Artículo de investigación

The function of syntagmatic connections in an experimental lexical network on the example of *the street* lexeme

La función de las conexiones sintagmáticas en una red lexica experimental para el lexema ulica

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ABSTRACT This article presents an experimental lexical network, which was created as a result of a cyclically-conducted the basis of free word associations for the Polish. Meaning in a network of this kind is represented by the connections between the defined lexeme and the defining lexeme. Using the lexeme 'street' (in Polish: *ulica*) as an example, we show how dependencies build meaning and which function is performed by syntagmatic relations.

KEY WORDS Experimental lexical network; associative mechanism; syntagmatic connections; lexeme; Polish; semantic field; language recognition; meaning.

RESUMEN El presente trabajo presenta una red léxica experimental, originada de resultados de un experimento, conducido cíclicamente, del test de asociación libre de palabras, para la lengua polaca, que buscaba examinar el reco

nocimiento del significado. En tal red, el significado se representa mediante las conexiones entre lexema definido y lexema definidor. Acudiendo al lexema 'calle' (en polaco, *ulica*) se muestra de qué modo las dependencias construyen el significado y qué función desempeñan las relaciones sintagmáticas.

PALABRAS CLAVE Red léxica experimental; mecanismos asociativos; conexiones sintagmáticas; lexema; polaco; campo semántico; reconocimiento del lenguaje; sentido y significado.

Introduction: Lexical Networks

An experimental lexical network is a dictionary model built up of lexemes and links between the lexemes. The network shown in this paper was created as a result of an experiment of free word associations, in which the participants, in response to a stimulus, provided the first lexeme that came to their minds.

The set of responses to a given stimulus builds an experimental definition of the meaning of the stimulus lexeme (Deese, 1965). Links between the stimulus and the response are expressed by lexical relations, where approximately 50% of connections are paradigmatic, mainly hyponymous, (e.g. *house – building*) and meronymic, such as *house – roof*[1]. The remaining connections obtained as a result of the experiment are syntagmatic connections (Clark, 1970; De Deyne and Gert 2008; Gatkowska, 2017; Kiss et al., 1973). If we conduct the experiment cyclically, i.e. use the responses obtained in the first phase as an input for the function of stimuli in the second phase of the experiment, we will obtain a lexical network that represents syntagmatic connections soundly, because each lexeme (network node) will have both connections coming to its own responses and from stimuli for which it was the answer.

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1. As the reader may notice, the direction of association does not have to be consistent with the direction of the lexical relation.

Graph 1

Fragment of the experimental lexical network.
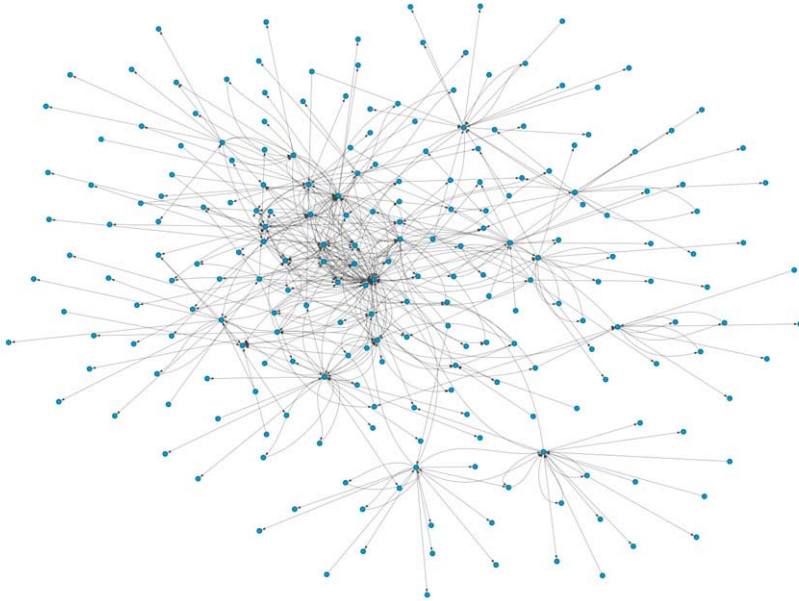
Source: Godny (2013, p. 22).

A simple experiment of free word associations

The result of the test of free word association yields an association list, that is, a collection of words comprising the replies linked with a specific stimulus word. The partial association list below corresponds to the stimulus word *alcohol*[2] :

wódka (vodka)	*127*	*14.5 %*
pijak (drunk)	*117*	*13.37 %*
piwo (beer)	*78*	*8.91 %*
pić (to drink)	*40*	*4.57 %*
impreza (party)	*39*	*4.46 %*
procenty (percent)	*29*	*3.31 %*
zabawa (fun)	*9*	*3.31 %*

The first column, on the left, contains those response words linked (associated) with the stimulus. The second column refers to the number of people linking (associating) the stimulus phrase with a specific response word, while the third column represents the linking strength of the stimulus and the response in percentage points

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2. Only the most common replies of the total provided by 900 subjects are shown here.

– such strength being determined by dividing the number of people providing a specific response by the total number of participants in the survey.

A cyclical experiment, or how the network was created

> The list of associations just shown has all of the attributes indicated by Clark (1970). Yet it does not exhaust all the vocabulary research possibilities the association test puts at our disposal. Thus, in 1973, the British researchers George R., Kiss, Christine Armstrong, Robert Milroy and James Piper observed that if we research an appropriately large number of word stimuli while conducting an experiment in a **cyclical** manner, that is, while employing those responses obtained in the first cycle as a stimulus for the next cycle, the resultant stimuli and responses will form a lexical network. How this works may be illustrated with the following example.

Let us assume that A, B, C, D, and E are actually existing words in a given language (Polish, in this particular case) and that certain associations occur between them, thereby creating stimulus – response pairs:

A → D   ex. *ulica* (street) $\longrightarrow$ *kręta* (winding)
A → B   ex. *ulica* (street) $\longrightarrow$ *rzeka* (river)
B → C   ex. *rzeka* (river) $\longrightarrow$ *miasto* (city)
A → C   ex. *ulica* (street) $\longrightarrow$ *miasto* (city)
C → A   ex. *miasto* (city) $\longrightarrow$ *ulica* (street)
D → B   ex. *kręta* (winding) $\longrightarrow$ *rzeka* (river)
B → E   ex. *rzeka* (river) $\longrightarrow$ *woda* (water)

The collection of stimulus – response pairs build up a network in the following form:

Graph 2
The creation of a network.
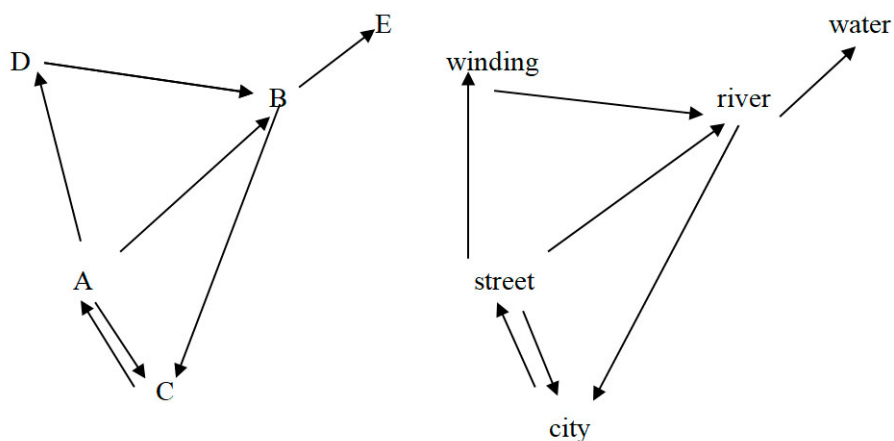
Lexical units (words) are **nodes of the network**, and the arrows indicate the links or edges and their **directions**, always from the stimulus to the response. We can distinguish two types of links or edges: **outgoing links**, leading from one hub to another (see, for instance, for the case of the node street: *street → winding*, street → *river*) and **incoming links**, leading to a given hub from another node (e.g., *street ← city*, for the node *street*).

Attention to the empirical properties of lexical networks leads to the conceptualization of various types of nodes. Below are those most relevant for the purposes of the present paper:

Full nodes. Full nodes are those types of nodes formed around a word which was a stimulus word in the experiment. They have both ingoing and outgoing links (in our example: *street, city, river, or winding*).

Reduced nodes. Reduced nodes are those formed around lexemes (words) which were not stimulus lexemes (words). They have only incoming links (e.g., here, in our example: *water*).

Links which are outgoing and incoming are **direct links**. There are also indirect links in the network, for example *city – water*, which are represented by a sequence of direct links, in our example, this would be the *city → street → winding → river → water* sequence. The sequence of direct links connecting any two nodes in the network is called a **path**. Paths are one of the fundamental concepts of graph theory, a particular branch of mathematics and computer science which has proven seminal for linguistics in its everyday applications (ranging from natural language processing to chatbots, to just name a couple of them).

Backlinks (feedback connections). Backlinks are connections between nodes that in the experiment were the stimulus and the answer for our example: A⟶C and C ⟶A, abbreviated A↔C, ex. *street ⟶ city* and ex. *city ⟶ street: street ↔ city.*

Every linkage in a network built by the free word association experiment has the strength of a link. **The strength of connection** is the ratio of the number of respondents who answered stimulus A with response B to the number of all respondents who answered stimulus A. For example, when the number of all respondents who answered stimulus A is 95, of which 49 respondents responded to B, the strength of the relationship A- B is 52% (49/95 rounded) (Gatkowska, 2017a, pp. 19-22).

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Strength of connection

Strength of connection constitutes an important parameter because it shows whether the coexistence of meanings in a given natural language is frequent or sporadic. It allows us to study the direction of meanings, that is, how meanings correlate with each other in a given natural language. Hence directivity becomes a crucial aspect of the research on linguistic meaning.

We know that certain meanings need to be linked to others, e.g. *zakaźna* (infectious) ⟶ *choroba* (disease) (89.11%)[3] and we do expect, therefore we can intuitively assume that there is a *choroba* (disease) ⟶ *zakaźna* (infectious) relationship (0.69%). However, only specific data, as those obtained in the course of our experiment, allow us to precisely define the connectivity between these two meanings, or, in other words, the strength of the connection.

Strength of linking meanings- this parameter is helpful in distinguishing significant features of meaning for the empirical model of the lexical unit (lexical node). This parameter can also be used in research on prototypical and stereotypical elements of meaning (which we will not deal with in this text).

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3. The number of identical answers was converted into a percentage.

It should go without saying that constraints on compossibility have long been acknowledged to be a defining trait of human *logos*, be it in its logical form or in its speech manifestation. We traditionally associate the name of Leibniz with efforts on the study of the former; as to the latter, two examples should suffice here as particular instantiations of: selective categories, namely, Coseriu (1977) 's classeme, which lies at the core of the syntagmatic dimension of his structural semantics, and Whorf's (1956) cryptotype, a kind of underlying semanteme governing relations between a certain class of family items.

We may therefore state that the collection of stimulus-response dependencies characterizes the stimulus as a lexical unit, which to a significant degree supplies data concerning the links between the meanings.

The original cyclical experiment for Polish conducted in Kraków

The network was built during a cyclical experiment in which 900 subjects (Polish students of the Jagiellonian University and AGH in Kraków) took part. The participants in the experiment ranged between 19 and 41 years of age and covered a wide array of majors and minors (Psychology and Philosophy lacking any representation in the pool, though)[4]. Polish was the mother tongue for all of them.

The response time to 322 stimuli ranged from a maximum of 34 minutes 38 seconds in the case of a 41year old female subject to a minimum of 6 minutes 9 seconds in the case of a 20 year old male subject.

The total 322 stimuli correspond to 63 nouns from the Kent-Rosanoff's list (cycle I) plus 259 (including nouns, verbs and adjectives) which constituted the most frequent replies to the 63 stimuli from the Kent-Rosanoff list in the experiment conducted by I. Kurcz in 1967. For the present paper, a computer program specifically written for our purpose was used, which displayed randomly ordered lexemes and stimuli, giving the respondent 5 seconds for an answer. The lack of a response resulted in the next stimulus being displayed; it was not possible to return to the previous lexeme. Thus, the experiment forced the participants to spontaneously provide the first association that came to their mind after recognizing the meaning of the stimulus lexeme.

Result: An experimental lexical network

The network obtained in this way consists of 10,448 lexical nodes (or lexemes) and 35,170 connections or edges between nodes. The nodes of the network are mainly made up of nouns (69%), adjectives (22%), and verbs (7%), while other parts of speech (pronouns, numerals, adverbs, proper names, and other expressions) together represent the remaining 2% of the nodes. That can be summarized in the following table:

stimulus   response

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4. Students of Psychology and Philology did not participate in the experiment, so that the educational training did not affect the results of the study.

Table 1

Distribution of connections with the division into parts of speech.

	noun	verb	adjective
noun	45.128	2.991	12.767
verb	2.886	847	151
adjective	24.647	171	3.759

The connections of the noun with the verb and those of the noun with the adjective present in the network, which may occur in the sentence, creating the correct syntactic structure, are less numerous than the other connections in the network that do not create syntactic structures on their own, e.g. *home* → *garden, doctor* → *stethoscope, brain* → *head*, etc. This phenomenon, which also occurs in English language networks, was pointed out back in the day by Clark (1970) as well as by contemporary researchers (De Deyne and Storms 2008, Schulte im Walde and Borgwaldt, 2015). The table above shows that noun-verb connections account for 3% of all connections in the experimental network. The experimental lexical network is structured as a natural dictionary.

A comparative analysis of empirical network data obtained from text corpora with an experimental network using the human associative mechanism shows the similarities in terms of paradigmatic relations and the differences in terms of syntagmatic relations that build the meaning of the lexeme, i.e. in an experimental network both types of relations occur equally often and thus is precisely how the meaning of the lexeme is built together (Gatkowska, 2021). The qualitative characteristics of the connections of the lexical node (noun) in the lexical network reveal lexical relations, i.e. known paradigmatic relations such as hyponymy, meronymy, synonymy, antonymy or complementarity (Lyons, 1968), as well as a set of syntagmatic relations such as physical features, mental features, functional dependencies, spatial and temporal relationships, relationships between states, and so on), which have already been defined and used for semantic analysis (Gatkowska, 2017a), as well as causality.

Causal relationships are usually considered in the context of a sentence. There are no sentences in the experimental lexical network. However, it turns out that the causal relations also appear in the natural dictionary, which is the experimental lexical network. Causality is an important fragment of subnets built around many lexemes, representing not only the relationships between states, e.g. *fear* ↔ *pain, disease* → *problem*. The causality that often appears in the network is of an implicit nature, for example: *child* ↔ *trouble*. The experimental direction of the link does not always run from cause to effect, it is often the opposite. The word association mechanism reveals that in the human mind, cause and effect are closely related to each other.

The experiment shows that the syntagmatic, paradigmatic and causality connections create an experimental definition of the meaning of the stimulus lexeme.

As illustration, we will present paradigmatic and syntagmatic relations that build the meaning of 'the street' lexeme ('ulica in Polish) in the experimental lexical network.

Additionally, we will provide experimental data, i.e. the strength of the connection between the lexemes and the direction of the connection in the network. In this way, we will obtain a complete experimental picture of 'the street' lexical node in the network. We emphasize that we only use experimental data in our lexical analysis.

Lexical nodes in the network

The experimental lexical network has a similar structure to that of a dictionary (Gatkowska, 2017a, p. 24). As we have already mentioned, there are two types of nodes in the network: **full nodes**, which have both outbound links and inbound links, and reduced nodes, which only have incoming links. Each full node was a stimulus in our experiment.

Besides, we need to consider **backlinks** (feedback connections), which are specific interconnections between nodes (lexemes) in the network.

We take the 'street' lexeme to be a full node in our network, as it corresponds to the lexeme 'the street' (*ulica* in Polish) being a noun. It is interesting to underline that no verb is to be found among the answers provided, which would imply connections with other nodes[5].

As we will see below, paradigmatic relationships are represented by hyponymy and meronymy.

There is also a very rich set of syntagmatic connections, both of the noun-adjective and noun-noun type. Such dependencies are of different quality. And this is how they build the meaning of the lexeme.

Lexical node (lexeme) *ulica* **(street)** - it is included in 230 outgoing connections (⟶) to other network nodes and in 32 incoming connections (⟵) from other network nodes.

paradigmatic relations such as:

hyponymy, we adopt the definition of hyponymy provided by Lyons (1968, p. 453), which is based on the model of intension and extension (Gatkowska, 2017a, pp. 51-53),

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5. It is worth note on passing that there is no arbitrariness in assigning connectivity with other nodes to the verb category. It is not just some whimsical representation, but rather, it reflects the fact that valency zero ought to be construed as a marked case, as opposed to transitivity and further satellites being part of the verbal structure under analysis.

for 'street': *ulica* (street) → *droga* (road)7.34, cohyponyms: *ulica* (street) → aleja (avenue) 1.24, → *alejka* (lane) 0.23,

meronymy, we derive the study of meronymy from collection theory (mereology), a logical model of a set using one part-whole relation and distinguishing various types of a whole (Gatkowska 2017a, pp. 53-58),

for 'street': *ulica* (street) ↔ *miasto* (city) 5.2 (→ *miasto* 4.51, ← *miasto* 0.69), *ulica* (street) → *chodnik* (sidewalk) 1.47, → *asfalt* (asphalt) 1.02, → *bruk* (pavement) 0.56, → *kostka* 0.34, (paving) → *brukowana* (paved) 0.34,

syntagmatic relations, such as:

size, defines the relationship between: people, animals, inanimate beings including natural objects and artifacts (things) and the physical features of the object, determining the perceived (relative) or measured (absolute) physical dimension (Gatkowska, 2017a, p. 61),

for 'street': *ulica* (street) ↔ *długa* (long) 30.32 (→ *długa* 10.5, ← *długa* 19.82), *ulica* ↔ *krótka* (short) 1.16 (→ *krótka* 0.23, ← *krótka* 0.93), *ulica* (street) ↔ *szeroka* (wide) 24.35 (→ *szeroka* 7.22, ← *szeroka* 17.13), *ulica* (street) ↔ *duża* (big) 0.22 (→ *duża* 0.11, ← *duża* 0.11), *ulica* (street) → *wąska* (narrow) 1.13, → *ciasna* (tight) 0.23,

shape determines the relationship between: people, animals, inanimate beings, including natural objects and artifacts (things) and the external form of an object perceived by touch or sight (Gatkowska, 2017a, pp. 61- 62),

for 'street': *ulica* (street) → *prosta* (straight) 0.23, → *kręta* (winding) 0.45

color is used of the relationship between: people, animals, natural objects and artifacts (things) and the properties of their surfaces perceived by sight, depending on how they reflect or emit light, (Gatkowska, 2017a, p. 62),

for 'street': *ulica* (street) ← *zielona* (green) 0.45, ← *czarna* (black) 0.34,

location, defines the spatial relations between objects (plants, natural objects, artifacts); the relation is relative we have a locating and locating object (Gatkowska, 2017a, p. 66),

for 'street': *ulica* (street) ↔ *dziura* (hole) 0.57 (→ *dziura* 0.23, ← *dziura* 0.34), *ulica* (street) ↔ *lampa* (lamp) 0.68 (→ *lampa* 0.45, ← *lampa* 0.23), *ulica* (street) → *skrzyżowanie* (crossroads) 0.34, → *zaułek* (alley) 0.34, → *dom* (house) 6.21, → *domy* (houses) 0.45, → *latarnia* 2.14, → *drzewo* (tree) 0.23, → *samochód* (car) 0.68, → *auta* (cars) 0.23, → *znak* (sign) 0.34, → *znak drogowy* (road sign) 0.23, and *ulica* (street) ← *z dziurami* (with holes) 0.34,

characteristic place, determines the relationship between: people or animals and artifacts or natural objects in which a person or an animal performs characteristic activities, (Gatkowska, 2017a, p. 64),

for 'street': *ulica* (street) → *zatłoczona* (crowded) 0.79, → *tłum* (crowd) 0.45, → *ludzie* (people) 0.45, → *tłok* (crush) 0.23, and *ulica* (street) ← *kieszonkowiec* (pickpocket) 0.23,

specific property, determines the relationship between: people, animals, natural objects or artifacts (things) and states or actions that define the specificity of the object (Gatkowska, 2017a, p. 62),

for 'street': *ulica* (street) ↔ *ciemna* (dark-adjective) 1.51 (⟶ *ciemna* 3.5, ⟵ *ciemna* 13.01), *ulica* (street) ↔ *ruch* (traffic) 5.18 (⟶ *ruch* 1.58, ⟵ *ruch* 3.6), *ulica* ↔ *pusta* (empty) 0.68 (⟶ *pusta* 0.11, ⟵ *pusta* 0.57), *ulica* ↔ *czysta* (clean) 0.58 (⟶ *czysta* 0.23, ⟵ *czysta* 0.35), *ulica* ↔ *ciemno* (dark -adverb) 0.57 (⟶ *ciemno* 0.11, ⟵ *ciemno* 0.46),

ulica ↔ *ciemność* (darkness) 0.57 (⟶ *ciemność* 0.34, ⟵ *ciemność* 0.23), *ulica* ⟶ *ruchliwa* (busy) 1.58, ⟶ *mokra* (wet) 0.45, *ulica* ⟵ *wiejska* (rural) 3.81,

pragmatic dependencies:

<u>name</u>, is used of the relationship between animate objects, people, natural phenomena, inanimate objects and their proper names (Gatkowska, 2017a, p. 67),

for 'street': *ulica* (street) ⟶ *Floriańska* 0.34, ⟶ *Mickiewicza* 0.34, ⟶ *warszawska** 0.23, ⟶ *norymberska **0.23, ⟶ *puławska** 0.23, ⟶ *szewska**0.23, ⟶ *Łojasiewicza* 0.23, ⟶ *zamkowa** 0.23, ⟶ Rynek 0.23,

<u>knowledge</u>, the term used for the relationships between natural objects, phenomena, people, animals, plants and artifacts, which are the result of scientific knowledge, work experience, knowledge of a foreign language (usually an equivalent) or information provided by the media, (Gatkowska, 2017a, p. 67),

for 'street': *ulica* (street) ⟶ *numer* (number) 0.23, ⟶ *adres* (address) 0.56, ⟶ *nazwa* (name) 0.45, ⟶ *street* [English translation] 0.23,

<u>identification</u> - determines the relationship between: objects and their classification resulting from the action or process of identifying (recognizing) the specificity of an object by an observer, (Gatkowska, 2017a, p. 68),

for 'street': *ulica* (street) ↔ *moja* (my) 1.35 (⟶ *moja* 1.24, ⟵ *moja* 0.11),

<u>assessment</u> - defines a positive or negative attitude towards an object or state, resulting from the subjective attitude of the observer, (Gatkowska, 2017, p. 68),

for 'street': *ulica* (street) ↔ *ładna* (pretty) 0.34 (⟶ *ładna* 0.11, ⟵ *ładna* 0.23).

Data analysis

The lexical node *street* creates one subnet in the experimental network, which corresponds to the meaning of the lexeme 'street'. The subnetwork is organized around feedback connections (backlinks). Thus, *street* ↔ city, defines the 'street' as part of the 'city', while the 'street' itself is a whole built of parts (outgoing connections, e.g. ⟶ *pavement*, ⟶ *asphalt*, ⟶ *pavement*, ⟶ cube, etc.) links are explained by the determinant of meronymy.

Furthermore, feedback connections lead to the following nodes:

street ⟷ long
street ⟷ short,
street ⟷ wide
street ⟷ large,

and other outgoing connections (e.g. →*narrow*, →*tight*), which are the determinants of size. The street node has connections leading to nodes designating the urban layout (→*straight*, → *winding*), which are explained by the determinant of shape, and the color of the surface, incoming connection: ← *black*), and overgrowing vegetation (incoming connection: ← *green*), which are explained by the determinant (relation) of color.

When analyzing the feedback connections, the following emerged:

characteristic features of the 'street' - *street*⟷*traffic*, *street*⟷*empty*, *street*⟷ *clean*, and also the conditions may be undesirable, but less common: *street* ⟷*dark*, *street*⟷*darkness*, which is explained by the determinant specific property.

The street has a name, this fact is revealed in the connections originating in the street node, it is a rich set of street names that explains the determinant of the name, as well as pragmatic administrative needs, which are expressed in the outgoing connections labeled by the determinant knowledge.

In the immediate vicinity of the physical street there are its numerous additions, which find their place in the subnet of the lexical node street labeled by the determinant (relation) location (these are feedback connections: *street*⟷*hole*, *street* ⟷*lamp* and outgoing connections: →*crossroads*, →*alley*, → *house*, etc.).

People, passers-by and pedestrians move along the street, hence the outgoing connections are not surprising: →*crowded*, → *crowd*, → *people*, →*crowds*, etc., which is explained by the determinant of a characteristic place.

The street obviously has a name, as revealed in the connections originating in the street node: it is a rich set of street names that explains the determinant of the name, as well as pragmatic administrative needs, which are expressed in the outgoing connections labeled by the determinant knowledge.
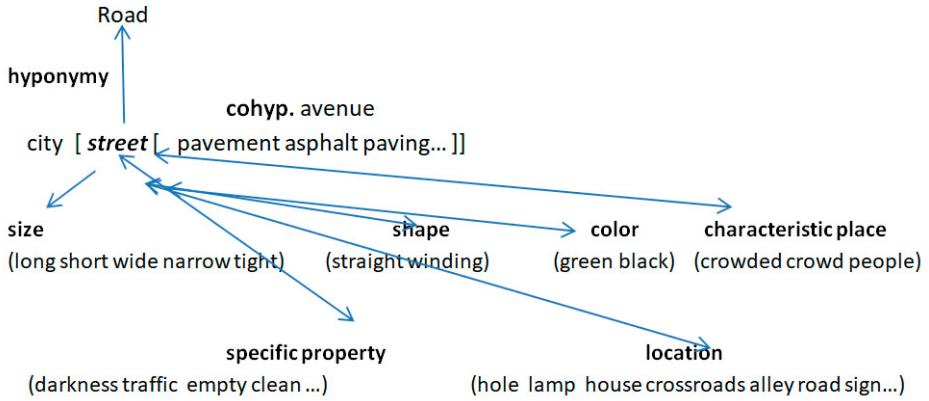
In the street node feedback connections are to be found: *street*⟷ *my*, which is explained by the determinant identification, and *street* ⟷*pretty*, which is explained by the determinant assessment.

If we ignore the connections that do not contribute to the definition of meaning, hence the connections expressing the name, knowledge, identification and evaluation, then the experimental model of the meaning of the lexical unit 'street' can be presented in the form of a graph of semantic relations:

An experimental model of the meaning of the 'street' lexeme.

Graph 3

Graph of semantic dependencies for lexeme 'street'.

Road

hyponymy

cohyp. avenue

city [**street** [pavement asphalt paving…]]

size
(long short wide narrow tight)

shape
(straight winding)

color
(green black)

characteristic place
(crowded crowd people)

specific property
(darkness traffic empty clean …)

location
(hole lamp house crossroads alley road sign…)

Signs:

paradigmatic relations:

Hyponymy ↑

Meronymy [ ]

syntagmatic relations:

dependency name, for example : size, shape, specific property ( )

Other connections

Additionally, we have to consider distant connections. These are the connections that go from lexical node to lexical node in the network which we cannot explain with the help of paradigmatic, syntagmatic, or pragmatic relationships. Distant connections are explained by paths in the network. These connections are semantically distant. They cannot be explained by one sole relationship. Here are some examples:

ulica (street) ⟶ Kraków* (city name in Poland) 0.34,

ulica (street) ⟶ noc (night) 0.45,

and those that share a common hyperonym: road

ulica (street) ⟶ *autostrada* (highway) 0.23, ⟶ *szosa* (main road) 0.34.

Distant connections are a transition to other parts of the lexical network. Due to the distant connections, the network has a coherent structure.

Conclusions

The cyclical experiment of free word associations provided empirical evidence on the strength of the connection between the lexemes being analyzed.

Each of the 900 participants in the experiment responded to 322 stimuli. The structure of the experiment, i.e. the strongest responses to the stimuli used in the first cycle, became the stimuli in the second cycle of the experiment. In addition, the use of a specially prepared application that did not allow the participant to return to the previously displayed stimulus (the participant could not change or complete the answer) and a limited time to respond (5 seconds).

Thanks to the research constructed in this way, we obtained natural connections between the lexemes. We also obtained the connection strength between the lexemes.

In the process, it became obvious how important it is to pay attention to the feedback connections, since they indicate mutual connections that strengthen the structure of the subnetwork.

Thus, consider:

ulica (street) $\longleftrightarrow$ *miasto* (city)
ulica (street) $\longleftrightarrow$ *długa* (long),
ulica (street) $\longleftrightarrow$ *krótka* (short),
ulica (street) $\longleftrightarrow$ *szeroka* (wide),
ulica (street) $\longleftrightarrow$ *ciemna* (dark - adjective),
ulica (street) $\longleftrightarrow$ *dziura* (hole),
ulica (street) $\longleftrightarrow$ *ruch* (traffic),
ulica (street) $\longleftrightarrow$ *lampa* (lamp),
ulica (street) $\longleftrightarrow$ *pusta* (empty),
ulica (street) $\longleftrightarrow$ *czysta* (clean),
ulica (street) $\longleftrightarrow$ *ciemno* (dark -adverb),
ulica (street) $\longleftrightarrow$ *ciemność* (darkness),
ulica (street) $\longleftrightarrow$ *moja* (my),
ulica (street) $\longleftrightarrow$ *ładna* (pretty),
ulica (street) $\longleftrightarrow$ *dziura* (hole).

The experimental network is built in such a way that, from the lexical node, 'street', it can go to any other node (lexeme) with which it has a connection, i.e., for example: *city, house, lamp, road,* etc. and each of these lexemes builds its own subnetwork. It should be added that if a lexeme has more than one meaning, then it builds more than one subnetwork that represent the meanings, for example, such a lexeme is a house/home (*dom* in Polish, Gatkowska, 2017b).

As a result of this experiment, qualitative analyses of the paradigmatic and syntagmatic relationships between lexemes were carried out, as well as pragmatic relationships such as proper names, knowledge, identification, assessment.

The discussed lexeme enters paradigmatic relations, such as hyponymy and meronymy. Lexeme *the street* is encapsulated with numerous defined syntagmatic connections which, as we have shown, build its meaning. It is worth noting that syntagmatic relations also occur between nouns, in our example: *ulica* (street) ↔ *lampa* (lamp), *ulica* (street) → *ludzie* (people), *ulica* (street) ← *kieszonkowiec* (pickpocket), *ulica* (street) → *samochód* (car), *ulica* (street) ↔ *dziura* (hole), etc.

A very small number of verbs was found in the entire experimental network (7%), and the lexeme under discussion has no verb in its subnet.

Based on the experimental data, an experimental model of meaning was derived. Such model might respond positively as an empirical implementation of the lexical field concept (Lyons 1984, pp. 259-260).

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