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Using a geospatial approach to document and analyse locational points in face-to-face conversation

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Summary

This paper presents a geospatial framework for the documentation and analysis of naturally-occurring locational points in interaction. This novel approach aims to provide a set of methods and procedures for interrogating geographically-enriched interactional data. GPS and GIS metadata and satellite imagery are brought to bear on video-recorded multiparty interactions to situate pointing gestures within the broader topographic setting, allowing the directionality of points to be determined to within a few degrees. The methods illustrated in this paper primarily aim to assist research on the relationship between language, gesture, and spatial cognition. By examining and comparing naturally-occurring locational points produced by speakers of typologically different languages (namely English, Gija, Murrinhpatha, and Jaru) this paper demonstrates how a geospatial approach may facilitate systematic comparisons of pointing styles across languages, contexts, and cultures, and support investigations into universals of human conduct.

Note: The video recordings of the extracts in this paper can be accessed through Figshare at:
https://doi.org/10.25949/17211686

Abbreviations

ABL = ablative; ALL = allative; ANAPH = anaphoric demonstrative; AUX = auxiliary; CONT = continuative; DEM = demonstrative; DIR = directional; DIST = distal demonstrative; DO = direct object; EXC = exclusive; F = feminine; FOC = focus; NFUT = non-future; INTS = intensifier; IO = indirect object; IPFV = imperfective; LOC = locative; NC =ANM = 'animate' noun classifier; NC =HUM = 'human' noun classifier; NC =RES = 'residue' noun classifier; NC =PL/T = 'place/time' noun classifier; NFUT = non-future; NSIB = non-sibling; OBL = oblique; PC = paucal; PIMP = past imperfective; PL = plural; PRES = present tense; PROX = proximal demonstrative; PST = past; RT = response token; S = subject; SG = singular; TAG = tag particle; TR = transitive; TOP = topic; 1 = first person; 3 = third person

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1. Introduction

Methods based on information derived from Geographic Information Systems (GIS) and Global Positioning Systems (GPS) have been increasingly employed in the social sciences over the past thirty years (Spencer 2003). Due to the improved accessibility and portability of GPS technologies, researchers interested in the relationships between human spatial behaviour and the environment have increasingly drawn on geotopographical dimensions in their analyses. Simultaneously, as GIS software has become more accessible and easier to use, visual methods incorporating mapping components have been adopted in linguistic research, particularly within language documentation (Gawne & Hiram 2016).

The use of geographic information is not new in social sciences research methods, and certainly not unheard of within linguistics. Scholars working in various fields of diachronic and synchronic linguistics (see, e.g., Auer et al. 2013), and in language and spatial cognition (see, e.g., Levinson 2003, and references therein) have long utilised geographical data for their analyses and linguistic mapping. However, the potential offered by GPS-enhanced visual methods has only recently been more thoroughly explored, particularly within research on spatial language and orientation (Cialone 2018; 2019) and language documentation (Larsson et al. 2020). These studies have called for methods that facilitate the integration of behavioural and geospatial data. In particular, Larsson et al. (2020) insist on the analytical significance of acquiring georeferenced video-recorded data through GPS for visuospatial linguistic analyses of speech communities through GIS software. While a renewed interest in spatial and topographical considerations of language use has been recently put forward in research on correlations between environmental features and diversity in spatial language (e.g., Palmer et al. 2017, 2018a), GPS-informed naturalistic studies on interactions between spatial referencing strategies and embodied practices remain scant. Notable exceptions are Haviland (1993, 2000, 2003) on pointing gestures in narratives by speakers of Guugu Yimidhirr and Mayan Tzotzil, and, more recently, study of the relationship between of demonstratives, points, and referent distance in large scale space in Quiahije Chatino by Mesh et al. (2021), and a study by de Dear et al. (in press) which employs the approach and the methodology discussed in the next sections.

This paper proposes a *geospatial* approach for the documentation and analysis of locational pointing practices during occasions of place reference in conversation. This approach has originated from the Conversational Interaction in Aboriginal and Remote Australia (CIARA) project.[1] CIARA is a

[1] http://ciaraproject.com/, accessed 2021-11-21.

multi-institutional project for the documentation and language revitalization of four endangered Aboriginal languages, and remote and rural varieties of Australian English.[2] One crucial aim of the project is to better understand how participants' knowledge of place is managed in conversation, be it through language or otherwise. Using the methods of Conversation Analysis (Schegloff 2007) and Interactional Linguistics (Couper-Kuhlen & Selting 2018), we present a comprehensive framework for the empirical study of locational points as they naturally occur in everyday multiparty interactions. Conversation Analysis (henceforth CA), from which Interactional Linguistics (henceforth IL) derives, is a naturalistic, inductive approach to the investigation of language in social interaction. This analytic approach provides a rigorous and empirically-grounded framework for the study of human verbal and embodied conduct, with a focus on the ways in which social actions are incrementally accomplished and sequentially organised in and through interaction. Our interest in geospatial explorations of locational points stems from considerations surrounding the ways in which speakers understand *where* someone is talking about in conversation. In line with conversation analytic interest in exploring participants' sense-making practices in everyday interactions, we are mainly concerned with locational practices which speakers treat as *adequate* for all practical intents and purposes (Garfinkel 1967: 7-9), rather than *accurate* in absolute geospatial terms. Repeated observations of the multimodal practices employed by speakers during place formulation, particularly when referring to distant referents, have highlighted the analytic advantages of incorporating geospatial data into the analyses of talk and other conduct in interaction. Thus, our framework aims at facilitating analyses of pointing to locations in contexts of place reference through the aid of spatial insight. In conceptualising locational pointing, we follow a definition given by Enfield et al. (2007: 1724) (see also Kendon 2004: 200):

> [a] communicative bodily movement which projects a vector whose direction is determined, in the context, by the conceived spatial location, relative to the person performing the gesture, of a place or thing relevant to the current utterance.

Regardless of its articulator (e.g., a hand, a stick, the eyes, the lips, or the head), a point commonly includes four main components (Le Guen 2011: 272), namely an *origo* (O) from which the vector originates, a *vector*, i.e. a

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[2] Conversational Interaction in Aboriginal and Remote Australia is a collaborative research project funded by the Australian Research Council (DP180100515).

semi-axis projected from the origo which encodes the angular orientation of the point through an *anchor point* (A), and a *target* (T) which designates the entity being pointed at. Figure 1, adapted from Le Guen (ibid.), illustrates these features:

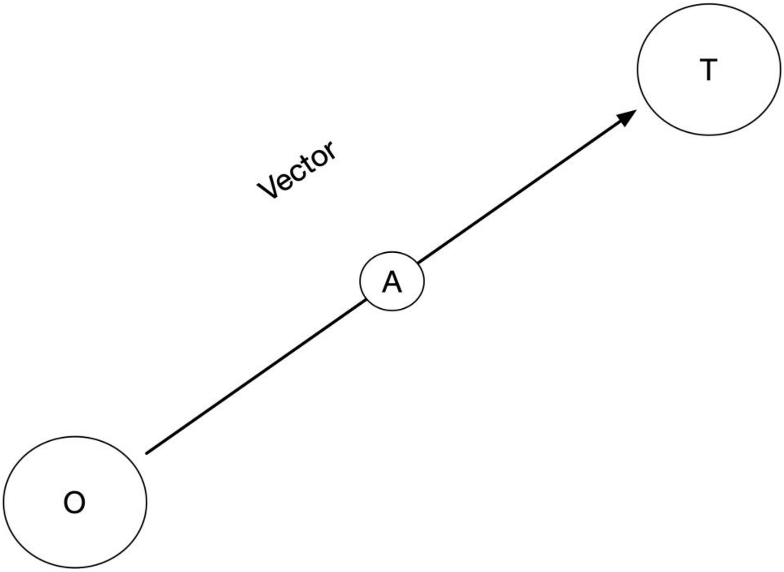

Figure 1: Main point components

The methods and procedures discussed in this paper show how to integrate multimodal conversation analytic methods (Stivers & Sidnell 2005) with GPS-derived information and GIS visual representation of geospatial context. Through our geospatial approach, we aim to provide researchers with a systematic, highly replicable account for the analysis of pointing gestures relative to parts of speech, sequences of actions in interaction, as well as the wider geographic environment in which the pointing gestures occur. While the multimodal approach to conversational data enables us to uncover the relationship between different semiotic resources mobilised in locational practices, the geospatial framework enhances and expands the domain of talk-in-interaction by facilitating the incorporation of the wider spatial context in which the locational points are produced. Specifically, we demonstrate how geographically enriched interactional data can be interrogated to capture the directionality of locational pointing gestures, particularly in the study of conversational place reference and spatial language and cognition.

In order to demonstrate some of the practical implications of a geospatial approach to interaction, this paper illustrates the procedures used to describe and compare locational points across conversational corpora from four typologically different languages, namely Gija, Murrinhpatha, Australian English spoken in a remote community of north Western Australia (de Dear et al. in press), and Jaru.

The paper is organised as follows: Section 2 offers a brief account of existing research on locational pointing, with a focus on the different methodologies employed. Section 3 illustrates the procedures through which we identify, code, and visually represent pointing gestures in order to verify their directional acuity. Section 4 presents four excerpts (one from each language) where geospatial considerations are integrated into the interactional analysis. Finally, implications for the study of naturally-occurring locational pointing practices and spatial language are discussed in Section 5.

2. Space, language, and locational pointing

Referring to places in space is a fundamental and ubiquitous activity in human interaction (Enfield & San Roque 2017; Levinson 2003; Schegloff 1972). While virtually all languages are equipped with a variety of grammatical options to express spatial relations (Levinson 2003; Levinson & Wilkins 2006), speakers are seen to routinely draw on embodied resources to achieve place reference in conversation (Enfield 2013; Schegloff 1972). In fact, bodily behaviour typically accompanying verbal place reference practices may entirely substitute verbal formulations (Schegloff 1984).

Pointing is widely considered to be a fundamental human gesture (Tomasello 2008: 62) normally emerging in early infancy (e.g., Filipi 2009), and appears to be universally distributed across human societies (Kita 2003a). Pointing gestures have attracted the attention of numerous researchers from disparate disciplines for centuries (see Kendon 2004 for a historical overview). In recent years, pointing gestures have been explored within the fields of psychology and cognitive sciences, psycholinguistics, language acquisition, semantics, semiotics, pragmatics, and ethnography (cf. Enfield 2009 and references therein).

Psychologists, cognitive scientists, and acquisitional linguists have been primarily concerned with the emergence of pointing gestures in relation to language processing, acquisition, development, and loss. Specifically, researchers working within psycholinguistic frameworks have highlighted similarities between language and gesture underlying cognitive processes, which are described as primarily computational (e.g., McNeill 1985). Psycholinguistic research has provided fundamental insights into the ontogenesis of pointing gestures and their relationship with language, while also establishing widely adopted classifications of gestures, such as the *iconic*, *metaphoric*, *deictic*, and *beat* categories (McNeill 1992). As these perspectives are primarily informed by cognitive sciences, studies within this tradition are usually carried out in a laboratory setting and typically involve controlled variables, the administration of ad-hoc designed tasks, and the adoption of other non-naturalistic procedures (e.g., McNeill 1985, 2000). In a similar vein, and employing the same methods derived from cognitive sciences, language acquisition research has investigated the relationship between pointing and language (e.g., Goldin-Meadow 2014; Liszkowski et al. 2004), particularly as a precursor and predictor of language acquisition (Butterworth 2003), and as a means to convey shared intentionality in prelinguistic infancy (Liszkowski et al. 2006).

A considerable amount of research on locational pointing has been conducted in comparative pragmatic and semantic studies on linguistic and spatio-cognitive variation (cf. Kita 2009 for an overview). Cross-cultural and cross-linguistic explorations of spatial language and Frames of References (FoR) (Levinson 1996, 2003), namely the different cognitive strategies speakers use to conceptualise space, have considered the relationships between spatial language and non-linguistic behaviour. Notably, research on FoRs has suggested that remarkably different methods for linguistically encoding space across language groups might account for FoR preferences (e.g., absolute VS relative VS intrinsic).[3] Studies in comparative pragmatics and semantics have principally employed stimuli, such as elicitation techniques, 'Picture-Book', memory and localisation tasks, maps, and the *Men and Tree Space Game* (Levinson 1996: 200; Levinson et al. 2002; Levinson & Wilkins 2006: 8–13). Rotational tasks have been used to reveal participants' 'dominant' FoR, and to establish a correlation between cognitive and linguistic methods of encoding space (e.g., Majid et al. 2004; Pederson et al. 1998). Within this line of research, Le Guen (2011) has significantly contributed to the development of the geospatial methods presented in this paper. In this study, the author draws on naturalistic and experimental data from two speech communities (Yucatec Maya and French), and focuses on gestures used for path indication and the placement of entities in remote space. Central to the development of our framework, Le Guen (2011: 301) recommends that:

> when studying pointing when the geocentric frame of reference is used it is necessary for the researcher to always be able to identify the orientation of the scenes described, i.e., to have an extensive knowledge of the local geography, objects, and manmade things (roads, houses, etc.) using maps and GPS measurement.

[3] For a critique of FoR models and Whorfian assumptions in studying naturally-occurring points in interaction cf. de Dear et al. (in press)

Studies on Australian Aboriginal languages have investigated spatial language and gesture use predominantly in narratives, and typically in languages considered to prototypically rely on absolute FoRs for expressing spatial relations (Green 2014; Green & Wilkins 2014; Haviland 1993, 1998; Levinson 1996, 1997; Wilkins 2003). Similarly to the studies discussed above, research on Australian Aboriginal narratives usually employs elicitation techniques, recollection tasks, and stimuli. Central to the development of our geospatial framework, Blythe et al. (2016) demonstrate the possibilities of GPS and GIS derived information to investigate the relationships between pointing gestures and the use of demonstratives in Murrinhpatha in an interactional experiment. Building on the methods in Blythe et al. (2016), a recent study by de Dear (2019) employs the geospatial approach presented in this paper to investigate conversational place reference and pointing in Gija, while de Dear et al. (in press) draw on the same approach to compare pointing gestures across Gija, Murrinhpatha, and Australian English spoken in remote regions.

A related line of research on spatial reference in Australian Aboriginal languages proposes a sociotopographic account of spatial language diversity both across languages (Palmer et al. 2018a), and within language communities (Palmer et al. 2018b). Such explorations of the connections between culture, topography, and spatial language (Palmer 2015; Palmer et al. 2017) have been particularly relevant to the development of our geospatial approach to locational pointing, especially for the incorporation of the surrounding environment to which speakers refer verbally and otherwise (cf. also de Dear et al. in press). While sociotopographic considerations of spatial language and gestures provide compelling evidence for the significance of geographical data for linguistic analyses, these studies employ experiment-based methods, rather than naturally-occurring conversational data.

Although research on pointing has been predominantly conducted within experimental and quasi-experimental frameworks, involving the use of stimuli, elicitation, and recollection-based methods, socio-interactional lines of inquiry (with which our approach aligns) have positioned pointing gestures as a locally-situated practice (Goodwin 2003, 2006). Unlike cognitively-oriented research, socio-interactional studies primarily draw on video recordings for the study of pointing gestures, and are often informed by conversation analytic methods. For instance, Enfield (2009) and Enfield et al. (2007) investigate pointing gestures during semi-structured 'locality interviews', as well as in naturally-occurring conversation in Laos. Similarly, whilst concentrating on the interactional and pragmatic aspects of pointing, Kendon (1992, 1995, 2004) draws on a vast corpus of naturally-occurring conversations in everyday settings, but also institutional and semi-institutional talk, as well as elicited talk. In another study, Kendon & Versante (2003) use naturally-occurring video-recorded Italian conversations to describe and compare six forms of deictic manual pointing during occasions of place and name reference. Socio-interactional research on the coordination of pointing gestures and speech has also drawn on mixed-methods, i.e., experimental and naturalistic data, in an effort to bridge psycholinguistic conceptualisations of locational gestures with their interactional use in everyday conversations (e.g., Kita 2003b).

Interactional research informed by Ethnomethodology (Garfinkel 1967) and CA has systematically investigated interactants' embodied conduct and its relationship with turns-at-talk (Schegloff 1984), with a specific focus on the sequential organisation of actions in interaction. Over the past 30 years conversation analytic research has demonstrated the complexities of pointing and its finely tuned coordination with talk. Specifically, conversation analysts have explored pointing in a variety of contexts, including work meetings (Mondada 2007), archaeological field excavation (Goodwin 2003), parents-children interactions (Filipi 2009), and atypical interactions (Goodwin 2003; Klippi 2015; Wootton 1990). Moreover, a recent call for a more pragmatically-oriented and interactional understanding of place reference in interaction using naturally-occurring data has been put forward by a special issue of *Open Linguistics* (Enfield & San Roque 2017).

Although the fine details of interaction and matters such as temporal and sequential relations have traditionally been at the centre of CA research, the relationship between locational gestures, the wider space, and geography has regularly been overlooked. CA studies have typically considered the immediate interactional context, describing the ways in which participants may orient to specific interactional affordances offered by the surrounding environment, artefacts, and other local referents. While aligning with CA research, we aim to fill this gap by providing a framework that will yield spatial insights into the analysis of interactions by incorporating the wider spatial context through GIS and GPS technologies.

3. Tools of analysis

The following sections discuss the acquisition and management of geospatial data as integral to interactional data collection procedures (3.1); the mapping of geographically-enriched data onto the wider geographical environment (3.2); and the techniques employed to visually represent pointing gestures and their locational acuity (3.3).

3.1 Acquiring and managing geographically-enriched conversational data

Data collection represents a crucial, and particularly delicate, stage for the investigation of naturally-occurring locational pointing gestures. This section presents the procedures adopted in de Dear (2019) and de Dear et al. (in press). Where possible, two cameras, one of which was mounting a wide-angle lens and shot in 4K resolution, were positioned at different angles to capture embodied conduct accompanying talk from two perspectives. Audio was recorded with two shotgun microphones mounted on cameras, and individual cardioid lavalier microphones worn by participants. The audio signal from the lavalier microphones was captured through wireless transmitters and receivers, and acquired by an eight-track field recorder, which generated backup audio tracks and allowed real-time monitoring during the recording sessions.

A first set of geographical information was obtained with a handheld Global Positioning System (GPS) unit. It is worth noting that some cameras can mount GPS receivers, or have in-built GPS. Mobile phone applications, such as iOS Compass, and various other GPS trackers can also be used for geolocalization purposes (see Figure 2).

Figure 2: A handheld GPS unit such as the Garmin etrex touch 35 *(on the left) or the iOS compass application (right) can be used to determine the longitude and latitude of the recoding location and the absolute bearing of the camera.*

Throughout the data collection process, it is central to ensure that the location of the recording session is noted as accurately as possible,[4] preferably including complete coordinates for a more precise retrieval of the location(s) where the recording session takes place. In order to make the location as geographically-transparent as possible, and to minimise possible placename ambiguity,[5] coordinates should be expressed following the *WGS84 Web Mercator* coordinates system. The latitude and longitude should be annotated through the Degree Minutes and Seconds system (DMS) (e.g., Sydney: 33°51′54″S 151°12′34″E), or the Degrees and Decimal Minutes system (DMM) (e.g., Sydney: 33.8678500 151.2073200), so that the geographical information can be readily shared, imported, and utilised in satellite imagery and mapping software.

GPS information allows researchers to obtain sufficiently accurate coordinates of the recording location, particularly when the recording takes place outdoors or in unfamiliar areas. Importantly, the compass sensor, usually integrated in GPS trackers, enables the absolute bearings of cameras to be recorded (in degrees from true north), which will be used in subsequent analyses of locational points. Annotating camera bearings is another central aspect of verifying the acuity of locational pointing practices. Initial relative alignments of the camera(s) should be recorded, as well as any subsequent alignment changes during the session. While the alignment of cameras will commonly be expressed in degrees, it is also useful to include approximate compass directions with the aid of a physical compass, a handheld GPS device, or a dedicated application.

Geospatial information should then be incorporated into recording session metadata files. Metadata represent a crucial set of information in language documentation and analysis, particularly for data management, retrieval, storage, and archiving. Table 1 shows the template that was employed to generate and manage metadata for video-recording sessions within the CIARA Project.

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[4] Generally, accuracy of 10-30 meters is expected (Stephan Winter, personal communication, 2021-05-31), however, open-sky GPS is usually accurate to within 4.9 meters (National Coordination Office for Space-Based Positioning, Navigation, and Timing 2020)

[5] Locations may have different or alternative denominations and spellings, as is frequently the case for Australian place names.

Table 1: CIARA metadata template

Session	ddmmyy_recorder(s)_session number
Date	dd/mm/yyyy
Speakers	Name; Name; Name
Recorder	Initials
Recording Location	Place name(s)/Description of location
Session type	Conversation
Language(s)	Language(s) X; (Y)
Notes	Abc
Notes on tracks	Xyz
Audio file	Session ID_SpeakerName.wav Session ID_SpeakerName.wav Session ID_SpeakerName.wav Session ID_Composite.wav
Video file(s)	Session ID_CAMERAID.mp4 Session ID_CAMERAID.mp4
Camera(s) Alignments	CameraName1 Position; Compass direction CameraName2 Position; Compass direction

3.2 Mapping the recording location

Geographic Information Systems (GIS)-based software, such as *Google Earth*, represent an essential complement to the analysis of GPS-derived information, particularly for the visualisation of pointing vectors. Once the geographical data are instrumentally acquired, the recording location can be mapped using GIS software. *Google Earth* 7.1.8 and *Google Earth Pro* 7.3.3 were used for our comparative study of locational pointing in Aboriginal and remote Australia (de Dear et al. in press). *Google Earth* offers a direct import option that can be found under the *Tool* tab (cf. Figure 3). When the GPS device is connected to the computer, *Google Earth* can import the selected GPS data and depict them in the satellite imagery.

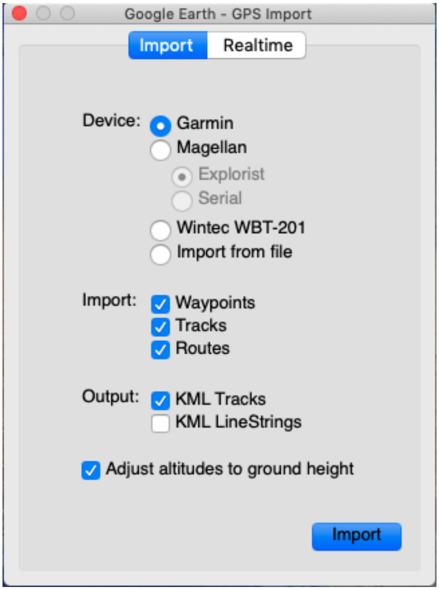

Figure 3: GPS Import window in Google Earth

Alternatively, the coordinates of the recording location can be manually entered into the search box, in the left-hand panel, as shown in Figure 4.

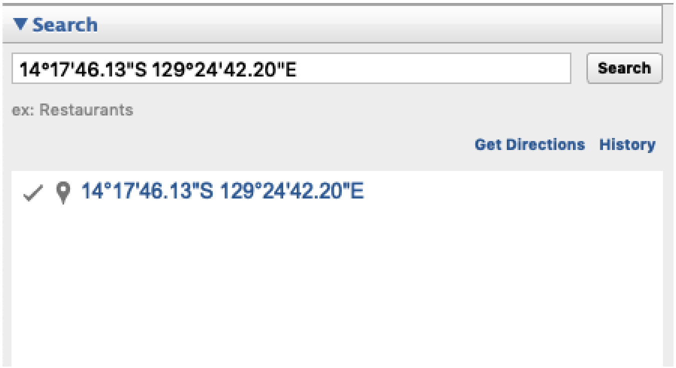

Figure 4 : Manual search of recording location in Google Earth search bar

Once the recording place is located, a *placemark* or *pin* can be added to the satellite imagery by clicking on the placemark icon (cf. Figure 5), or by selecting *Placemark* under the *Add* tab. Renaming the placemark with the video-recording session ID will be reflected in the label of the placemark in the satellite imagery, as shown in Figures 5 and 6. A brief description, including a URL, and images on the internet and/or locally stored, can be added to the placemark under the *Description* tab, while the label size, scale, transparency, and colour can be edited under the *Style*, *Color* tab. Various visualisation features of the placemark, including the relative tilt degree, can be adjusted in the *View* tab, while the placemark can also be displayed according to its absolute, relative, or clamped altitude in the *Altitude* tab.

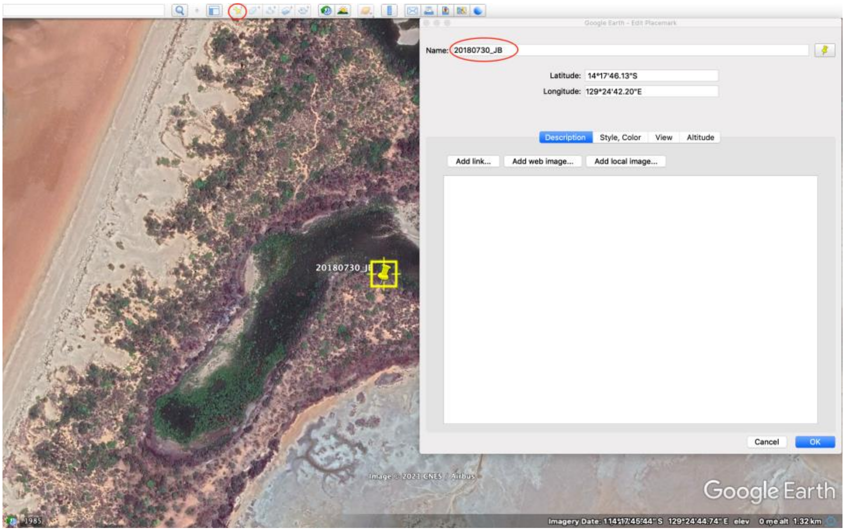

Figure 5: Placemark window

Figure 6: Screenshot of a placemarked recording location in Google Earth

The coordinates and relative altitude of the recording placemark are also provided in Google Earth, in the bottom right corner of the screen, as shown in Figure 7.

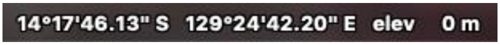

Figure 7: Coordinates and Elevation of the placemark

Once the recording location is saved, the spatial data can be stored as a *Keyhole Markup Language* (KML) file, or in its compressed version (KMZ) (cf. Figure 8). KML and KMZ formats ensure exportability and importability from and into other GIS software programs that can be later used for the visualization of geospatial data. KML and KMZ files can also be easily shared across a variety of platforms and can be converted into shapefiles (SHP), a dedicated geospatial vector data storage format commonly employed by GIS software for the mapping, editing, and analysis of geospatial data, such as QGIS.[6]

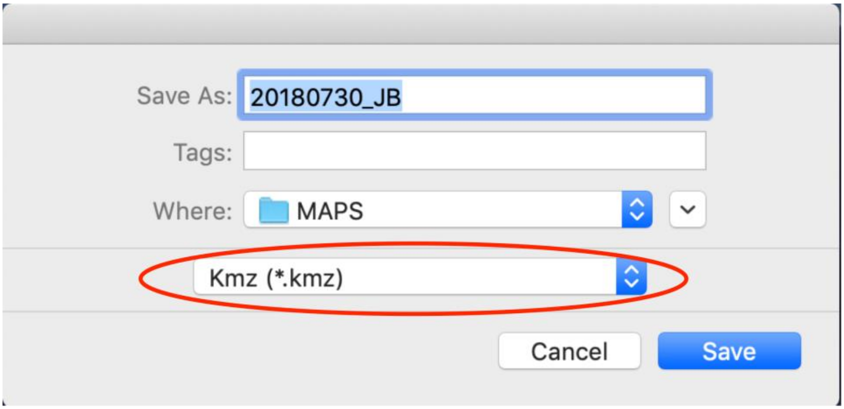

Figure 8: Saving Placemarks as a .kmz file in Google Earth

[6] QGIS is an Open Source Geographic Information System (GIS).

3.3 The visual representation of space and locational pointing gestures

The graphics for the representation of locational points in conversation were realised through a process of geospatial information overlaying. This section illustrates the main steps that were taken to visually complement the comparative interactional analysis of locational points in conversation.

Once the locational points are identified in the recording, a still frame of the gesture, usually capturing the *stroke* phase of the point,[7] is grabbed, as shown in Figure 9. Here Mabel points north-north-east with an elevated index-finger.

Figure 9: Still frame of a pointing gesture

In order to extrapolate the trajectory of the vector projected by the pointing gesture, and the resulting semi-axis orientation determined by the main articulator or anchor point (Le Guen 2011: 272) it may be helpful to visualise the scene from an ideal vantage point, such as a bird's-eye view (cf. Figure 10). Software such as *Adobe InDesign* or *OmniGraffle* can be useful to recreate a model of the scene. In Figure 10, the inferred pointing vector (yellow arrow), the camera position and its bearing (red arrow), as well as the physical arrangement of the participants are visually represented, while the pointing gesture in question is circled by a dotted line; a compass is included for reference. It should be noted that the spatial arrangement of the participants is not instrumentally recorded but only inferred. Close examination of the video-recorded interaction and/or pictures of the scene

[7] Research on gesture describes points as generally articulated into three core distinct phases: *preparation*, *stroke*, and *retraction* (e.g., McNeill 1992).

enables the extrapolation of the participants' relative positioning, and allows the analyst to produce a sufficiently accurate visual representation.

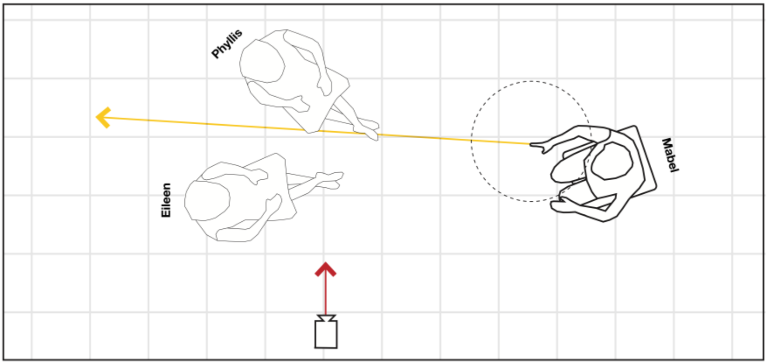

Figure 10: The scene reproduced from a bird's-eye perspective

Using the video recording metadata, the satellite imagery is rotated according to the camera bearings (110° east-south-east in the example here illustrated).[8] A simple method to ensure that the map rotation reflects the camera bearing(s) is to use the *ruler* tool in Google Earth (cf. Figure 11).

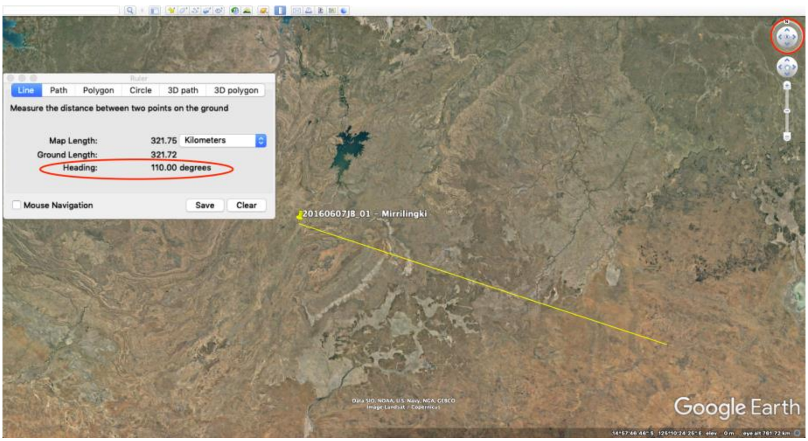

Figure 11: Using Google Earth's ruler tool to orient to landscape with respect to the absolute bearing of the video camera.

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[8] Only one camera was used during this recording session.

When the 'line' tab is selected, it is possible to draw a semi-axis with a precise heading measured in degrees. 'Heading' should be an exact match to the bearing of the camera, as recorded in the metadata. Once the line has been saved, the compass on the top right-hand side of the screen (circled in red) needs to be rotated until the line reaches a perpendicular positioning (see Figure 12). The line can then be saved as a KMZ file and made (in)visible for later use and further analysis.

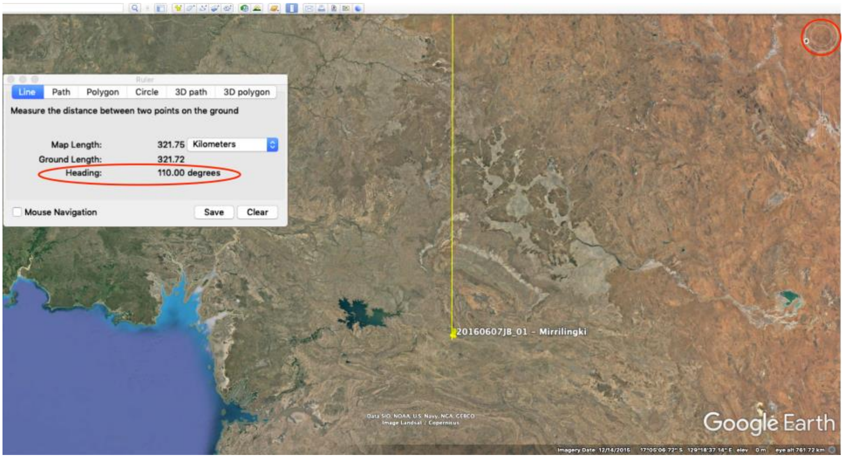

Figure 12: The landscape is rotated until the camera bearing is aligned vertically toward the top of the image

The recording location, in this case *Mirrilingki* (Western Australia), is pinned onto the satellite imagery through the place-marking process discussed in the previous section. A snapshot of the rotated satellite imagery displaying the recording location is taken and saved as a .jpg or .png file.

The image is then imported into digital illustration software, where the origo (O) of the point as well as the intended targets of the point (T_n), here the communities of Kununurra (WA) and Wadeye (Northern Territory), are, at least temporarily, indicated as T_1 and T_2. A compass showing north is also included for reference (Figure 13).

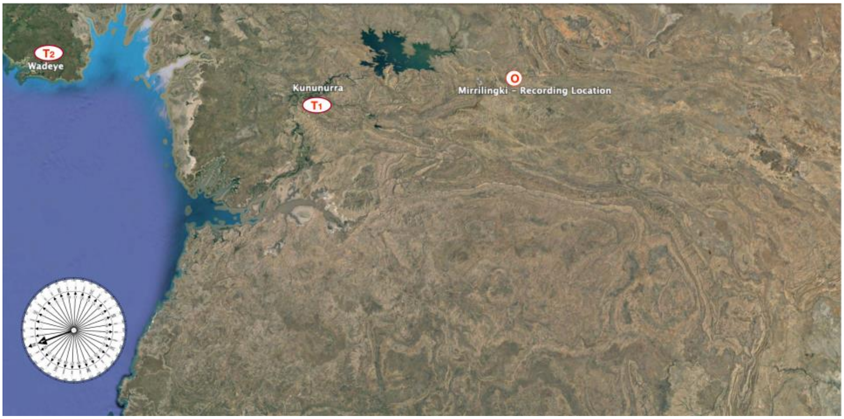

Figure 13: The satellite imagery with Origo and Targets place-marked

A still frame of the gesture, including an arrow indicating the direction of the vector projected by the point plus the names of participants, is then overlaid onto the map. The extrapolated vector is visualised by solid arrows in absolute space (i.e., in the satellite imagery), and on the reference compass. An ideal vector connecting the origo with the target(s), represented here by a barred line, is then added to the image, as shown in Figure 14.

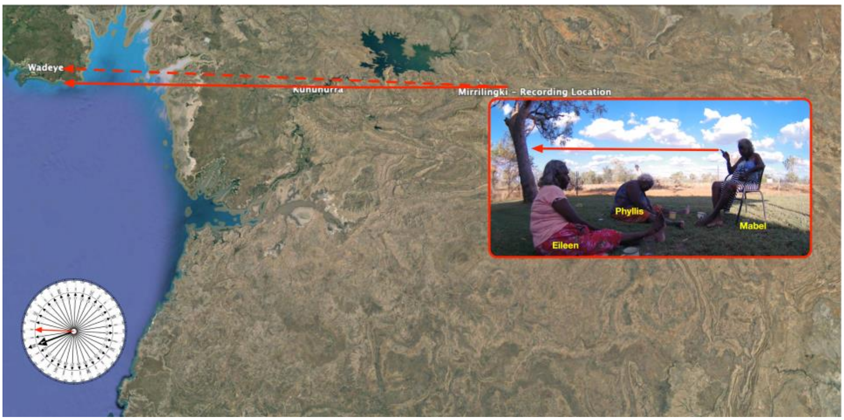

Figure 14: The satellite imagery showing actual and ideal pointing vectors

The procedure illustrated above has proved crucial for investigation of pointing directionality. By comparing the trajectories of actual pointing vectors with corresponding ideal vectors, researchers can calculate the approximate angular discrepancy between the two vectors, thus deriving the degree of locational acuity. In the examples illustrated above, we were able to calculate the approximate direction of points in degrees, and the relative angular discrepancy between the actual point (A) and the intended target(s) (T), as shown in Table 2.

Table 2: Actual points and relative angular discrepancy

Language	**Extract**	**Point No**	**Target (T) and Actual point (A)**	**T-A Discrepancy**
Gija	1	1	T=~251° A=~258°	7°
	2	1	T=~22° A=~20°	2°

It is through this contrastive analysis of point vectors that the relative accuracy of locational points in remote Australian communities emerged in our cross-linguistic study of spatial reference and pointing in conversation (Stirling et al. 2022; de Dear et al. in press). In particular, within sequences of interaction where multiple points to distal targets were produced, the comparison between ideal and actual vectors highlighted how relative distances between intended targets were generally maintained. Graphic representations of ideal and actual vectors rendered the remarkable acuity of locational points more readily available. Moreover, extrapolating and comparing vector angular information may offer quantitative insights into the study of locational points, particularly when conducting large-scale cross-linguistic studies.

3.4 The coding of pointing gestures

Using the approach of combining CA and IL to the study of language and social interaction, video recordings and associated geospatial data were complemented with detailed transcriptions of vocal and embodied conduct (Couper-Kuhlen & Selting 2018; Hepburn & Bolden 2017). While the transcripts were essential for capturing temporal aspects (i.e., the *position*) of points within sequences of action in interaction, an ad-hoc coding scheme was developed for the systematic description of their *composition*. The coding methods were also informed by CA methods, and by recent work within Pragmatic Typology (e.g., Dingemanse & Enfield 2015; Floyd, Rossi & Enfield 2020). Hence, coding-scheme categories were derived and selected through direct observations of naturally-occurring video-recorded interactions. The morphology of locational points as described in the coding scheme includes the size, orientation, direction, and motion of the articulators involved in pointing practices (cf. de Dear 2019: 32). Table 3 shows the coding scheme for manual pointing.

Table 3: Coding scheme for manual pointing

Size	Articulator	Orientation	Direction	Motion
Big (arm extended)	Index finger	Sagittal	Elevated	Sweeping (single motion)
Small (arm not extended)	Two-finger	Axial	Up/Down	Flap (outward)
	Hand (fingers adducted)	Parasagittal	In/Out (towards/away from speaker)	Flick (inward)
	Thumb	Palm-front/Palm-back	Behind (the speaker)	Fluttering (continuous Flap + Flick)
	Open hand (fingers relaxed)			Wrist rotation
	Object (e.g., stick)			Wrist flexion (acute angle of wrist bent towards inner arm)
				Circular

Uses of the head to point were coded according to the anchor (Le Guen 2011: 272), their most prominent articulator (lip, gaze, chin, and (whole) head), and motion, as in Table 4.

Table 4: Coding scheme for head pointing

Articulator	**Motion**
Lip	
Gaze (sustained, inferred from head orientation)	
Chin (upward head movement leading with the chin + eye gaze)	
Head (downward head movement + eye gaze)	Nod (front)
	Turn (whole head pivot)

The coding scheme enabled frequency and distributional considerations of the pointing gestures observed across the corpora, however it also provided a standardised way to describe and integrate the gestures into the transcripts. The transcription of talk follows the standard Jeffersonian conventions (Jefferson 2004; Hepburn & Bolden 2017), while locational gestures and their approximate directions have been annotated on a dedicated tier within square brackets in order to preserve their temporal relations with the unfolding talk.

To illustrate how geospatial methods can be integrated in the study of place reference and locational points in conversation, the next section presents geospatial interactional analyses of four excerpts from the CIARA corpus.

4. Geospatial analyses of pointing in conversation

The excerpts discussed in this section are part of a collection of place reference and locational points in multiparty conversations from two typologically distant Australian languages, Murrinhpatha (Northern Territory) and Gija (Western Australia), and a variety of Australian English spoken in the remote Kimberley region (Western Australia). In addition to these languages, Jaru (Western Australia) is also included as it forms part of the larger collection of Australian languages within the CIARA corpus (cf. Table 5).

Table 5: The languages from the CIARA corpus

Language	**Murrinhpatha**	**Gija**	**Australian English**	**Jaru**
Description	Southern Daly language: head marking, poly-synthetic, nominal classifiers	Jarragan language family: head marking, complex predicates. Code-mixed with Kriol	Germanic, SVO	Ngumpin-Yapa language: dependent marking, complex predicates. Code-mixed with Kriol

Extract 1 from the Gija corpus has Shirley, Mabel, Phyllis, and Helen sitting outdoors in Bow River in the Kimberley region of Western Australia.[9]

[9] Abbreviations in the interlinear glosses are: ABL = ablativee; ALL = allative; ANAPH = anaphoric demonstrative; AUX = auxiliary; CONT = continuative; DEM = demonstrative; DIR = directional; DIST = distal demonstrative; DO = direct object; EXC = exclusive; F = feminine; FOC = focus; NFUT = non-future; INTS = intensifier; IO = indirect object; IPFV = imperfective; LOC = locative; NC =ANM = 'animate' noun classifier; NC =HUM = 'human' noun classifier; NC =RES = 'residue' noun classifier; NC =PL/T = 'place/time' noun classifier; NFUT = non-future; NSIB = non-sibling; OBL = oblique; PC = paucal; PIMP = past imperfective; PL = plural; PRES = present tense; PROX = proximal demonstrative; PST = past; RT = response token S = subject; SG = singular; TAG = tag particle; TR = transitive; TOP = topic; 1 = first person; 3 = third person.

Extract 1: 20170426_JB_01 (000408_000417) [Crocodile Hole-1]

1 Shi GA:nggA:l nga:genyel ↓nambinel marrarn
gangga-l ngageny-l nambin-el marrarn
granny-fem mine-fem skin_name-fem go_away
My (female relation) is going off

2 nyidja [hosbidal-°yoorroong°.]
nyidja hosbidal-yoorroong
3sgfS-go/come_PRES-3sgfS hospital-ALL
to the hospital.

3 Phy [[G(h)end(h)oowa h,](0.2)] (0.5)
gendoowa
up
Upstream,
Phy [**1** fig.15 ((*headturn NW*))]

4 .hh [wayiniyana roord ngenaniyinde](0.2)
wayiniyana roord ngenaniyinde
like_that sit 1sgS-be/stay_PAST-CONT
I was sitting there like that coming

5 Shi [((untranscribed))]

6 Phy gerlirrangbiny ngayawarle, mm?
gerlirrang-biny ngayawarl-e
from_west-ABL sand-LOC
from the west on the river sand, mm?

7 Shi .HHh
.HHh

8 Hel gaya:nyja.
gaya-anyji-a
where-maybe-FOC
Where abouts.

9 Phy [GArdA[roo:n ngoorroon, (.) roo:]goo:n] (.)[gendoowa.]
gardaroo-n ngoorroo-n roogoo-n gendoowa
place_name-LOC DIST-LOC place_name-LOC upstream
Over there at Gardaroon, upstream from Roogoon (Crocodile Hole)
Phy [**2** fig.15 ((*points with chin NWbN*))]

```
10   Mab          [ngaga wanYA:gel dalga:.          ]
                   ngaga  wanyage-l da-l-ga
                   oh_no! little-F  DEM-F-FOC
                   Oh this is just a small one (plane).

11   Hel                                                       [Aa-       ]
                                                                ah
                                                                INJ
                                                                Ah-

12          (0.4)

13   Hel     Aa-
             ah
             INJ
             Ah-
```

Figure 15: Phyllis gazes and points her chin upstream from Roogoon (Crocodile Hole)

Extract 1 overlaps with the content of an earlier discussion about a plane that had soared over the participants' heads during the recording. Thus, Shirley's comments at lines 1-2 and Mabel's at line 10 reprise their earlier discussion about the plane. In a turn spanning lines 3, 4 and 6 Phyllis sets the scene for a story by producing the geomorphic directional term *gendoowa* ('upstream') and turning her head north-west. At lines 5 and 7, Phyllis reformulates her description of the scene, but does not directionally-orient her gaze as she had done at line 3. Despite her vivid description of the landscape, Phyllis' method of anchoring herself in the location of the narrative with a landscape term (*ngayawarl* 'sand') and abstract coordinates (*gerlirrangbiny* 'from the west') is deemed problematic, which is evidenced by Helen's other-initiation of repair at line 8: *gayanyja* ('where abouts'). Phyllis then repairs the trouble, drawing on a range of verbal and visual practices at line 9 to ensure successful recognition of this place: She proffers a place name (*Gardaroon*), supplemented by embodied deixis (*ngoorroon* + chin point and gaze north-west, see Figure 15), and she anchors her place reference to a more recognisable landmark, which is known to have a Gija community (*Roogoon*, *gendoowa* ‘upstream from Crocodile Hole’).

Extract 2 is from the Murrinpatha conversational corpus. Lily is recalling an event that transpired during World War II, when she was a child. A sailboat from one of the islands of the Indonesian archipelago was washed up on the beach south of Wadeye, very near where the women are presently sitting. At that time the Royal Australian Air Force operated a radar base at *Thuykem* (Airforce Hill), five kilometers from the Port Keats mission, now the Northern Territory community of Wadeye. The hapless sailors were rounded up by military personnel and taken away.

Extract 2: 20091121JBvid03 (1139632_1167986) [Gunpoint]

```
1   Lil    Yingkalitj manandji mana ngangkathu berename.
           Yingkalitj       ma-nandji   mana ngangka-gathu bere-name
           English_language not-NC:RES  only there-hither  completion-PC.F.NSIB
           They didn't have any English, only (the language} from there.

2          (0.3)

3   Ros    °Mm.°

4   Mar    (Daka) purnililidhagathu;
           da-ka    purni-lili-dha-gathu
           PL/T-TOP 3SG.S.6go.PIMP-walk-PST-hither
           Were they walking?

5          (0.8)

6   Lil    Kardu purnililidhawarda; (0.2) ringapnu pamam;
           kardu  purni-lili-dha-warda         ringap-nu     pamam
           NC:HUM 3PL.S.6go.PIMP-walk-PST-then telephone-DAT 3PL.S.34say/do.NFUT
           Then some Aboriginal people were walking, so they could ring up.

7          (0.8)
```

```
8   Lil   [Kardu kigay ngamere ngangku °k°anyi;]
           kardu  kigay       ngamere ngangka kanyi
           NC:HUM teenage_boy few     there   PROX
          A few young boys up this way.
    Lil   [     ((sweeping index finger point from N to NE))       ]

9          (0.6)

10  Mar    Mm.

11         (0.5)

12  Lil   Punnungampinhatka [˚ng˚arra padha ngalla; (.) pumamna(ra).
          punnungam-winhat   ngarra padha  ngalla    pumam-na
          3PL.S.7go.NFUT-run LOC    father important 3PL.S.8say/do.NFUT-3SG.M.IO
          They ran up to tell the priest.

13         (0.3) ((Lily scratches her head))

14  Lil   Padha [ngallaka ringap mam  panguwardangu;         ]
          padha  ngalla-ka     ringap mam           pangu-warda-wangu
          father important-TOP phone  3SG.S.say/do.NFUT DIST-then-thither
          The priest rang up over that way.
    Lil         [1 fig.16 ((sweeping index finger point E))   ]

15         (1.4) ((Lily scratches her head))

16  Lil   [da::,                               ] (0.7)
           da
           NC:PL/T
          {What's the} place?
    Lil   [2 fig.16 ((open hand sagittal elevated point E))   ]

17  Mar   Thuykem;
          thuykem
          place_name
          Airforce Hill?

18  Rit   Dawun;=
          Darwin?

19  Lil   =Thuykem [thuykem;                                   ]
           thuykem    thuykem
           place_name place_name
           Airforce Hill. Airforce Hill.
    Lil            [3 fig.16 ((glances and points E with index finger))]

20         (0.3)

21  Rit     Mm.

22         (0.3)

23  Lil    [kuka nyindamatha pirrinidha;                              ]
           ku-ka      nyini damatha pirrini-dha
           NC:ANM-TOP ANAPH INTS    3PL.S.1sit.PIMP-PST
           Those non-Aboriginal people were staying there.
    Lil    [4 fig.16 ((open palm waves downward E))]

24         (1.4)
```

```
25  Lil   [trak ngallawathu wurriniwinart°tha°;            ]
           trak    ngalla-gathu     wurrini-winart-tha
           vehicle important-hither 3SG.S.6go.PIMP-going_along-PST
```
A big truck came along.

Lil [**5** fig.16 ((*waves left hand from E to W, gazes W*))]

```
26         (0.5)

27  Lil   [pibimbunmardaputj thungkuwanku.
           pibim-wun-mardaputj                         thungku-wanku
           3PL.S.3stand.NFUT-3PL.DO-load_up_a_truck fire-as_well
```
They loaded them on at gunpoint.

Figure 16: In extract 2 Lily makes a variety of points to Thuykem, all of which are accurate to within ten degrees.

At line 1 Lily points out that the foreign sailors did not speak any English. At lines 6, 8 and 12 Lily recounts how a group of Aboriginal children travelled back to the mission to alert the priest about the sailors' arrival. At line 14 Lily recounts how the priest 'rang up' (radioed) the RAAF officers stationed 'over that way' (*panguwardangu*). Inset 1 of Figure 16 shows the apex of her sweeping index-finger point. By scratching her head at line 15 and by producing an intonationally incomplete bare place/time classifier (*da*, at line 16) Lily displays difficulty retrieving the place-name. The bare, drawn-out nominal classifier[10] is produced simultaneously with a second iteration of the easterly point, this time acompanied by a sagittally aligned flat hand (inset 2 of Figure 16). At line 17, Mary proffers *Thuykem* (Airforce Hill) as a candidate location for Lily's confirmation, while Rita proffers Darwin (at line 18). By twice repeating the placename *Thuykem* at line 19, whilst glancing and pointing in roughly the same direction (see inset 3 of Figure 16), Lily confirms Mary's proffer, and disconfirms Rita's. At line 23 she then adds that it was where non-Aboriginal people (the military) were stationed, whilst simultaneously gazing and pointing with a horizontal flat hand in the same direction (see inset 4 of Figure 16). The climax of the story is that a truck set out from Airforce Hill (line 25), the sailors were then loaded up at gunpoint (line 29), and taken away.

All five of Lily's points are accurate to within ten degrees of the target location (see the barred yellow line in Figure 16), which is sufficiently accurate for Mary (who, like Lily, was a schoolgirl at the time) to recognise *Thuykem* as the most probable location, despite it being 16 km distant and not having been previously mentioned in this conversation.

Extract 3 comes from the Jaru corpus. Three women, Nida, Ruby, and Juanita, are sitting and talking at the old Gordon Downs homestead, near Yaruman in north Western Australia. Prior to this extract, the women have been talking about the presence of water, namely in soakages, in the surrounding area. Juanita asks about the occurrence of seasonal floods there in the past, which Nida confirms. The discussion of past presence of surface water triggers an extended sequence of talk about the location of airstrips in the area.

[10] Drawn-out bare nominal classifiers are often produced during word searches. In this case the place/time classifier strongly suggests difficulty with retrieval of a placename.

Extract 3: 20181018JD (605953_641226) [Erradram]

1 Nid ngaba nga nyinani raidap murlangga na,
ngaba nga nyi-nani raidap murla-ngga na
water AUX(3SG.S) stay-PST.IPFV right.up PROX-LOC FOC
the water was right up here,

2 buruja yanani.
buruja ya-nani
run go-PST.IPFV
it was running.

3 (0.4)

4 Nid [garra na,]
garra na
thus FOC
like this now,

5 Rub [ngurrpa]lurla yananyarra, ((Ngardi language))
ngurrpa-lu-rla ya-nanya-rra
not.knowing-3PL.S-3SG.OBL go-PRES.DIR-thither
don't know where they're going,

6 Jua en eapot nga wu- [gankula murlangga nyinani indit.
en eapot nga gankula murla-ngga nyi-nani indit
and airport AUX(3SG.S) on.top PROX-LOC stay-PST.IPFV TAG
and the airport wu- was up here innit.
Jua [((*big hand sagittal point and gaze WNW-NW*))

7 (1.3)

8 Jua o [murla paatda na.
o murla paat-da na
or PROX part-LOC FOC
or in this part.

Jua *[((open hand point NE-ENE))*

9 (0.5)

10 Nid m:mh.
mmh
RT
mmh.

11 (.)

```
12  Rub  [ngh.]
          ngh
          RT
          mmh.

13  Jua   [ea]pot;
           eapot
           airport
          airport;

14        (1.1)

15  Jua  [ngi?]
          ngi
          indeed
         right?

16  Nid  [[mei]l ngarnalu gayiniyin nambatwelfda.             ]
           meil nga-rnalu     gayi-niyin namba-twelf-da
           mail AUX-1PL.EXC.S north-from number-twelve-LOC
          we used to get the mail from the north near [bore] number twelve.
    Nid  [1 fig.17 ((big elevated open hand point and gaze N))]

17       (.)[(0.3)
    Nid   [2 fig.17((big elevated open hand and gazes N X6 pulses))-(23)

18  Jua  [nathawan (wib-)
          natha-wan
          another-one
          another one

    Jua  [3 fig.17 ((elevated sagittal hand point N))--->(20)

19       (0.4)

20  Nid  ngarnalu man]ani yalungga nau, e-
         nga-rnalu     ma-nani      yalu-ngga nau
         AUX-1PL.EXC.S get-PST.IPFV DIST-LOC  FOC
         we used to get it right there, ae-
    Nid          -->))]

21       erradram  nga        nyinani.]
         erradram  nga        nyi-nani
         aerodrome AUX(3SG.S) stay-PST.IPFV
         there was an aerodrome.

22       (0.2)

23  Jua  [yea  ] det] ngamu det erradram [dea yu gadem,]
          yea  det ngamu    det erradram  dea   yu  gad-em
          yeah the long.ago the aerodrome there you have-TR
          yeah long ago you had the aerodrome there
    Nid   -->))]

24  Rub  [  y e a;  ]
           yea
           yea
          yeah;

25  Nid                                 [mm      hm,  ]
                                         mm      hm
                                         RT      RT
                                         mm hm,

26       (0.8)
```

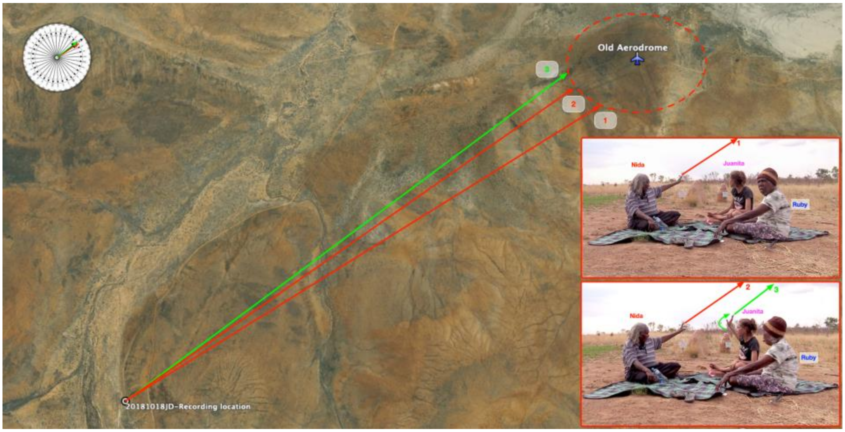

Figure 17: Nida and Juanita pointing to the Old Aerodrome

At line 6 Juanita points south-westwardly to where she believes an airport used to be, *over there on top*. Due to the lack of confirmation following her turn, Juanita offers an alternative tentative location, *or in this part*, turning her torso by 180 degrees while also pointing and gazing towards north-west. After receiving a somewhat ambiguous confirmation of her candidate location, Juanita pursues a confirmation from Nida in line 13 and, following a 1.1 second silence, in line 15. In the subsequent line Nida produces a first elevated northerly point accompanied by gaze (1) indicating the place where she *used to get the mail from the north*, namely an old aerodrome located in the vicinity of a bore, approximately 8 km north of the recording location. Realising that Nida is referring to a different airport (*another one*), Juanita produces a sagittally-oriented open-hand point behind her right shoulder (3) (lines 18-20) which appears to mirror Nida's second sustained point (2) (lines 17-23).

Nida's manual points are remarkably accurate and display a significant degree of morphological complexity. Both points are produced with a fully extended and elevated arm, suggesting that the target location is removed from the more proximal setting (Kendon 2004; Le Guen 2011; Cooperrider & Mesh 2020). The points are articulated through her open hand and relaxed fingers. However, while the first point is accompanied by a flicking motion produced in overlap with the cardinal *gayiniyin* (from the north) in line 16, followed by a flap, the second is punctuated by a series of pulses produced with the hand and fingers. The notable directional similarity of the second point might have been enhanced by the fact that Nida avoids retracting completely her first point by maintaining it in *hold* position. Rather than producing another point anew, the second point originates from her already extended and elevated arm.

Finally, the second point sustains a longer stretch of talk (lines 17-23) and accompanies the distal demonstrative *yalungga*.

In Extract 4, from the Australian English corpus, Dave launches a story about a friend of his whose car broke down along the Tanami track and who was rescued and taken to his destination, Lara, 'between Geelong and Melbourne' in Victoria, more than 2,000 km to the south-east.

Extract 4: 20181907LSJB (002745.175_002801.811) [Lara]

```
1   Dav   my old mate an' his bloody, (0.3) and [h  i  ]s- (0.2)=
2   War                                         [°yeah°]
3   Dav   th- th- [the fellow of a mate of mine th- th-
    Dav           [1 ((small index finger point SSE---
4         his car broke down the] Tanami
    Dav                      -->))]
5         and he's to need to na- the RAC[11],[ had to take ('em) from
6         [here to (.)        Lara                  ] in Victoria
7   Dav   [2 fig.18    ((index finger point SSE))    ]
8         between Geelong and Melbourne, and it was ten grand_
9         (1.3)
10  War   °je:s[us°
11  Dav        [a bit ^frightˇening innit?
12  War   yeh
13       (1.4)
```

[11] RAC = Royal Automobile Club

In line 4 Dave points, rather accurately, to the Tanami track, where the accident took place. Dave points again in line 6 (2), this time to a distal location, as he formulates the place reference 'Lara in Victoria, between Geelong and Melbourne'. The vector projected by this second point (Figure 18) is remarkably accurate, some five degrees south of Lara, 2,728 Km away from the recording location.

Figure 18: Dave's finger point to Lara in Victoria is accurate to within five degrees.

5. Conclusions

Whenever a place reference is formulated in conversation, an immediate and rather central task for conversationalists is to understand *where* the speaker is referring to. An approach that intends to develop a participant-relevant understanding of embodied practices surrounding place reference must be able to handle the empirical details of interaction, and describe how such practices are locally achieved. CA offers a robust theoretical framework and a set of extremely powerful tools to do so. However, participants' location analysis (Schegloff 1972) may reveal an exceptionally intimate acquaintance with the surrounding landscape – both proximal and distal – particularly within those communities where land represents crucial sociocultural aspects of life. Thus, if we are to address the empirical question of *if* and *how* the immediate interactional context in which points are produced relates to the wider sociocultural and topographic environment in which the interaction takes place, we need a framework capable of mitigating the knowledge imbalance between analysts as external observers and the participants themselves.

This paper introduces a novel approach for the analysis of locational pointing gestures in conversation employed within a language documentation project for Australian languages. It presents the procedures followed in the collection, management, and application of geographically-enriched interactional data. The geospatial framework insists on the analytical importance of including GIS-derived information in the investigation of locational pointing practices in interaction. Specifically, we have highlighted the significance of incorporating data derived from satellite imagery-based programs such as *Google Earth*, to extrapolate the direction of points. The interactional analyses presented in this paper show how our geospatial framework can be applied to the documentation of spatial language, and integrated into interactional investigations of locational-pointing practices. In particular, overlaid graphics are crucial to multimodal transcription of talk and embodied behaviour, particularly when determining the directionality of points. While detailed transcripts capture the temporal relationships between unfolding talk and gestural components, the use of overlaid graphics offers a twofold advantage: (1) they enable the visualisation of the 'proximal scene' in which the point occurs (i.e., the relative arrangement of the participants and the morphology of the point represented in its stroke phase); and (2) they represent the 'wider scene' where the point occurs (i.e., the terrain derived from satellite imagery, and the direction and acuity of vectors projected by the pointing gesture).

Without geospatial information, the relevance of the topographic context and the ways in which it is referred to, invoked, and 'used' in interaction would be lost, rendering an emic account of naturally-occurring locational pointing ultimately unviable. We have demonstrated how the interpretative and analytic efforts aimed at describing endogenous practices occasioned by place reference in interaction benefit from considerations that are exterior to the most proximate interactional scene, and that, quite literally, surround it.

Shifting the scale from local to more distant space can help us advance our understandings of how locational points emerge and are understood in everyday interactions. These methods also help us to uncover the complex relationships between locational gestures, language, and interaction with the wider environment, and what this might reveal about spatial cognition. Finally, as demonstrated by the interactional analyses discussed in this paper, these methods can be fruitfully employed in the comparative study of locational pointing practices and support investigations into universal aspects of human conduct.

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