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STEPGRAD
СТЕПГРАД

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PILOT ELICITATION OF LOCAL NAVIGATION PARAMETERS FOR PEDESTRIAN WAYFINDING: A BANJA LUKA CASE STUDY

Abstract

Pedestrian route choice in cities depends both on the overall structure of the street network and on local decisions made at points of directional change. While space syntax has shown the importance of configurational relations, wayfinding and navigation tasks point to additional cognitive mechanisms related to landmarks, route legibility, and task-specific strategies. This paper presents a pilot questionnaire study conducted before a larger virtual-survey experiment, aimed at identifying which cues respondents spontaneously use when (i) describing their own walking routes and (ii) giving directions to others. The pilot was administered digitally and included audio-recorded responses. Results show that respondents often structure instructions topologically, rely strongly on landmarks, and use metric or time estimates inconsistently. Route deviations also suggest that comfort and familiarity can outweigh shortest-path logic. The pilot therefore provides a concise set of geometric and cognitive parameters for later controlled testing in visually standardized conditions.

Keywords: Space syntax, wayfinding, cognitive maps, pedestrian networks, route choice, landmarks, topology vs. metric distance.

ПИЛОТ - ИСПИТИВАЊЕ ЛОКАЛНИХ ПАРАМЕТАРА РЕЛЕВАНТНИХ ЗА НАВИГАЦИЈУ И СНАЛАЖЕЊЕ ПЈЕШАКА У ПРОСТОРУ: СТУДИЈА СЛУЧАЈА БАЊА ЛУКЕ

Сажетак:

Избор пјешачких рута у градовима зависи и од укупне структуре уличне мреже и од локалних одлука које се доносе на мјестима промјене правца. Иако је *space syntax* показао значај конфигурацијских односа, задаци оријентације и навигације указују и на додатне когнитивне механизме повезане са оријентирима, читљивошћу руте и стратегијама специфичним за задатак. Овај рад представља пилот-истраживање засновано на упитнику, спроведено прије већег експеримента виртуелне анкете, с циљем да се утврди које показатеље испитаници спонтано користе када (i) описују сопствене пјешачке руте и (ii) дају упутства за кретање другим особама. Пилот-истраживање је спроведено дигитално и обухватало је аудио-снимљене одговоре. Резултати показују да испитаници често организују упутства тополошки, снажно се ослањају на оријентире, док метричке или временске процјене користе недосљедно. Одступања од руте такође указују на то да комфор и познавање простора могу имати већи значај од логички најкраће путање. Пилот-истраживање стога пружа сажет скуп геометријских и когнитивних параметара за накнадно контролисано испитивање у визуелно стандардизованим условима.

Кључне ријечи: Space syntax, оријентација у простору, когнитивне мапе, пјешачке мреже, избор руте, оријентири, топологија наспрам метричке удаљености.

1. INTRODUCTION

Understanding how pedestrians move through urban public space is central to urban design and planning, because movement patterns shape encounters, activity, and the "life" of streets and open public corridors. In configurational approaches such as space syntax, urban space is modeled relationally-through network relations rather than metric distance-enabling quantification of street-network properties associated with pedestrian movement patterns [1], [2], [3], [4]. At the same time, pedestrians do not move as abstract graph agents: they interpret local spatial scenes, pick recognizable references, and apply heuristics (e.g., minimizing turns) that can diverge from global shortest paths.

The broader research program from which this paper is derived-developed within the author's doctoral dissertation-argues that, besides global configurational parameters, there exist local parameters tied to perception at "choice" points where direction decisions are made, and that these local parameters must be studied through navigation tasks and cognitive evidence [5]. In that context, the present study was conducted as a pilot questionnaire for the dissertation, intended to elicit qualitative navigation cues and heuristics (i.e., the kinds of elements people spontaneously mention and rely on) in order to define candidate parameters and refine the instrument for the subsequent main survey. This paper therefore focuses on the pilot study that preceded the main virtual (360°) experiment and served as an exploratory step to identify parameters for later controlled testing. The pilot's immediate aim was to compare verbal route descriptions and to determine which environmental elements respondents use as "characteristic and recognizable" when informing someone unfamiliar with the city.

This paper's objective is to document and interpret a pilot questionnaire study that elicits local navigation parameters-metric/time expressions, topological references, landmark use, and reported orientation difficulties-from route-description tasks.

Contributions:

- A method-oriented account of a pilot elicitation protocol that separates imagined-route descriptions from third-person navigation instructions.
- Empirical evidence (from a Banja Luka case study) on the relative salience of landmark, topological, and metric/time cues in verbal wayfinding.
- A distilled parameter set that motivates the subsequent visually guided (virtual) survey design intended to reduce subjectivity in route imagination.

Research Questions

- **RQ1:** Which cue types dominate pedestrian route descriptions in a familiar city center: metric/time, topological sequence, or landmarks?
- **RQ2:** Do imagined self-routes and third-person navigation instructions activate different description strategies?
- **RQ3:** Which environmental conditions are associated with reported disorientation in verbal route descriptions?

2. RELATED WORK

2.1. SPACE SYNTAX AND CONFIGURATIONAL EXPLANATIONS OF MOVEMENT

Space syntax conceptualizes the built environment as a network of spatial relations and uses graph-based representations (axial lines, segments, or hybrid line–segment models) to derive measures such as integration (to approximate to-movement potential) and choice (to approximate through-movement potential) [1], [2], [4]. While early "natural movement" formulations argue that configuration alone can generate recognizable movement regularities-often later reinforced by land-use attraction [3]-recent work has pushed these claims into data-rich, model-comparative settings, combining configurational metrics with GPS traces, systematic counts, and statistical route-choice models.

Recent work has strengthened configurational claims by validating space-syntax–style predictors on larger empirical datasets (e.g., citywide pedestrian counts) and by testing when network structure alone is sufficient versus when it must be complemented by contextual variables such as land use or amenities [6]. In addition, longitudinal studies indicate a reciprocal relationship over time: spatial configuration influences where activity concentrates, while emerging activity patterns subsequently reshape how streets are used and traversed, consistent with (and extending) earlier natural-movement arguments [7].

In parallel, route-choice research has converged on the idea that “shortest” often means least angular deviation rather than minimal metric distance-an interpretation directly compatible with segment-based, angular-weighted space syntax. Empirical testing has shown that pedestrian decisions can align more strongly with least-directional-change assumptions than with purely metric shortest paths, depending on context and trip purpose [8]. More recent work has refined this insight by isolating turn penalties: the number and type of turns operate as a robust competing heuristic that can override metric distance at decision points, making angular/turn structure a cognitively plausible proxy for “effort” [9]. This is reinforced by systematic reviews showing that route choice is multi-factorial: distance, directness/turning, safety, comfort, and land-use/streetscape attributes interact rather than compete in a single hierarchy [10].

Importantly for this dissertation’s emphasis on local parameters, recent studies demonstrate that configurational attractiveness can be outweighed by micro-scale experiential factors (noise, crowding, weather, pavement quality, shading, or perceived safety). A qualitative–quantitative “pedestrian type” taxonomy derived from GPS tracking and interviews identifies groups that prioritize comfort, landmarks, spontaneity, or rational optimization-explicitly showing that preferences can generate different route geometries even within the same configuration [11]. At the same time, revealed-preference GPS studies indicate demographic heterogeneity in attribute weighting (e.g., different sensitivity to directness vs. environmental quality), which supports the need to complement global configurational readings with user- and context-sensitive interpretation [12]. In the broader field, bibliometric syntheses confirm that space syntax has matured into a highly interdisciplinary research program, with increasing attention to mobility behavior, visibility, and evidence-based design evaluation rather than purely theoretical development [13]. Likewise, systematic reviews focusing on public-space outcomes highlight that syntactic measures are most informative when paired with design elements and situated behavior (e.g., seating, landscaping, microclimate, and programmed activity) [14].

2.2. COGNITIVE REPRESENTATIONS, URBAN IMAGEABILITY, AND WAYFINDING

Classic accounts of urban legibility emphasize that people navigate cities through structured mental images built from paths, nodes, edges, districts, and landmarks [15], and that the built environment can be evaluated for “legibility” as a navigational resource [16]. Contemporary wayfinding research extends these ideas by operationalizing cognition with process-level behavioral evidence (eye tracking, trajectory logging, VR experiments, and computational annotation), enabling finer distinctions between what environments *afford* and what pedestrians *actually attend to*.

First, landmark research has shifted from treating landmarks as static “good objects” to analyzing landmark salience as task- and context-dependent, shaped by visibility, semantic meaning, and decision-point relevance. A recent review consolidates evidence that landmarks often function as *confirmation cues* and that their usefulness depends on familiarity, perspective, and the action demands of specific decision points (e.g., intersections vs. long segments) [17]. This directly supports the study’s methodological stance: verbal route descriptions should be expected to mix landmark anchoring with ordinal/topological scaffolding, and the stability of each cue type will vary with task framing.

Second, there is growing evidence that wayfinding is a stage-based cognitive process rather than a single behavior. In an outdoor, real-city experiment, gaze behavior and visual attention were analyzed across Downs & Stea’s four wayfinding stages (self-localization, route planning, monitoring, and goal recognition), showing that fixation/saccade patterns and attention to signs/buildings shift systematically with stage and familiarity [18]. This provides a strong empirical rationale for separating “self-route” accounts from “giving directions” tasks: different stages and audiences elicit different cue priorities and descriptive strategies. Complementing this, recent GIScience work has begun decoding outdoor wayfinding through data-driven analysis of movement and decision sequences, targeting how people transition from uncertain exploration to stable route control and how the environment constrains those transitions [19].

Third, immersive and image-based methods have become central for studying navigation in public space because they standardize exposure while preserving scene realism. VR studies increasingly combine perceptual ratings with physiological measures to quantify environmental evaluation across user groups, showing that expertise or training can alter both perceptual and affective responses to the same urban scenes [20]. This is methodologically aligned with the study’s move toward virtual/standardized stimuli: when all participants see the same visual field, landmark salience, turn identification, and perceived comfort can be compared more reliably than in purely imagined tasks.

Finally, the last several years have produced stronger evidence that digital navigation aids (GPS and turn-by-turn systems) can alter spatial learning and the formation of survey knowledge, often reducing incidental encoding of environmental structure compared to self-directed navigation. Systematic review evidence suggests that navigation assistance can shift attention away from environmental cues toward device-driven confirmation behaviors, complicating interpretation of “natural” wayfinding strategies unless the study controls device use and exposure conditions. This is especially relevant for public-space studies conducted remotely: participants’ habitual reliance on navigation tools may influence how they estimate distance/time or select landmarks in imagined descriptions.

2.3. TASK STRUCTURE IN WAYFINDING STUDIES

Wayfinding is not a unitary skill; it is a family of tasks that recruit different knowledge forms and strategies [21]. Recent route-choice scholarship reframes this variability through integrative principles: pedestrians (i) selectively perceive information, (ii) integrate it into subjective representations, (iii) respond to attractive/repellent attributes (often with feedback effects), and (iv) apply decision mechanisms that trade off competing cues [22]. This framework is useful for interpreting mixed cue use in verbal data: metric estimates, turn counting, and landmark references can be understood as outputs of different “information integration” and “decision mechanism” regimes rather than as inconsistencies or noise.

Task framing also strongly shapes what is communicable. In instruction-giving, people often prefer shareable, countable structures (e.g., intersections, traffic lights, ordinal sequences) over idiosyncratic landmarks that require shared familiarity-an effect consistent with stage-based and familiarity-based findings from outdoor eye-tracking studies [18]. Conversely, self-route descriptions allow more reliance on experiential and affective factors (comfort, shade, crowding), which can dominate at local decision points even when the underlying configuration predicts a different “optimal” route. Contemporary evidence supports this distinction: qualitative typologies derived from interviews and tracked routes show that some walkers are explicitly “landmark-reliant” while others are “comfort-first” or “rational/directness-first,” and these types yield systematically different route geometries and sensitivities to local conditions [11]. Reviews of pedestrian route choice likewise conclude that attribute weighting changes by context (day/night, safety perceptions, trip purpose), reinforcing the dissertation’s decision to separate tasks and later standardize visual input in a virtual survey stage [10].

3. PILOT STUDY DESIGN AND METHODS

3.1. INSTRUMENT AND TASK STRUCTURE

The pilot instrument contained (a) general questions and (b) two groups of route-description tasks (Fig. 1):

- **Walking routes:** Respondents were asked to imagine and verbally describe how they would walk between two specified points. Two mutually transverse routes (A and B) were used to ensure movement through the central area and enable comparison of route tendencies.
- **Navigation routes (third-person instruction):** Respondents were asked to provide directions to a third person between specified points. These point pairs were chosen so the shortest route would not simply follow primary corridors but would require movement through less integrated streets (routes C and D).

The general questionnaire gathered demographics and context variables (gender, age group, habitual transport mode, self-assessed familiarity with the city, and whether navigation technologies are used).

3.2. CASE STUDY AREA AND MOVEMENT SCOPE

The pilot study focused on the wider center of Banja Luka. The broader research defines the study extent for pedestrian analysis as approximately a 15-minute walking diagonal and maps pedestrian routes (including sidewalks on both sides where relevant).

For the pilot tasks, origin (1), destination (2) points were positioned so that the shortest path crosses or tangentially touches the inner core; points were arranged “diagonally” or “opposite” within the defined movement extent.

Importantly, respondents were not given explicit boundary constraints for where they may move.

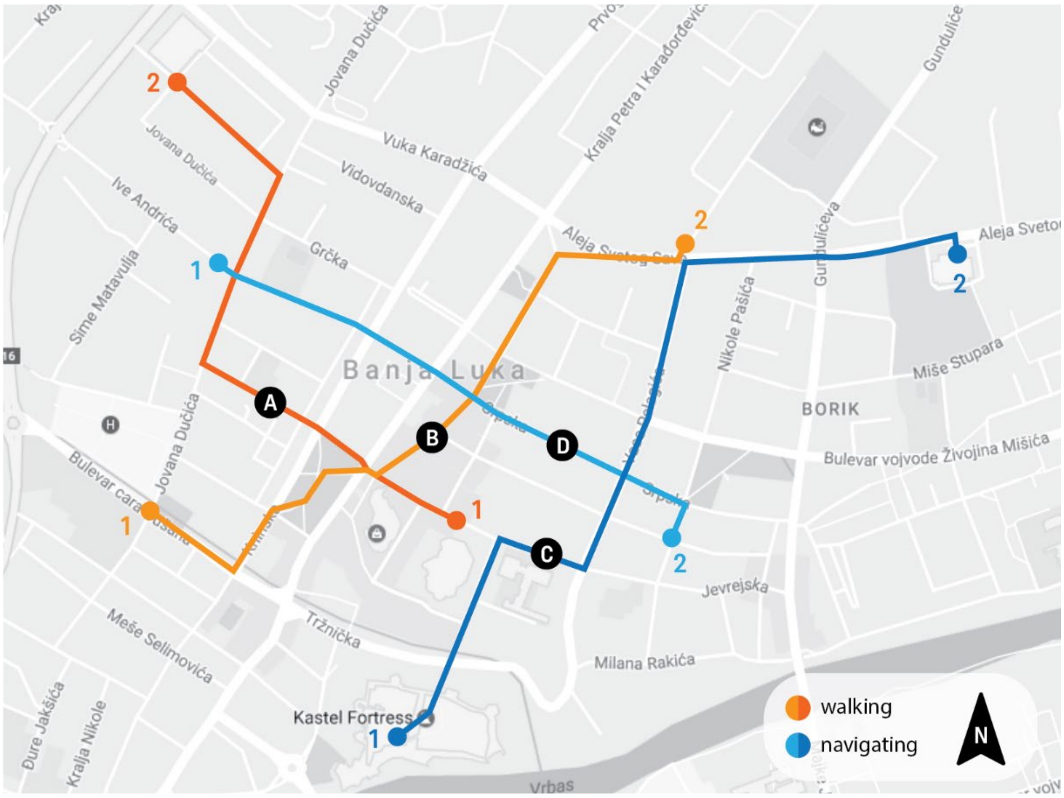

Figure 1. *Shortest paths between assigned points in the pilot survey (1-starting point, 2-finish). Drawing by author.*

3.3. PARTICIPANTS

The pilot questionnaire was completed by 20 participants aged 20–60 (Fig. 2). The research reports a roughly balanced gender distribution and indicates that more than half of respondents stated that they know the city "very well," and none reported knowing it "poorly."

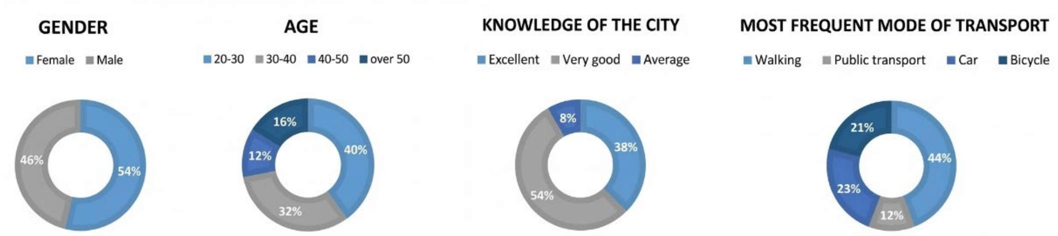

Figure 2. *Descriptive statistics of pilot respondents (gender, age, city familiarity, and most frequent transport modes). Diagram by author.*

3.4. DATA COLLECTION PROCEDURE

The survey was administered remotely. Tasks were delivered to participants via a web link, and participants recorded answers as audio messages using their mobile phones via the Opinionmeter2 platform. The remote audio protocol has a known limitation: because the researcher is not present, participants may misinterpret instructions and cannot immediately ask for clarification.

To support spatial analysis, route sketches and frequency maps were reconstructed from the audio responses. Each respondent's verbal description was translated into a polyline route on the same base pedestrian network map (i.e., the path implied by the spoken sequence of streets, turns, and referenced places). Segment-use frequency was then computed by counting how many respondents' routes traversed each street segment. For visualization, segment frequencies were rendered using the standard space syntax-style heat palette, where low-frequency segments are shown in blue and high-frequency segments in red (with intermediate frequencies in a graded range).

Participation in the pilot survey was voluntary. Before starting the online questionnaire, respondents were informed about the study purpose, the nature of the tasks, and that their answers would be collected as **audio recordings** submitted remotely; proceeding with the survey was taken as informed consent. Audio responses were used solely for research, transcribed for analysis, and handled in a way that avoids personal identification; results are reported only in aggregated and anonymized form.

3.5. DATA PREPARATION AND ANALYTIC APPROACH

After completion, all audio responses were listened to, categorized, and processed analytically and statistically. For this paper, responses were coded by a single researcher (the author) using a structured coding manual developed from the pilot material. To mitigate inconsistency, the coder applied the codebook (Appendix Table 1).

The reporting is organized around two complementary outputs:

(a) Route geometry and segment-frequency mapping

- **Input:** respondent audio narratives (turns, street names, landmarks, "go straight," etc.).
- **Output:** one route polyline per respondent per task; aggregated segment frequency per task.
- **Visualization rule:** standard space syntax palette (blue = least frequent; red = most frequent).

(b) Cue-category coding of verbal content

All responses were coded into cue categories reflecting how participants described the route. The coding categories were derived directly from the observed response features summarized in the pilot coding table (Appendix Table 2). In practical terms, the coding distinguishes:

- **Topological cues:** references to intersections/traffic lights and explicit counting of decision points;
- **Landmarks and place references:** named buildings, facilities, and recognizable urban features;
- **Metric/time cues:** time and distance estimates;
- **Environmental comfort cues:** shade/greenery/pleasantness;
- **Heuristics:** turn minimization, straightness, preference for a "main" entry, or habitual route selection;
- **Orientation issues:** explicit statements of confusion or difficulty locating a place.

The unit of analysis is a **distinct mention** of a cue type in a respondent's narrative. A mention is counted each time it occurs unique per participant.

4. RESULTS

Using a single-coder content analysis, each transcript was coded by counting **distinct cue mentions** (i.e., every time a respondent referred to a cue type in the narrative, it was recorded as one mention) and then aggregated by task group. **Table 1** reports the five most frequent categories across all tasks (A–D). Overall, respondents relied most heavily on **named objects/places (including functions such as shops or institutions)** (174 total mentions), indicating that place-based references form the dominant backbone of verbal route descriptions. This category remained the most frequent in both imagined routes (A+B: 102) and third-person navigation tasks (C+D: 72). Beyond that shared reliance, the cue profile shifts by task type: **descriptive adjectives** increase strongly in navigation-to-others (C+D: 42 vs. A+B: 12), suggesting that respondents compensate for a lack of shared familiarity by adding qualitative descriptors (e.g., "main," "wide," "small"). Conversely, **street names** appear more often in imagined routes (A+B: 30 vs. C+D: 14), consistent with self-navigation narratives that draw on habitual street-based knowledge. References to **recognizable urban elements** (e.g., fountain, park, parking area) also rise markedly in navigation tasks (C+D: 28 vs. A+B: 5), functioning as communicable anchors. Finally, **counting decision points** (traffic lights/intersections) is largely concentrated in navigation tasks (C+D: 19 vs. A+B: 2), reinforcing that third-person instruction favors stable, countable topological structure. Although **metric/time expressions** were not among the top five categories, they still occurred (14 total mentions, primarily in C and D), but were treated cautiously due to their observed subjectivity.

Table 1. Five most frequent categories across all tasks

Cue category (top 5)	Total (A–D)	Walking routes (A+B)	Navigation to others (C+D)
Named objects/places (incl. function)	174	102	72
Descriptive adjectives	54	12	42
Street names	44	30	14
Recognizable urban elements	33	5	28
Counting lights/intersections	21	2	19

4.1. WALKING ROUTE TASKS

4.1.1. Route A (Library → TC Konzum / Čajavec)

The first walking route asked respondents to describe how they would walk from the University Library to the Konzum shopping center in the Čajavec complex. Figure 3 aggregates chosen paths and encodes segment frequency through line thickness and a color scale.

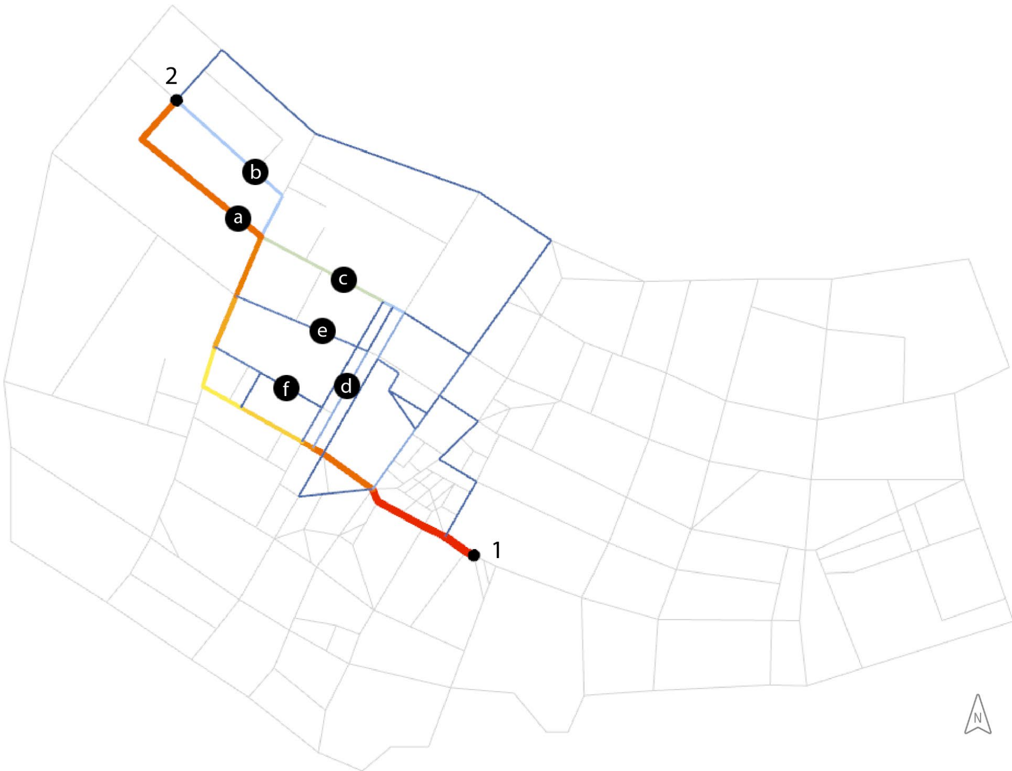

Figure 3. Aggregate of all paths chosen in walking route A. Drawing by author.

A central observation is that the **globally shortest route substantially matches respondent choices**, except in the passage through the Čajavec complex. The shortest path used a side gate (Fig 3-a), reported as recently put into use, while respondents tended to choose the main gate (Fig 3-b).

Two contextual explanations are given: (i) residents' habituation to the main gate and its richer activity edge (shops and services along the approach), and (ii) practical discomfort on the side-gate approach due to heavy parking congestion that makes walking inconvenient.

A further pattern concerns diagonal "shortcutting" across a large parking area to reach Grčka Street-respondents explicitly described walking "diagonally" through the parking lot (Fig 3-d).

Grčka Street (Fig 3-c).is described as an older street with a characteristic street front; the research suggests that its continuity and the sense of a distinctive streetscape may have contributed to preference over parallel alternatives.

Additionally, all respondents who chose this street continued straight ahead, which is consistent with a “minimize turns” heuristic and the attraction of a longer linear direction.

Finally, two respondents explicitly stated that greenery/shade motivated their route choice; the research notes the pilot was conducted in summer with high temperatures, making shade a plausible comfort driver.

Interpretive summary (Route A): Even when the shortest path is broadly followed, **local affordances-familiar entrances, active edges, and walking comfort**-can explain systematic deviations. Such deviations represent candidate “local parameters” that are not reducible to metric distance.

4.1.2. Route B (Gymnasium → RC Zenit)

The second imagined route asked respondents to describe walking from the Banja Luka Gymnasium to the Zenit shopping center. As with route A, Figure 4 aggregates paths and encodes segment frequencies.

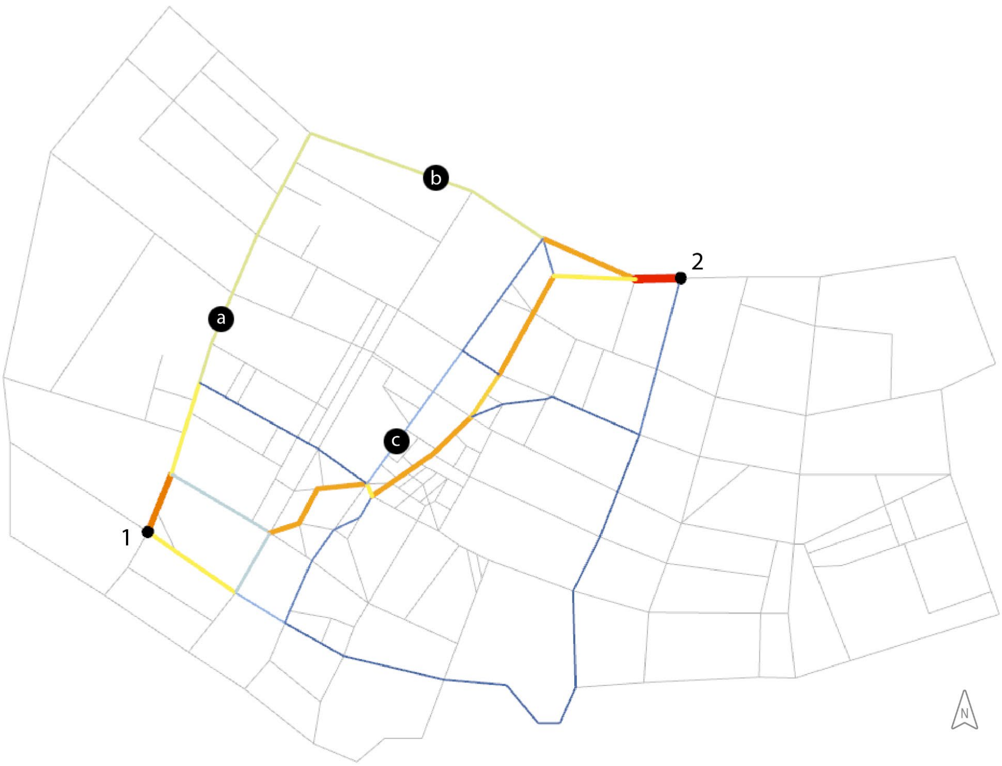

Figure 4. Aggregate of all paths chosen in walking route B. Drawing by author.

Most respondents followed the shortest route shown in the pilot geometry, but a substantial subgroup (6 of 20) selected a route characterized by the fewest turns, specifically along streets Jovana Dučića and Vuka Karadžića (Fig 4-a,b).

The research highlights that these streets include tree lines, supporting a comfort/shade explanation consistent with summer conditions.

In addition, some respondents chose the city’s widest central street (Kralja Petra I Karađorđevića) with a wide pedestrian promenade zone (Fig 4-c).

Interpretive summary (Route B): The pilot provides strong evidence for a **turn-minimization heuristic** as a competing route-choice principle alongside shortest-path reasoning-particularly when a “straight” or promenade-like option is perceptually attractive.

4.2. NAVIGATION (THIRD-PERSON) TASKS

4.2.1. Route C (Kastel Fortress → Borik Sports Hall)

The first navigation task asked participants to give directions from Kastel Fortress to the Borik Sports Hall. Figure 5 visualizes chosen routes and segment frequencies.

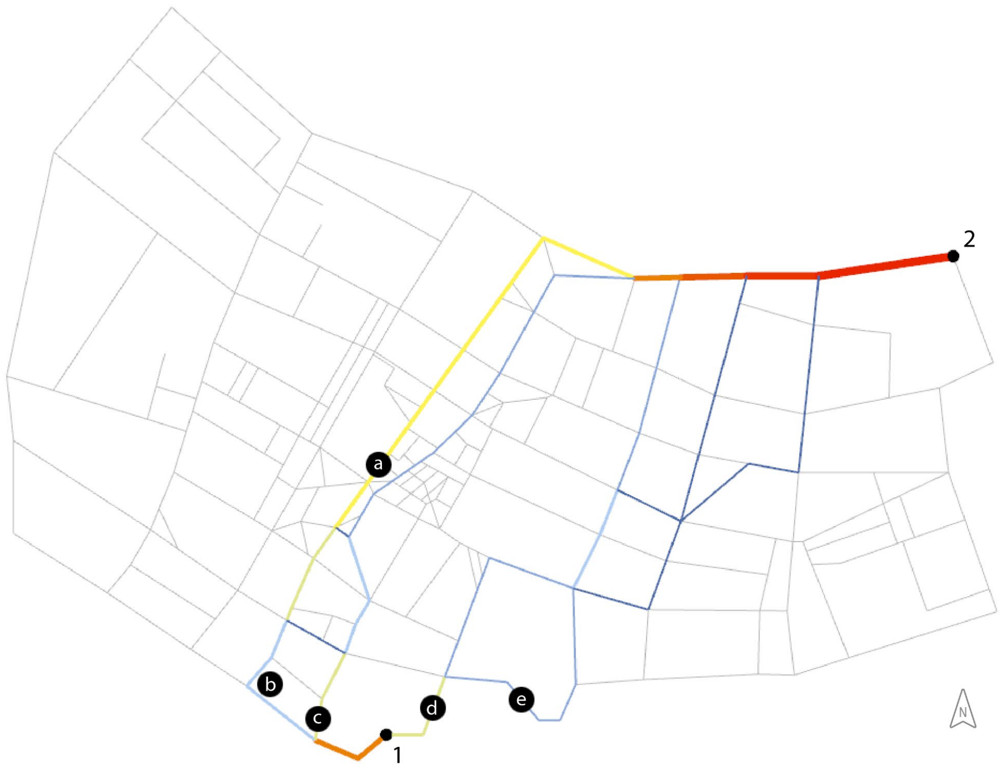

Figure 5. Aggregate of all paths used in navigated route C. Drawing by author.

A key methodological issue emerged: nine respondents did not complete this task successfully due to technical problems with recording, so their data were not captured.

Despite this, the research notes that the **shortest path does not coincide** with the most frequently used segments when giving instructions to a third person.

This supports the general hypothesis that instruction-giving emphasizes comprehensibility and salient references rather than pure distance minimization.

In interpreting route choices, the research notes that many respondents treated the “main entrance” of the fortress as the western gate, leading to a lower-rank street (Fig 5-c) rather than the northern gate (Fig 5-d). A proposed reason is that the western option connects old and new city areas and is more integrated within the overall system; the northern option leads toward a less walkable area along a river and is not adequately arranged for walking.

Interpretive summary (Route C): When explaining routes to others, respondents appear to prefer instructions that **trace more integrated and walkable** corridors and that align with commonly understood “main” passages, even when these diverge from the shortest route.

4.2.2. Route D (Music School → Economic School)

The second navigation task asked participants to provide directions from the “Vlado Milošević” Music School to the secondary Economic School. Figure 6 visualizes chosen routes and segment frequencies.

The research observes that the **chosen routes broadly align with the shortest route** in the task geometry, but the shortest route-while linear-requires cutting across larger streets and crossing a parking area rather than following a single clean corridor.

Figure 6. Aggregate of all paths used in navigated route D. Drawing by author.

The task exhibited strong difficulty and non-completion: approximately half did not finish due to technical recording problems; additional respondents reported difficulty in identifying the precise location of the Economic School (which intersection it is located at).

The research proposes that the **orthogonal grid in this district, strong street fronts, and relatively uniform building heights may reduce distinctive cues and thereby increase orientation difficulty**.

In route descriptions, respondents tended to guide the third person to Nikola Pašić Street (Fig. 6-e) and then orient toward the school, suggesting incomplete "global grasp" of that part of the city map.

Notably, no respondent chose Kralja Alfonsa XIII Street (Fig. 6-c), which directly leads to the school and is described as pleasant with tree lines, whereas alternative streets (Srpska and Jevrejska) lack sidewalks in some sections (Fig. 6-d).

The research further concludes that many respondents did not fully satisfy the instruction-giving requirements: some descriptions reference objects or city parts not visible to the person receiving instructions, indicating that the "reference elements" exist primarily in the respondent's mental map rather than in shared perceptual context.

Interpretive summary (Route D): This task demonstrates a key challenge for direction-giving studies: **respondents' mental references can be rich but not externally shareable without a common perceptual frame** (e.g., shared images), reinforcing the value of the subsequent virtual-survey method.

4.3. CUE SALIENCE ACROSS TASK TYPES: LANDMARKS, TOPOLOGY, AND METRIC/TIME

The research reports that it was expected respondents would frequently use descriptive adjectives, but this was primarily observed in the second group of tasks-when explaining the route to a third person.

Participants most often relied on characteristic objects either as activities (e.g., café, pharmacy) or as recognizable buildings (e.g., National Theater, "Boska"), and these references occurred more often in the walking task group (reported as 102 occurrences) than in the navigation task group (72 occurrences).

The research interprets this as evidence that respondents struggled to fully assume the perspective of someone unfamiliar with the city.

Conversely, in the second task group (direction-giving), respondents more often referenced physical elements they considered characteristic (e.g., a specific fountain, a distinctive clock, a wide parking area).

The research also confirms that respondents used metric or time values when giving directions, but estimates varied substantially and were often not precise.

5. DISCUSSION

5.1. CONFIGURATIONAL TENDENCY WITH LOCAL OVERRIDES AT DECISION POINTS

In imagined tasks, many respondents gravitate toward routes that are globally “short” (consistent with sensitivity to network structure). But the systematic deviations (e.g., choosing a more active/main entrance over a shorter but less attractive/obstructed alternative) show that **local experiential parameters**-activity edges, perceived safety, obstructions, familiarity-can override configurational optimality at specific nodes. These deviations are exactly the “missing local parameters” that purely 2D/global readings don’t capture.

5.2. A COMPETING “SHORTEST” HEURISTIC: TURN MINIMIZATION / ANGULAR SIMPLICITY

A notable subgroup selected the **fewest-turns** option (e.g., in Route B). This suggests that “shortest” is often operationalized cognitively as **minimal angular change and directional simplicity**, not strictly metric distance. That aligns with space-syntax ideas of **relational/angular distance** and supports the broader claim that a “feels-shortest” route can be the one with the smallest angular deviation toward the destination.

5.3. CUE HIERARCHY DEPENDS ON TASK: SELF-ROUTE DESCRIPTIONS VS NAVIGATION-TO-OTHERS

Across the pilot, participants mix cue types, but their stability shifts by task context:

- **Metric/time descriptors** are common but inconsistent across individuals (highly subjective).
- **Topological sequence** (countable decision points like intersections/traffic lights) becomes the most reliable backbone for giving directions.
- **Landmarks** often appear as confirmation (“you’ll know you’re right when you see X”), but they can be unusable when the listener lacks the same mental map. This explains why navigation-to-others can produce different (sometimes misleading) evidence than self-route descriptions: without a shared perceptual frame, respondents compensate by relying on generic, countable nodes and broader descriptors.

5.4. COMFORT, LEGIBILITY, AND VISUAL UNIFORMITY AS MODULATORS-AND WHY THIS MOTIVATES THE VIRTUAL SURVEY

Comfort cues (shade/greenery, seasonal conditions) can strongly shape **personal** imagined choices, but they matter less reliably in instruction tasks where **communicability** and shared references constrain what people say. Meanwhile, visually repetitive/block-like fabrics can trigger disorientation and weaken landmark anchoring, pushing respondents toward topological counting. Together with technical/audio limitations and inconsistent metric estimates, these findings justify the next-stage **visually standardized virtual survey**: it preserves the cognitive character of wayfinding while controlling what is visible, comparable, and shareable across respondents.

5.5. LIMITATIONS

The pilot relied on a small convenience sample (N = 20), spanning roughly ages 20–60, with most respondents reporting that they know Banja Luka “very well.” This creates two linked limitations. First, statistical generalization is not possible; observed tendencies (e.g., preference for certain cues) should be interpreted as *indicative* rather than population-level effects. Second, the dominance of highly familiar participants introduces familiarity bias: people who routinely move through the area may compress route knowledge into habitual scripts and may omit details that less familiar pedestrians would rely on (e.g., explicit landmark anchoring). The pilot therefore risks underrepresenting strategies typical of visitors, newcomers, or infrequent walkers.

Furthermore, data were collected remotely, with tasks delivered online and answers recorded as audio via mobile phone. While efficient, this format reduces control over how participants interpret instructions. The dissertation explicitly notes the risk that respondents may misunderstand the task because the researcher cannot clarify questions in real time. Methodologically, this increases measurement noise in at least two ways:

- participants may answer a different question than intended (e.g., describing a familiar habitual route instead of the route constrained by the task points), and
- participants may provide uneven levels of detail depending on individual communication style, confidence, or time available, which affects the comparability of verbal narratives.

Because responses were recorded and submitted through a digital audio workflow, some participants encountered recording problems and did not complete tasks. These yields missing data that is unlikely to be random (e.g., less tech-confident respondents may be disproportionately affected). Non-random missingness can bias summaries of which cues are used most often, because the final dataset may overrepresent respondents who are more comfortable with digital tools and more likely to give longer or clearer descriptions.

6. CONCLUSION AND FUTURE WORK

This study sets out to identify the types of spatial cues that pedestrians spontaneously employ when verbally describing routes within a familiar urban environment, as a preparatory step for a controlled virtual survey. The pilot questionnaire confirms that verbal navigation is predominantly structured around topological elements and landmark-based confirmation, while metric and temporal estimations, although present, demonstrate significant inter-individual variability.

Beyond identifying cue frequency, the pilot clarifies the relative stability and interpretative consistency of different descriptor categories. Topological references and salient landmarks emerged as cognitively robust anchors, whereas metric descriptions proved less reliable for standardized comparison. Furthermore, the distinction between self-route and navigation-to-others tasks proved analytically meaningful - third-person instruction consistently favored countable topological structures and recognizable environmental objects over habitual, experience-driven references, confirming that task framing shapes not only what is described but how navigational knowledge is organized and communicated. The findings also reveal that visually repetitive urban fabrics may weaken landmark anchoring and increase disorientation: in environments with low streetscape differentiation, respondents either failed to complete instructions or resorted to mental-map references inaccessible to a listener without shared familiarity, suggesting that environmental morphology plays a measurable role in navigational description strategies.

In methodological terms, the pilot fulfills its intended function: it refines and validates a focused parameter framework for subsequent controlled testing. By isolating cue categories that show both frequency and structural consistency, the study establishes a more precise basis for the design of the virtual survey phase. The transition to a visually standardized environment is therefore not merely procedural but analytically justified as a necessary step to reduce imaginative variability and strengthen cross-participant comparability.

Taken together, the pilot advances the overarching research objective by transforming an exploratory inquiry into a structured experimental foundation, thereby increasing the methodological rigor and explanatory potential of the forthcoming controlled phase.

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7. APENDIX

Table 2. Codebook

Code	Category name	Definition (what to tag)	Include	Exclude / avoid confusion with	Example phrases (English equivalents)
ADJ	Descriptive adjectives	Qualitative descriptors of spatial features	wide/narrow, big/small, red/blue, etc.	pure street names without descriptors	“a wide street”, “the narrow passage”
MET	Metric/time estimates	Quantified or approximate distance/time	minutes, meters, “about 5 min”	ordinal counts (“second light”)	“walk ~300 m”, “about five minutes”
CARD	Cardinal directions	References to N/S/E/W or “toward north”	“north”, “south”, “east/west”	left/right turns (code as TOP/HEU if needed)	“go north toward…”
STR	Street names	Named streets used to structure route	“Gundulićeva”, “Kralja Petra…”	landmark names (LMK/URB)	“continue along [street name]”
URB	Recognizable urban elements	Public features not necessarily “buildings”	square clock, fountains, park, parking lot	specific buildings/facilities (LMK)	“past the fountain”, “through the parking”
LMK	Buildings/places (incl. functions)	Named objects/places incl. commercial content	shops, schools, institutions, complexes	generic “park” (URB)	“near the library”, “by the bakery”
SHA	Shade/greenery preference	Comfort statements tied to microclimate	shade, trees, greenery, “cooler path”	general “pleasant street” unless clearly comfort-related	“I stay in the shade”, “tree-lined street”
CTR	“Center” as anchor	Using “center” as a reference concept	“the center”, “center = Krajina square”	street name “Centar” if that exists	“go to the center / main square”
OFF	Off-route / non-visible reference	Reference point not on/visible from route	“toward transit”, “toward Nova Varoš” (without visible cue)	normal landmarks on path	“head toward [district], then…”
TOPC	Counting decision points	Explaining route by counting lights/intersections	“second traffic light”, “three crossings”	time/distance (MET)	“after the second traffic light…”
NBH	Neighborhood/district name	District anchoring	Dolac, Nova Varoš, etc.	street names (STR)	“toward Dolac”
ELV	Elevation/level change	References to slope, uphill/downhill	“uphill”, “down the slope”	metaphorical “go down” meaning “continue”	“go uphill toward…”
ORI	Orientation problem	Explicit confusion/difficulty locating	“hard to find”, “I get lost near…”	mere uncertainty without location	“I have trouble near the economic school”
VLM	High vertical landmark	Tall, visible reference landmarks	bell tower, minaret	ordinary buildings not described as vertical beacons	“use the minaret as reference”
LEX	Frequent terms (optional)	Lexical frequency tracking	“traffic light”, “main”, “crosswalk”, “sidewalk”	conceptual coding already captured above	“main street”, “crosswalk”

Table 3. Coding table

Characteristic categories (coded cues)	**A**	**B**	**C**	**D**
Use of descriptive adjectives (e.g., big/small, wide/narrow, red/blue…)	5	7	22	20
Use of metric or time values (distance/time estimates)	0	0	11	3
Use of cardinal directions (N/S/E/W)	0	1	4	1
Use of street names	15	15	7	7
Use of recognizable urban elements (e.g., square clock, fountain, park, parking)	1	4	10	18
Use of object/place names (including functions/contents)	56	46	38	34
Respondent explicitly stated they walk “in the shade”	3	1	0	0
“City” identified with the “center,” and “center” with Krajina Square	1	1	1	0
Movement oriented toward a reference element not on the route / not in the visual field (e.g., “toward the transit station,” “toward Nova Varoš”)	1	5	5	3
Explaining the route by counting traffic lights or intersections	0	2	11	8
Referring to a neighborhood/district (e.g., Dolac, Nova Varoš)	0	4	0	0
Referring to elevation/level differences (uphill/downhill)	0	0	6	2
Orientation/finding problem near the Economic School	0	0	0	5
Use of tall visual landmarks (e.g., bell tower, minaret)	0	0	4	3
Frequently used terms	**A**	**B**	**C**	**D**

Traffic light	5	6	8	7
Center	1	0	1	1
Main (main street / main entrance, etc.)	6	6	9	5
Pedestrian crossings / crosswalks	1	0	0	1
Sidewalk	1	0	2	0