidung durch Larsson

Larssons Tor gegen seinen ehemaligen Verein, für den er in sieben Jahren 242 Mal getroffen hatte, sorgte für die endgültige Entscheidung. Zwischendurch nahm die Partie dramatische Züge an, als nach etwa einer Stunde Chris Sutton der umjubelte Ausgleich gelang. Barcelonas Trainer Frank Rijkaard hatte Larsson zunächst nur auf die Ersatzbank gesetzt, um im Angriff mit dem brasilianischen Star Ronaldinho sowie Ludovic Giuly und Samuel Eto'o zu beginnen.

French text

Le Barça jubile à Glasgow

Mardi , 14 septembre 2004
Par Alex O ' Henley à Celtic Park

Le FC Barcelona est la première équipe à remporter un match d'UEFA Champions League à Celtic Park. Deco, Ludovic Giuly et Henrik Larsson, qui effectuait son grand retour, ont marqué et offrent les trois points au Barça dans le Groupe F.

Larsson buteur

Le but de Larsson , pour son grand retour au club pour lequel il a marqué 242 buts en sept ans , scellait une victoire qui ne semblait pas acquise après l'égalisation de Chris Sutton à l'approche de l'heure de jeu . Le coach du Barça , Frank Rijkaard, décidait de reléguer Larsson sur le banc des remplaçants, alors que le prodige brésilien Ronaldinho faisait son entrée pour former un trio de tête avec Ludovic Giuly et Samuel Eto'o.

Figure 6: An annotated parallel text, linked to the lexical resource

5. Outlook

At this point in time, the Kicktionary is complete in the sense that a reasonably large[3] number of LUs from the football domain has been analysed and integrated into the described architecture. It is also complete in the sense that this architecture is accessible via a website. There are, however, various ways in which it could be improved and extended.

First, an extension of the corpus is likely to uncover new LUs and a larger corpus could be used to increase the number of annotated examples for existing LUs. In both cases, the additional material may make it necessary to remodel parts of the scenes-and-frames hierarchy and parts of the concept hierarchies. Further text materials from the UEFA website have been acquired for this purpose and are presently being processed.

Second, user feedback for the Kicktionary website should make it possible to evaluate the quality of the resource and its presentation. One possible way of improving the presentation might be the inclusion of additional films and pictures into the description of scenes.

Third, the existing architecture, together with the concordancing and annotation tool developed for the analysis, should make it relatively easy to supplement the

[3] "Reasonably large" meaning that a) the number of lexical units for each language is considerably higher in the Kicktionary than in comparable printed dictionaries (e.g. Yıldırım 2006, Colombo et al. 2006) and that b) a further analysis of the corpus would turn up no or very few additional LUs.

Kicktionary with data from other languages. Italian, Portuguese, Spanish, Russian, Chinese, Korean and Japanese corpus material is available for lexicographers interested in constructing versions for these languages.

Finally, I think that the Kicktionary could be regarded as a promising test case for the development and application of methods for collaborative creation of specialized multilingual lexical resources. This is so because (1) football is a well-delimited special domain with a large, but manageably-sized vocabulary, and (2) contrary to many other specialized areas, it is not too difficult to find "experts" who are competent users of that vocabulary (in different languages) and who may be able and willing to contribute to such a collaborative effort either as lexicographers or as evaluators of the resulting resource.[4] First steps towards a client-server architecture in which dictionary creators and dictionary users can work together to construct an improved version of the Kicktionary have already been taken.

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[4] Feedback so far shows that the Kicktionary seems indeed capable of getting both linguists and laymen interested in lexicography.