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“This area of rain will stick South in the far North”

Pointing and Deixis in Weather Reports

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Abstract

Pointing in face-to-face interactions has been largely studied in the literature, as well as route and spatial descriptions in map task experiments. Weather reports share features with both when it comes to the expression of spatial information. Although monologic by nature, weather reports, as will be shown in this preliminary study, are highly complex descriptions with constant switches from one viewpoint to another as well as frequent shifts in deictic center. The changes in viewpoints and deictic center may be congruent in speech and gesture, but they may also occur in one modality at a time, thus creating mismatches between the gestural and verbal information. Pointing in weather reports is also conditioned by the type of medium used, and the mixed frames of reference involved by the activity itself.

Index Terms: pointing, weather reports, viewpoint, frames of reference, deictic shifts

1. Introduction

Pointing has been the object of quite a large body of research as shown by a multidisciplinary publication such as [1]. In a variety of areas, from child development to psychology, linguistics and anthropology, research has shown the intimate link between the oral and gestural production in face-to-face interactions, especially as far as deixis is concerned, as noted in [2]. So, for instance, [2] and [3] noted that pointing is culturally determined and that, depending on whether the information encoded in speech is speaker-oriented or not in a given culture, then the information encoded in gesture will be of a completely different nature. Personal, temporal, and spatial deixis is central to discourse in weather reports. Yet, strangely enough, this type of description has only been studied in the field of automatic gesture recognition to the best of our knowledge (as in [4] and [5] to name just a few studies). The reason for this is possibly that weather reports are likely to abound in pointing gestures and that pointing is easier to recognize in terms of form than other more complex gesture types. We are all familiar with weather reports, and at first look, the mapping of gesture-speech units in this type of presentation may seem extremely straightforward, with nothing more than a person pointing to different locations on a map while describing the weather expected in those locations for the next day or couple of days. Now consider the sentence given as a quote from our corpus in the title of this paper: “this area of rain will stick South in the far North”, said as the speaker is making a sweeping gesture over an area of the map to his left. What could be the deictic center of such an utterance? If we posit the speaker as deictic center of the utterance, it works well for the beginning of the sentence and for the gesture, but it doesn’t work so well for the end of the sentence: “South of what?”, “the far North of what?” This is

not an isolated case in weather reports. Based on the analysis by [6], who describes a deictic split between the verbal and gestural deictic *origo* in some route directions, we will show how weather reports involve a constant shift of viewpoint and deictic center in the description of weather conditions. Although time plays a major role in weather reports, this paper will focus on person and space deixis, which are complex enough notions in the limited space of this paper.

2. Theoretical background

In [7], Lyons defines *deixis* as referring to “the function of personal and demonstrative pronouns, of tense and of a variety of other grammatical and lexical features which relate utterances to the spatiotemporal co-ordinates of the act of utterance” (p. 636). Levinson ([8]) adds to this definition by describing deixis as pertaining to the personal, temporal, spatial, discursive and social domains.

2.1. Orientational frames of reference

As stated by Levinson in [2], there are several ways in which utterances can be related to the spatiotemporal context of utterance. These ways are what he calls the “orientational frames of reference”. A discourse entity may be conceived of in an *absolute* frame of reference, with fixed bearings like cardinal directions. It may also be conceived of in a *relative* frame of reference, so that its location is defined with respect to another location (which can be the speaker, but also the viewer or another object in the field). This means that in order to define the location of the discourse entity, you have to identify the element that serves as a reference point and its own bearings. At last, a discourse entity may be referred to in an *intrinsic* frame of reference, i.e. in relation to a cultural conception of an object. For instance, unless under special circumstances, when we say that we’re “sitting in front of a computer”, we usually mean that we’re facing the screen, not the plugs on the other side.

As shown by [2] and [3], there is great linguistic variation as to which frame of reference is preferred in different cultures. In English, there is a strong preference for the relative frame of reference, although speakers may also use the other two frames. Shifts in frames may occur over a discourse unit but also within a single utterance, and this is true of verbal information as well as information imparted in other modalities, like gesture or body orientation.

2.2. Deictic center

The reference point in frames was originally called *origo* by Bühler ([9]), although others call it the *deictic center*, a term that will be adopted in this paper. Since the frame of reference may change over the course of an utterance, as mentioned in the preceding paragraph, the deictic center may also change, and this applies to both speech and gesture. [2] mentions for

instance that “ complex switches of this reference point or origo may occur in a single sequence of gestures” (p. 250). However, he seems to consider examples in which the reference point in speech and co-occurring gesture is the same. In [6], Fricke describes an example of route description and shows that there is a mismatch between the deictic center in speech and co-occurring gesture: over the course of the utterance, the origo of the gesture is the speaker’s body while the origo in speech content corresponds to the addressee imagined as wanderer. This is a crucial point for the study of weather reports as we will see that the nature of the description involves not only shifts in frames, but also of course shifts in deictic center and that the shifts may also generate mismatches between gesture and speech in terms of reference point.

3. Data

3.1. Corpus

The corpus on which this preliminary study is based consists in a small collection of 10 weather reports posted on the internet between 2011 and 2015. All the reports are in English. 5 of them are presented by female speakers, and the other 5 by male speakers, although no difference was noted in speech or gesture for male and female speakers. The reports we selected were from different TV channels located in various English speaking countries in order to avoid falling into the analysis of presenters’ speech and description habits. Table 1 below presents the channels, the location of their head offices, and the number of reports we downloaded from their websites.

Table 1. Channel, location of head offices, and number of reports downloaded for the present study.

Channel	Location of head offices	Nb of reports
National Weather Channel	Atlanta, US	2
Local CBS	New York City, US	1
BBC weather	London, UK	4
eNCA	Johannesburg, South Africa	1
Local CBS	Los Angeles, US	1
CNN	Atlanta, US	1

The total duration of the recordings was 15.41 minutes (8.04 min for male speakers and 7 min for female speakers), with report duration varying from 55 seconds to 2.35 minutes (average report length: 1:30 minutes).

3.2. Annotations

Pointing gestures and co-occurring speech in each report were coded using Elan ([10]) for easier retrieval and comparison of examples (181 occurrences). As far as gestures are concerned, we counted the preparation and retraction phases ([11]) as parts of pointing if there were any. We noted hand shape (open palm, extended index finger, or index and middle finger, or thumb, or little finger). We also noted if the gesture was a fixed pointing or described a path (that includes the *contour following gestures* or *area-sweep gestures* noted in [12]). At last, we noted gesture direction (away from or towards speaker) and arm extension (small, medium or full extension).

On two more tracks, we noted the target type of the pointing gesture (point or area), and whether the map was static or dynamic (scrolling map or animated icon on the map) during gesture production.

4. Formal description of weather reports

4.1. Overall structure

Although everyone is quite familiar with weather reports, a short formal description of their major features will provide a starting point for the analysis of deixis. Basically, a weather man or woman standing beside a map of a region or nation is describing what the weather is or is going to be like in different locations on the map. In addition to location points, icons and drawings representing weather types or fronts but also text may be superimposed on the map.

After greetings and an optional short introduction, the speaker launches into the weather report generally starting with the present state of affairs (which constitutes the spatiotemporal reference point) and proceeds with a description of the weather conditions expected for a later time (which can be the same day or the following day). This is immediately followed by a description of the expected temperatures. At last, the forecast is extended to the next couple of days or even the coming week before closing the presentation with farewells to the audience. A weather report is a monologue throughout, although it may be launched with a short question-answer sequence if it is included in the larger context of a news report.

4.2. Types of maps

The traditional weather report uses a background projection screen behind the speaker who monitors his gestures with the help of a control screen (placed either in front or to the side) in order to avoid turning his back on the audience during the description. With this setup, speakers point at locations without looking at the map. Some reports use an oblique screen with respect to the speaker and a different camera angle which presents the screen in the larger frame of the recording studio. In this case, no control screen is used and speakers gaze more freely at the map. The difference between the two types of screen is shown in Figure 1.



Figure 1: Traditional background projection screen (left) [17] and oblique screen (right) [18] used by different channels for weather reports.

In some reports, the scale of the map remains constant throughout the report with possible dynamic objects superimposed on the map, but in others, the scale of the map changes as the report progresses which has an obvious impact on gesture size and direction as shown in Figure 2. In this report, although the speaker basically points to a same area on the map of the UK in the two frames, the two gestures are radically different due the shift in scale. The fact that the medium may change is specific to weather reports and does not occur when people point at maps in route descriptions where the map is held constant.

This has an impact on gesture-speech mapping in terms of deixis since speakers may refer in speech to locations “further away” from a reference point previously established while gesturing closer to their own bodies.



Figure 2: Pointing at the South-East area of the UK on a smaller scale map (left) and larger scale map (right) [19].

Another aspect of the maps used in weather reports is that at times, the scale may be held constant while the speaker is pointing at two different locations on the map, but the map may be scrolling down which may generate yet another type of gesture-speech mismatch as in example (1) below (the two gestures of interest are marked in the text with square brackets and are illustrated in Figure 3 below):

- (1) (a) [Maybe some patch of rain in Cambria] by the end of today, (b) [but down towards Manchester], Birmingham, temperatures widely up into the high 20s.



Figure 3: Two pointing gestures in example (1): effect of scrolling map ([19]).

As he mentions Cambria, the weather man points at a location on the map as shown in (a) and he then partly retracts his gesture (arm still extended but somewhat lower, fist closed). While saying “down in Manchester”, he opens up his hand and points slightly upwards again towards the location on the map as illustrated in (b). In between the two gestures, the map has scrolled down, which creates the gesture-speech mismatch typical of weather reports when a speaker points upwards while uttering “down”. When in “real life”, a gesture would follow a moving target; this is not what happens with a scrolling map in the context of a weather report.

4.3. Frames of reference

The survey maps in weather reports use an absolute frame of reference with externally fixed coordinates. By convention, the North has been placed at the top of the map since the discovery of the magnetic North and the invention of the compass. However, this absolute frame of reference is inserted in the relative frame of reference of the speaker, since the North point of the map is not oriented to the North in the recording studio, and since the speaker is standing on one or the other side of the map (which may change as well in the course of the report). The two frames of reference are mixed in speech in example (2) below with a first mention of the absolute frame of reference (“the North West”, map internal) followed by the relative frame of the speaker (“down across”, map external) in the next sentence:

- (2) This is the result of this weather front. It’s pushing in from the North West. It’s gonna sink down across the country overnight.

5. Viewpoint in weather reports

The viewpoint adopted in weather reports can be quite straightforward. Example (3) below shows a perfect example of a weather woman addressing the audience. The viewpoint adopted is that of the speaker both in speech and gesture:

- (3) Let’s come back to that cluster of clouds I showed you earlier. (a) [There it is on our forecast charge], (b) [an intense area of rain].



Figure 4: Two pointing gestures in example (3): speaker viewpoint ([20]).

In this utterance, the pronoun “I” clearly makes reference to the speaker, and “earlier” makes reference to a time prior to the time of speaking so that the frame of reference is clearly established as the “here and now” of the speaker. The two pointing gestures that accompany speech are static gestures, one being a point with the index finger while she says “there it is”, thus locating a precise location on the large scale map, the other a point with extended open palm in the same direction, matching the word “area” in speech. Both gestures locate a point or an area on the map with respect to the speaker’s body so that there is a perfect match in between the “here and now” in speech and the “here and now” in gesture, with a viewpoint that is completely external to the map. Such a perfect match is however not always met in weather reports as will be shown below, and mismatches may arise due to switches in viewpoint, in speech, in gesture or both, or to shifts in deictic center.

5.1. Switches in viewpoint

Consider the following example from a BBC national report in the UK:

- (4) That cloud then stays with us in the South. To the north of it, here we’ve got some clearer spells.

The question is: Who is “us/we”? Or in other words, what is the viewpoint adopted in this stretch of talk? Traditional grammars describe the pronoun “we” as including the speaker and any number of other people. This is perfectly appropriate for the mention of “us” in the first sentence. Since the recording studio is located in London, it makes sense to consider that “us” refers to the speaker and the part of the audience who lives in the South. The mention of “we” in the second sentence cannot however refer to the same people. For one thing, another part of the audience is included in the reference, and besides, the speaker cannot be “in the South” and “to the north of it” at the same time, which means that “we” can’t include the speaker this time.

However, in weather reports, speakers are supposed to be objective and not take their hometowns as systematic deictic centers in the description. In order to remain as objective as possible, they generally assume the role of *narrator*, whose deictic center is as neutral as possible and is placed on the map in the middle of the space they describe (a nation, a country, a region...).

So in example (4) above, one can consider that in the second sentence “we” refers to the part of the audience living north of the cloud and the narrator of the report. The viewpoint in speech is now map-internal. Yet, the neutral deictic center (supposedly located in the middle of the UK in this national weather report) has shifted north as a new focus of attention ([13]) has been opened and the narrator’s deictic center has been “transposed” ([14]) to the North as indicated by the use of the proximal deictic pronoun “here”.

Now consider example (5) from a BBC report that presents the weather in some parts of Africa (some major towns on the continent are mentioned but not in every country though):

- (5) In Maputo we’re in for a bit of a deluge over the next couple of days.

The head office for this report is located in London and the report is not addressed to people living in Africa, but actually to people in the UK who might want to travel to the African countries mentioned in the report, or who have relatives there. The speaker of the report is therefore not in Maputo at the time of speaking and neither is the audience. “We” in this utterance includes the space of the narrator again, as well as some imagined people living there but not the audience of the report and the deictic center has once again shifted from some neutral deictic center to “Maputo” which becomes the temporary “present” location for the description.

Example (6) below is an extract from a CBS report about a blizzard over New York City. While uttering this sentence, the speaker makes 4 pointing gestures toward fixed locations on the map (first with index finger, then with tip of all fingers a little bit below the first gesture), followed by a dynamic sweeping gesture upward with the open palm of his hand, and at last a double-handed open palm gesture towards the map. The 4 gestures marked in the text with square brackets are illustrated below the example in Figure 5.

- (6) (a) [Right now], (b) [we’re dealing with them and we’re out in the East end of Long Island] (c) [all the way up through the coast] of Maine and (d) [this is your picture at around 3 o’clock] in the afternoon.

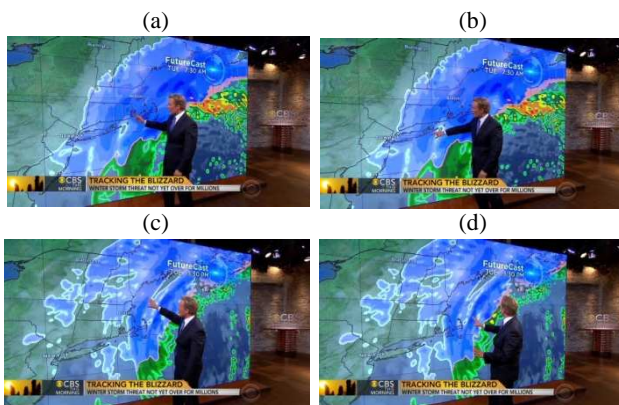


Figure 5: Four pointing gestures illustrating viewpoint switches over the course of an utterance ([21]).

In (a), the gestural viewpoint adopted is that of the speaker, pointing to a particular location on the map (New York City) that establishes a first reference point, but the deictic center is then shifted south and north of New York in (b) and (c) which

reveals not the viewpoint of the speaker but that of a narrator moving along the coast as he follows the expected progression of the represented snow front. The deictic center has shifted from New York City to the East end of Long Island which enables the narrator to express a distal information in speech with “all the way up”. In (d), the viewpoint is again that of the speaker standing in front of the map (and actually looking at the top right corner of the map where the expected time is noted in script) and addressing the viewers so we are back to a speaker/audience relationship, instead of the previous narrator/narrated object point of view.

As we can therefore see, switches in viewpoint may occur over the course of a verbal utterance, but may also be visible in the gestures made by the weather person. So far, gestures and speech have been congruent in the expression of viewpoint. We will now look at examples in which the viewpoint expressed in speech is not the same as the viewpoint expressed in gestures.

5.2. Viewpoint mismatches in speech and gesture

Example (7) below was uttered in the same CBS weather report as the extract just mentioned, whose head office is located in New York. The weather reporter is talking of a blizzard over New York City:

- (7) While we were sleeping [it just pushed a little bit more off to the East].

The verbal viewpoint adopted in this example is multiple since the deictic center shown by the use of “we” is New York City, and this is the space of the speaker, of at least part of the audience, as well as the deictic center of the narrator so the deictic center adopted lies at the intersection of the three spaces as represented in Figure 6 below:

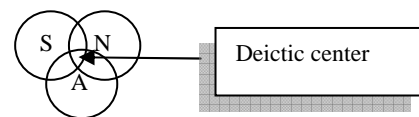


Figure 6: Deictic center at the intersection of speaker (S), narrator (N) and audience (A) space in example (7).

Let’s now look at the pointing gesture made by the speaker when uttering example (7). Index finger extended the speaker points to New York on the map and draws a short a line towards the right, as shown in the left-hand side picture of Figure 7:



Figure 7: Left: pointing gesture made by the weatherman in example (7); right: position of weatherman later in the video ([21]).

With this gesture, the weatherman illustrates the route taken by the blizzard overnight away from the city. If we consider the viewpoint of the audience and narrator, then the gesture moves away from the deictic center (a point on the map representing New York City), and this is consistent with the semantics of “off” in speech. But at this time of the report, the

speaker is standing on the right side of the map, which involves that while saying “off to the East”, the direction of his gesture is towards himself, thus creating a mismatch in between verbal content and gesture. The mismatch could have been avoided with a shift of the speaker to the other side of the map as he does later in the video.

Another mismatch is observed in example (8)

- (8) Temperatures a little bit warmer, still running low, somewhere about 70 to 75 [and here comes the next front in] which will arrive late Sunday.



Figure 8: Dynamic pointing gesture produced during example (8) [22].

As he is describing the temperatures in example (8), the weatherman is standing beside the map, facing the audience and gesturing but not pointing at the map. The deictic center is neutral, i.e. located towards the middle of the region of the US he is describing. This deictic center is still reflected in speech when he utters “here comes the next front in”, with the use of the verb “come in” which is appropriate from a viewpoint located in the middle of the map. The gesture however is made from the speaker’s viewpoint, since the weatherman makes a sweeping movement of the end towards the middle of the map. The viewpoint in gesture is then external to the map as it depicts the route the rain front will adopt.

In example (9) below, the reporter makes a continuous pointing gesture towards the map as she utters:

- (9) The temperatures are rising as we head for the South.



Figure 9: Pointing gesture made in example (9). Arm position during preparation phase (left) and at the end of preparation (right) [20].

This is the same weather woman as for example (5) and we’ve already said that while describing the weather in parts of Africa, she is not in Africa herself and thus does not share the physical space with the object of her description nor does the audience. So when she says “we head for the South”, she adopts the narrator’s point of view, as well as the viewpoint of the viewers, not a speaker’s point of view. Her gesture, however, is made from the speaker’s viewpoint, rather than from the narrator’s: she makes a single static gesture to her left, but during the preparation phase of her gesture, the map begins to scroll down so that her pointing gesture encompasses an area of the map, but does not in itself encode movement southward.

5.3. Shifts in deictic center

As shown in section 5.1, different gestures produced in a sequence may indicate switches in viewpoint, especially switches from speaker to narrator point of view and vice versa. They may also reveal shifts in deictic center. Consider example (10) below, illustrated in Figure 10:

- (10) (a) [Now, through this evening], (b) and (c) [that rain will gradually sink its way slowly southward] (d) [in the far North of England].

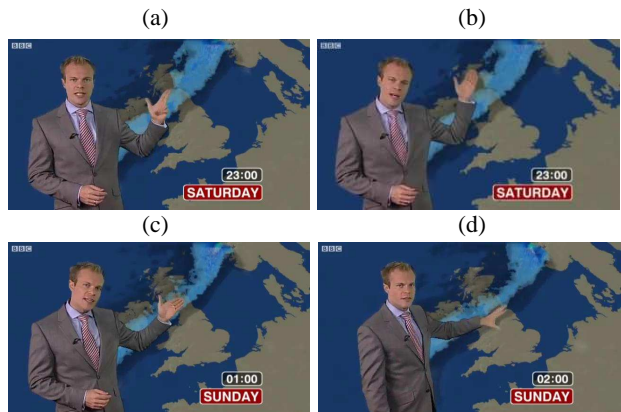


Figure 10: Sequence of gestures produced during example (10) [19].

Just before this stretch of talk, the weatherman was describing rainy conditions over Northern Ireland, with an area of rain extending northward (shown in blue on the map). The pointing gesture with index and middle finger extended in (a) enables the narrator to establish a new deictic center located in the middle of Scotland, which serves as a new reference point for the description of the path that will be adopted by the water front over the coming hours. In speech, this shift of deictic center is shown by the use of discourse marker “now” which does not refer to the present time of speaking but opens up a new focus of attention in a new discourse unit. The direction of the water front is itself depicted in the small sweeping hand movement downward illustrated in (b) and (c), with an open palm covering the area, that matches the accompanying speech “sink ... southward”. The flip of the hand shown in (d) indicates a new shift in deictic center that is present in speech as well: “the far North of England” implies that the reference point is somewhere towards the South of England, and that matches the location of the speaker in London, who is momentarily abandoning the neutral viewpoint of narrator.

Before concluding, let us return to the example given in the title of this paper, and which is reproduced below in (11):

- (11) [This area of rain will stick South in the far North].



Figure 11: Pointing gesture made in example (11) [19].

While uttering this sentence, the speaker makes a sweeping gesture to and fro along the border separating England and Scotland. While the whole gesture is speaker-oriented and

map external, speech functions exactly as in example (10), with a narrative shift from a point in Scotland as the speaker utters “stick South” to a point in the South of England as he utters “in the far North”. The role of the gesture in this example is not to accompany the shift in deictic center, but rather to oppose the two locations implied in speech.

6. Conclusion

This paper presented a preliminary analysis of personal and spatial deixis in weather reports, with a focus on the mapping of gestures with stretches of speech. Beyond the type of map (medium) used in each report, static or dynamic, which has an impact on gesture, creating possible mismatches between the two, it is especially in terms of viewpoint and deictic center that weather reports show real complexity.

In terms of personal deixis, the viewpoint adopted in weather reports corresponds to the “here and now” of the speaker in a relative frame of reference (map-external viewpoint), of a narrator transposed into the absolute frame of reference of the map itself, and/or of viewers (either as people directly sharing the space under description or not). In this Bakhtinian polyphony of voices, gesture and speech may be perfectly congruent as far as viewpoint is concerned, but we have seen as well that a certain viewpoint may be adopted in a modality whereas the viewpoint adopted in the other modality may be different, which is very close to what Fricke ([6]) showed in a face-to-face interaction of a route direction. The externality/internality of viewpoints regarding maps is reminiscent of the distinction made by McNeill ([15] and [16]) for gesture between character or observer-viewpoint.

In terms of spatial deixis, the deictic center is constantly changing as the description of the weather report progresses. Once again, the frequent shifts may result in mismatches in gesture and speech, although this is not necessarily the case.

Because of the already extreme complexity of medium, viewpoint and reference points, the temporal aspects of weather reports were left aside in this paper, but as a weather report is by nature linked with the passing of time, establishing links between past, present and expected weather in the future, all in the condensed form of a one or two-minute presentation, temporal deixis should be included in further studies of weather description. Another possible line of research would be to compare the description of a same event by different channels or in different countries.

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