Ontological Model of Lexical Concepts and Constructions

From Data to Knowledge Based Visualization

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Ontological Model of Lexical Concepts and Constructions

Language is a symbolic tool that enables human representation and categorization of the world via conventionalized linguistic expressions (Langacker 2008).

- languages convey the knowledge about the world
- model our representation of the world (Casasanto 2016).

Question: Can we and how visualize linguistic knowledge (meaning) and linguistic modeling of knowledge?
Corpus Constructions Ontology Emotion Cultural conceptualization

anger disgust fear guilt happiness love pride sadness shame surprise
Corpus based collocation analysis of the concepts

Croatian Web .hr domain Corpus hrWaC14 (1,2 Gw)
.hr top-level domain (Ljubešić and Klubička 2014) -2011

English Corpus enTenTen2013 (13 Gw)
Web corpus -2013

hrWaC14 (1,2 Gw)

<table>
<thead>
<tr>
<th>Feeling</th>
<th>krivnja</th>
<th>tuga</th>
<th>strah</th>
<th>ljutnja</th>
<th>gađenje</th>
<th>radost</th>
<th>ljubav</th>
<th>ponos</th>
<th>sram</th>
<th>iznenadenje</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Million</td>
<td>25.32</td>
<td>19.72</td>
<td>124.22</td>
<td>10.06</td>
<td>2.49</td>
<td>47.3</td>
<td>272.9</td>
<td>29.71</td>
<td>18.59</td>
<td>38.2</td>
</tr>
</tbody>
</table>

enTenTen (13 Gw)

<table>
<thead>
<tr>
<th>Feeling</th>
<th>guilt</th>
<th>sadness</th>
<th>fear</th>
<th>anger</th>
<th>disgust</th>
<th>joy</th>
<th>love</th>
<th>pride</th>
<th>shame</th>
<th>surprise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Freq</td>
<td>263,927</td>
<td>146,330</td>
<td>1,645,626</td>
<td>526,823</td>
<td>57,805</td>
<td>976,023</td>
<td>4,712,095</td>
<td>568,692</td>
<td>391,204</td>
<td>1,063,866</td>
</tr>
<tr>
<td>Per Million</td>
<td>11.61</td>
<td>6.43</td>
<td>72.4</td>
<td>23.17</td>
<td>2.54</td>
<td>42.94</td>
<td>207.31</td>
<td>25.02</td>
<td>17.21</td>
<td>46.8</td>
</tr>
</tbody>
</table>
Collocation data \textbf{[EMOTION NOUN TARGET+ CONCEPT]} is classified according to 7 types of syntactic-semantic constructions.

Linguistic \textbf{constructions} represent \textbf{cognitive mechanisms} that \textbf{schematically profile conceptualizations} of the target concept.

Tomasello, Langacker 1987, 2008

You shall know a word by the company it keeps... Firth, 1957
Collocation data \([\text{EMOTION NOUN TARGET+ CONCEPT}]\) is classified according to 7 types of syntactic-semantic constructions.

Linguistic **constructions** represent **cognitive mechanisms** that **schematically profile conceptualizations** of the target concept.

1) **[NT and/or N]** *what are the conceptually related concepts?*

<table>
<thead>
<tr>
<th>NT Lemma</th>
<th>Collocation</th>
<th>Gram_rel</th>
<th>Freq</th>
<th>Score</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>ljubav</td>
<td>briga</td>
<td>coord</td>
<td>798</td>
<td>5.68</td>
<td>brigu i ljubav (19%)</td>
</tr>
<tr>
<td>strah</td>
<td>depresija</td>
<td>coord</td>
<td>790</td>
<td>5.19</td>
<td></td>
</tr>
<tr>
<td>tuga</td>
<td>depresija</td>
<td>coord</td>
<td>116</td>
<td>5.95</td>
<td></td>
</tr>
<tr>
<td>strah</td>
<td>frustracija</td>
<td>coord</td>
<td>102</td>
<td>4.11</td>
<td></td>
</tr>
<tr>
<td>sram</td>
<td>krivnja</td>
<td>coord</td>
<td>109</td>
<td>5.82</td>
<td>tuge i depresije (6%)</td>
</tr>
<tr>
<td>radost</td>
<td>mir</td>
<td>coord</td>
<td>102</td>
<td>4.11</td>
<td></td>
</tr>
<tr>
<td>ljubav</td>
<td>nada</td>
<td>coord</td>
<td>96</td>
<td>3.54</td>
<td></td>
</tr>
<tr>
<td>strah</td>
<td>nasilje</td>
<td>coord</td>
<td>95</td>
<td>4.12</td>
<td>u strahu i panici (7%)</td>
</tr>
<tr>
<td>tuga</td>
<td>patnja</td>
<td>coord</td>
<td>116</td>
<td>5.98</td>
<td></td>
</tr>
<tr>
<td>tuga</td>
<td>ponos</td>
<td>coord</td>
<td>104</td>
<td>5.62</td>
<td></td>
</tr>
<tr>
<td>ljubav</td>
<td>razumijevanje</td>
<td>coord</td>
<td>203</td>
<td>5.69</td>
<td>ljubavi i razumijevanja (10%)</td>
</tr>
<tr>
<td>radost</td>
<td>sloboda</td>
<td>coord</td>
<td>102</td>
<td>3.82</td>
<td></td>
</tr>
<tr>
<td>sram</td>
<td>sram</td>
<td>coord</td>
<td>116</td>
<td>5.95</td>
<td></td>
</tr>
<tr>
<td>ponos</td>
<td>sreće</td>
<td>coord</td>
<td>114</td>
<td>5.47</td>
<td>sreće i ponosa (19%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NT Lemma</th>
<th>Collocation</th>
<th>Gram_rel</th>
<th>Freq</th>
<th>Score</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>love</td>
<td>peace</td>
<td>NT and-or</td>
<td>24.689</td>
<td>6.97</td>
<td></td>
</tr>
<tr>
<td>love</td>
<td>life</td>
<td>NT and-or</td>
<td>22.299</td>
<td>5.06</td>
<td></td>
</tr>
<tr>
<td>fear</td>
<td>anxiety</td>
<td>NT and-or</td>
<td>21.966</td>
<td>8.23</td>
<td>fear and anxiety (7%)</td>
</tr>
<tr>
<td>joy</td>
<td>peace</td>
<td>NT and-or</td>
<td>21.485</td>
<td>8.02</td>
<td>peace and joy (12%)</td>
</tr>
<tr>
<td>love</td>
<td>respect</td>
<td>NT and-or</td>
<td>18.915</td>
<td>6.66</td>
<td>love and respect (18%)</td>
</tr>
<tr>
<td>love</td>
<td>compassion</td>
<td>NT and-or</td>
<td>18.736</td>
<td>6.54</td>
<td>love and compassion (12%)</td>
</tr>
<tr>
<td>love</td>
<td>joy</td>
<td>NT and-or</td>
<td>17.679</td>
<td>6.67</td>
<td>love , joy (19%)</td>
</tr>
<tr>
<td>love</td>
<td>joy</td>
<td>NT and-or</td>
<td>17.679</td>
<td>6.67</td>
<td>love , joy (19%)</td>
</tr>
<tr>
<td>love</td>
<td>support</td>
<td>NT and-or</td>
<td>16.553</td>
<td>5.74</td>
<td>love and support (14%)</td>
</tr>
<tr>
<td>love</td>
<td>care</td>
<td>NT and-or</td>
<td>15.661</td>
<td>5.59</td>
<td>love and care (12%)</td>
</tr>
<tr>
<td>anger</td>
<td>frustration</td>
<td>NT and-or</td>
<td>15.335</td>
<td>9.2</td>
<td>anger and frustration (9%)</td>
</tr>
<tr>
<td>joy</td>
<td>happiness</td>
<td>NT and-or</td>
<td>15.410</td>
<td>8.37</td>
<td>joy and happiness (13%)</td>
</tr>
<tr>
<td>fear</td>
<td>anger</td>
<td>NT and-or</td>
<td>13.009</td>
<td>7.62</td>
<td></td>
</tr>
<tr>
<td>anger</td>
<td>fear</td>
<td>NT and-or</td>
<td>13.009</td>
<td>7.62</td>
<td></td>
</tr>
<tr>
<td>love</td>
<td>affection</td>
<td>NT and-or</td>
<td>12.883</td>
<td>6.43</td>
<td>love and affection (16%)</td>
</tr>
<tr>
<td>shame</td>
<td>guilt</td>
<td>NT and-or</td>
<td>12.380</td>
<td>9.27</td>
<td>guilt and shame (9%)</td>
</tr>
<tr>
<td>guilt</td>
<td>shame</td>
<td>NT and-or</td>
<td>12.380</td>
<td>9.27</td>
<td>guilt and shame (9%)</td>
</tr>
<tr>
<td>love</td>
<td>passion</td>
<td>NT and-or</td>
<td>12.108</td>
<td>6.1</td>
<td>love and passion (17%)</td>
</tr>
<tr>
<td>love</td>
<td>light</td>
<td>NT and-or</td>
<td>11.607</td>
<td>5.46</td>
<td>love and light (6%)</td>
</tr>
</tbody>
</table>
Collocation data \([\text{EMOTION} \text{NOUN TARGET} + \text{CONCEPT}]\) is classified according to 7 types of syntactic-semantic constructions.

Linguistic constructions represent cognitive mechanisms that schematically profile conceptualizations of the target concept.

2) \([\text{ADJ} \text{modifier} + \text{NT}]\) what are the salient attributes of the emotion?
Collocation data \([\text{EMOTION NOUN TARGET}+ \text{ CONCEPT}]\) is classified according to 7 types of syntactic-semantic constructions.

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3) \([\text{NT}\text{ modifier}+\text{N}\mid\text{V}]\) **what are the salient ENTITIES and EVENTS modified by the emotion?**

<table>
<thead>
<tr>
<th>NT Lemma</th>
<th>Collocation</th>
<th>Gram_rel</th>
<th>Freq</th>
<th>Score</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>strah</td>
<td>atmosfera</td>
<td>n_koga-čega</td>
<td>259</td>
<td>5.06</td>
<td>atmosferu straha (11%)</td>
</tr>
<tr>
<td>krvnjivja</td>
<td>djo</td>
<td>n_koga-čega</td>
<td>637</td>
<td>4.03</td>
<td>djo krvnjivja za (2%)</td>
</tr>
<tr>
<td>iznenadenje</td>
<td>gost</td>
<td>n_koga-čega</td>
<td>582</td>
<td>6.2</td>
<td>gost iznenadenja (12%)</td>
</tr>
<tr>
<td>krvnjivja</td>
<td>izjednačavanje</td>
<td>n_koga-čega</td>
<td>387</td>
<td>8.29</td>
<td>izjednačavanje krvnjivja (55%)</td>
</tr>
<tr>
<td>strah</td>
<td>osječaj</td>
<td>n_koga-čega</td>
<td>661</td>
<td>5.92</td>
<td>osječaj straha (17%)</td>
</tr>
<tr>
<td>krvnjivja</td>
<td>osječaj</td>
<td>n_koga-čega</td>
<td>2,901</td>
<td>8.76</td>
<td>osječaj krvnjivja (10%)</td>
</tr>
<tr>
<td>ponos</td>
<td>parada</td>
<td>n_koga-čega</td>
<td>979</td>
<td>9.14</td>
<td>Parada ponosa (7%)</td>
</tr>
<tr>
<td>ponos</td>
<td>povorka</td>
<td>n_koga-čega</td>
<td>1,119</td>
<td>9.36</td>
<td>Povorka ponosa (5%)</td>
</tr>
<tr>
<td>krvnjivja</td>
<td>priznanje</td>
<td>n_koga-čega</td>
<td>404</td>
<td>6.79</td>
<td>priznanje krvnjivja (21%)</td>
</tr>
<tr>
<td>sram</td>
<td>stup</td>
<td>n_koga-čega</td>
<td>1,047</td>
<td>09.06</td>
<td>na stup srama (15%)</td>
</tr>
<tr>
<td>anger</td>
<td>management</td>
<td>nouns and verbs modified by</td>
<td>8,509</td>
<td>5.67</td>
<td>anger management (20%)</td>
</tr>
<tr>
<td>pride</td>
<td>parade</td>
<td>nouns and verbs modified by</td>
<td>5,050</td>
<td>7.82</td>
<td>Pride Parade (13%)</td>
</tr>
<tr>
<td>fear</td>
<td>factor</td>
<td>nouns and verbs modified by</td>
<td>4,859</td>
<td>5.46</td>
<td>the fear factor (25%)</td>
</tr>
<tr>
<td>anger</td>
<td>issue</td>
<td>nouns and verbs modified by</td>
<td>4,294</td>
<td>4.06</td>
<td>anger issues (18%)</td>
</tr>
<tr>
<td>guilt</td>
<td>trip</td>
<td>nouns and verbs modified by</td>
<td>4,067</td>
<td>5.43</td>
<td>a guilt trip (6%)</td>
</tr>
<tr>
<td>joy</td>
<td>division</td>
<td>nouns and verbs modified by</td>
<td>3,133</td>
<td>5.97</td>
<td>Joy Division (7%)</td>
</tr>
<tr>
<td>fear</td>
<td>mongering</td>
<td>nouns and verbs modified by</td>
<td>2,974</td>
<td>5.88</td>
<td>fear mongering (20%)</td>
</tr>
<tr>
<td>joy</td>
<td>ride</td>
<td>nouns and verbs modified by</td>
<td>2,558</td>
<td>5.33</td>
<td>a joy ride (11%)</td>
</tr>
<tr>
<td>pride</td>
<td>event</td>
<td>nouns and verbs modified by</td>
<td>2,100</td>
<td>2.57</td>
<td>Pride events (8%)</td>
</tr>
<tr>
<td>pride</td>
<td>festival</td>
<td>nouns and verbs modified by</td>
<td>1,796</td>
<td>4.81</td>
<td>Pride Festival (9%)</td>
</tr>
<tr>
<td>fear</td>
<td>response</td>
<td>nouns and verbs modified by</td>
<td>1,558</td>
<td>3.47</td>
<td>fear response (21%)</td>
</tr>
<tr>
<td>guilt</td>
<td>feeling</td>
<td>nouns and verbs modified by</td>
<td>1,468</td>
<td>2.28</td>
<td>Fear God (16%)</td>
</tr>
<tr>
<td>guilt</td>
<td>feeling</td>
<td>nouns and verbs modified by</td>
<td>1,288</td>
<td>4.06</td>
<td>guilt feelings (11%)</td>
</tr>
<tr>
<td>fear</td>
<td>tactic</td>
<td>nouns and verbs modified by</td>
<td>1,272</td>
<td>4.28</td>
<td>fear tactics (11%)</td>
</tr>
<tr>
<td>pride</td>
<td>march</td>
<td>nouns and verbs modified by</td>
<td>1,185</td>
<td>3.71</td>
<td>Pride March (11%)</td>
</tr>
<tr>
<td>pride</td>
<td>month</td>
<td>nouns and verbs modified by</td>
<td>1,118</td>
<td>1.92</td>
<td>Pride Month (11%)</td>
</tr>
<tr>
<td>fear</td>
<td>itself</td>
<td>nouns and verbs modified by</td>
<td>1,108</td>
<td>4.43</td>
<td>Fear itself (14%)</td>
</tr>
</tbody>
</table>
Collocation data \([\text{EMOTION NOUN TARGET} + \text{CONCEPT}]\) is classified according to 7 types of syntactic-semantic constructions.

Linguistic constructions represent cognitive mechanisms that schematically profile conceptualizations of the target concept.

4) \([\text{NT Figure} + \text{Preposition}]\) 5) \([\text{Preposition} + \text{NT Ground}]\) what are the spatial/logical/causal relations?
Linguistic constructions represent cognitive mechanisms that schematically profile conceptualizations of the target concept.

6) [Verb+NT\textsubscript{object}] what processes can you (conceptually) do with the emotion?

<table>
<thead>
<tr>
<th>NT Lemma</th>
<th>Collocation</th>
<th>Gram_rel</th>
<th>Freq</th>
<th>Score</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>radost</td>
<td>imati</td>
<td>is_obj4</td>
<td>321</td>
<td>1.06</td>
<td>Večeras imamo radost i čast da ste</td>
</tr>
<tr>
<td>ljubav</td>
<td>imati</td>
<td>is_obj4</td>
<td>916</td>
<td>2.49</td>
<td>Sretni smo sve dok Imamo ljubav</td>
</tr>
<tr>
<td>ponos</td>
<td>imati</td>
<td>is_obj4</td>
<td>322</td>
<td>1.07</td>
<td>Hravti imaju ponos karakterističan</td>
</tr>
<tr>
<td>ljubav</td>
<td>iskazati</td>
<td>is_obj4</td>
<td>274</td>
<td>4.45</td>
<td>iskazati ljubav (8%)</td>
</tr>
<tr>
<td>ljubav</td>
<td>iskazivati</td>
<td>is_obj4</td>
<td>410</td>
<td>5.07</td>
<td>Kad neko nekome iskazuje ljubav</td>
</tr>
<tr>
<td>strah</td>
<td>izazivati</td>
<td>is_obj4</td>
<td>430</td>
<td>5.95</td>
<td>izazivati strah (10%)</td>
</tr>
<tr>
<td>strah</td>
<td>izazivati</td>
<td>is_obj4</td>
<td>239</td>
<td>4.88</td>
<td>izazivati strah</td>
</tr>
<tr>
<td>ljubav</td>
<td>moći</td>
<td>is_obj4</td>
<td>330</td>
<td>0.95</td>
<td>ljubav može (10%)</td>
</tr>
<tr>
<td>ljubav</td>
<td>načiti</td>
<td>is_obj4</td>
<td>369</td>
<td>3.88</td>
<td>načiti ljubav (5%)</td>
</tr>
<tr>
<td>strah</td>
<td>osjećati</td>
<td>is_obj4</td>
<td>590</td>
<td>5.56</td>
<td>osjećati strah</td>
</tr>
<tr>
<td>krivnja</td>
<td>osjećati</td>
<td>is_obj4</td>
<td>609</td>
<td>6.21</td>
<td>osjećati krivnju</td>
</tr>
<tr>
<td>ljubav</td>
<td>osjećati</td>
<td>is_obj4</td>
<td>479</td>
<td>4.67</td>
<td>osjećati ljubav</td>
</tr>
<tr>
<td>radost</td>
<td>osjetiti</td>
<td>is_obj4</td>
<td>369</td>
<td>6.18</td>
<td>osjetiti radost</td>
</tr>
<tr>
<td>ljubav</td>
<td>osjetiti</td>
<td>is_obj4</td>
<td>406</td>
<td>4.78</td>
<td>osjetiti ljubav (5%)</td>
</tr>
<tr>
<td>ljubav</td>
<td>postojati</td>
<td>is_obj4</td>
<td>330</td>
<td>3.19</td>
<td>postoji ljubav (18%)</td>
</tr>
<tr>
<td>krivnja</td>
<td>priznati</td>
<td>is_obj4</td>
<td>1,504</td>
<td>7.98</td>
<td>priznato krivnju (19%)</td>
</tr>
<tr>
<td>ljubav</td>
<td>voditi</td>
<td>is_obj4</td>
<td>8,945</td>
<td>7.26</td>
<td>voditi ljubav (3%)</td>
</tr>
</tbody>
</table>

Collocation data $[\text{EMOTION NOUN TARGET+ CONCEPT}]$ is classified according to 7 types of syntactic-semantic constructions.
Collocation data [EMOTION NOUN TARGET + CONCEPT] is classified according to 7 types of syntactic-semantic constructions.

Linguistic constructions represent cognitive mechanisms that schematically profile conceptualizations of the target concept.

7) [NT_subject+Verb] what processes (can you conceptualize) an emotion can do?
Collocation data \([\text{EMOTION}\text{NOUN TARGET}+\text{CONCEPT}]\) is classified according to 7 types of syntactic-semantic constructions.

Linguistic \textit{constructions} represent \textit{cognitive mechanisms} that \textit{schematically profile} \textit{conceptualizations} of the target concept.

1) \([\text{NT and/or N}]\) \textit{what are the conceptually related concepts?}

2) \([\text{ADJ}_{\text{modifier}}+\text{NT}]\) \textit{what are the salient attributes of the emotion?}

3) \([\text{NT}_{\text{modifier}}+\text{N}|V]\) \textit{what are the salient ENTITIES and EVENTS modified by the emotion?}

4) \([\text{NT}_{\text{Figure}}+\text{Preposition}]\)

5) \([\text{Preposition}+\text{NT}_{\text{Ground}}]\) \textit{what are the spatial/logical/causal relations?}

6) \([\text{Verb}+\text{NT}_{\text{object}}]\) \textit{what processes can you (conceptually) do with the emotion?}

7) \([\text{NT}_{\text{Subject}}+\text{Verb}]\) \textit{what processes (can you conceptualize) an emotion can do?}

These represent \textit{emergent conceptualization layers} of the target emotional lexical concept(s).
The scope: For each lexeme and construction a collocation list has been created with 50 most frequent lexical collocates using SketchEngine.
Visualizing constructions as a CONCEPTUAL NETWORK
The adjectives are source nodes and the lexicalized emotions: **ljubav** ‘love’, **ponos** ‘pride’, **ljutnja** ‘anger’, **strah** ‘fear’ are target nodes.
Force layout graph representation of the 50 most frequent [ADJ$^{\text{modifier}}$+NT] relations in the hrWac corpus.

The adjectives are source nodes and the lexicalized emotions: *ljubav* ‘love’, *ponos* ‘pride’, *ljutnja* ‘anger’, *strah* ‘fear’ are target nodes.
Valence and arousal modified Force layout graph representation of the 50 most frequent \([\text{ADJ}^{\text{modifier}} + \text{NT}]\) relations in the enTenTen corpus.

The modifier lexemes are the source nodes. The target lexemes are settled in the 2-D space according to their hedonic valence and arousal.
From data information to knowledge: The collocation data is **modelled** according to the **ontological hierarchy of lexical concepts and constructions**.

- Lexical concepts represent **complex system** of the embodylly percieved categories and REFERENCE
  
  a) Material  
  b) Psychological  
  c) Social

- Categories have characteristics of multiple interrelated components that create **networks**.
- Networks can become **new objects** that in recurrent fashion create self organizing networks of higher order, with **emergent hierarchy of properties** and ‘dynamic stability’.
- The conceptual structure of lexical items in OMLCC is thus organized as an **hierarchica l system** starting with **the more basic things** giving rise to **the more complex, emergent entities, properties, relations and processes**.
<table>
<thead>
<tr>
<th>SuperClass</th>
<th>Class</th>
<th>Emergent Class Property</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EXISTENCE</strong></td>
<td>01. Existence</td>
<td>A (Entity) exists</td>
</tr>
<tr>
<td></td>
<td>02. Emergence</td>
<td>A (Form) becomes B (Transformation)</td>
</tr>
<tr>
<td></td>
<td>03. Mat_Structure</td>
<td>A (Part) 1...n isPartOf B (Whole), B (Whole) hasParts A1...n (Part)</td>
</tr>
<tr>
<td></td>
<td>04. Spatial</td>
<td>A(Figure) is_in_spatial_relation_to B(Ground)</td>
</tr>
<tr>
<td></td>
<td>05. Force</td>
<td>A (ForceStructure) influences(by_mechanical/liquid/thermodynamic_force) B (Patient)</td>
</tr>
<tr>
<td></td>
<td>06. MotionAction</td>
<td>A (Mover/Actor has Force) moves /acts (on) B (Path/Patient 03-04) with (Vehicle/Instrument 03)</td>
</tr>
<tr>
<td><strong>MATERIAL</strong></td>
<td>07. SequenceTime</td>
<td>A (TimeEntity) has sequence (3-5)</td>
</tr>
<tr>
<td></td>
<td>08. Animacy</td>
<td>A (Animate) is_self-sustaining structure, organism that reacts to environment</td>
</tr>
<tr>
<td><strong>PSYCHOLOGICAL</strong></td>
<td>09. Perception</td>
<td>A (Percever B-11) perceives 9 (with_instrument_of_perception B) B(object of perception 1-8)</td>
</tr>
<tr>
<td></td>
<td>10. Affect</td>
<td>A (Experiencer B-14) experiences (with_organs_of_affect_experience B) B(experience/quality/emotion 10)</td>
</tr>
<tr>
<td></td>
<td>11. Cognition</td>
<td>A (Cogitor B-14) remembers, reasons, thinks B (Mental_Representation 11)</td>
</tr>
<tr>
<td><strong>SOCIAL AND CULTURAL</strong></td>
<td>12. SocIdentity</td>
<td>A (Person B-14) identifies as B(Social Identity 12)</td>
</tr>
<tr>
<td></td>
<td>14. SocCommunication</td>
<td>A (Communicator B-14) communicates with B (Receiver B-14) about C (theme 1-14) on D (code)</td>
</tr>
<tr>
<td></td>
<td>15. SocCultural</td>
<td>A (Model) is a set of values connected with experience, rituals, narration, philosophy, ethical stance, institution, material things, actors</td>
</tr>
</tbody>
</table>
The first step in the process of construction of the emotional OMLCC is to classify collocated entities, properties and processes (lexical concepts found in the corpora and constructions) according to their prototypical ontological status.

<table>
<thead>
<tr>
<th>Id</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>06</td>
<td>Motion.Action.Go Out[ACTION goes out from CONTAINER]</td>
</tr>
<tr>
<td>08</td>
<td>Animate.Cause.[CAUSER causes in a sequence EVENT]</td>
</tr>
<tr>
<td>13</td>
<td>SocBehaviour.Hide[AGENT hides OBJECT]</td>
</tr>
<tr>
<td>14</td>
<td>SocCommunication.Speak/Express[AGENT.SPEAKER speaks/express REPRESENTATION.MESSAGE with VOICE/EXPRESSION]</td>
</tr>
</tbody>
</table>

Graph: Classification of lexical concepts
Corpus + Constructions + Ontology + OMLCC Visualization

15. SC-Culture 1. Existence
14. SC-Communication
13. SC-Behavior
12. SC-Social identity
11. P-Cognition
10. P-Experience
9. P-Perception
8. M-Animacy
7. M-Time
6. M-Motion/Action
5. M-Force
4. M-Space
3. M-Structure
2. M-Emergence
OMLCC visualization of 50 most frequent \([\text{ADJ}^{\text{modifier}} + \text{NT}]\) relations in the enTenTen corpus.
Emotion is an emergent and biopsychocultural adaptation mechanism which allows each individual to react flexibly and dynamically to environmental contingencies.

Componental structure
Appraisal theory and components of the emotion process

Appraisal objectives

• (i) how relevant is this event for me? Does it directly affect me or my social reference group? (relevance);

• (ii) what are the implications or consequences of this event and how do they affect my well-being and my immediate or long term goals? (implications);

• (iii) how well can I cope with or adjust to these consequences? (coping potential);

• and (iv) what is the significance of this event for my self-concept and for social norms and values? (normative significance).
Protégé Ontology: MFOEM
More complex conceptual structures emerge from cognitive networks of conceptually more basic, constitutional structures to more complex entities, properties and relations. In this systems view, there is no essentiality in the objects of any kind; objects emerge from the networks of relationships, embedded in larger networks (Capra 1997: 36).
OMLCC visualization of 50 most frequent \([\text{ADJ} \text{modifier} + \text{NT}]\) relations in the enTenTen corpus.
Classification of relations between lexical concepts in constructions according to:

**The linguistic data restrictions**
Grammatical relations determine

**Construal features:**
argument /Frame structure with prototypical slots of semantic roles
{AGENT process PATIENT with INSTRUMENT}...

**The knowledge about the emotions restrictions**
Ontological relations determine

**TypeOfRelations features:**
meronymic
metaphoric...

---

### Table

<table>
<thead>
<tr>
<th>NT Lemma</th>
<th>Collocation</th>
<th>Gram_role</th>
<th>Freq</th>
<th>Score</th>
<th>Example</th>
<th>Source</th>
<th>SourceFrame</th>
<th>Target</th>
<th>TargetFrame</th>
<th>TypeOfRelation</th>
<th>Figurativ</th>
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<tbody>
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<td>predstavljanji</td>
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<td>10. Affect. Emotion</td>
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<td>10. Affect. Emotion</td>
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<td>pretvariti</td>
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<td>3.4</td>
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<td>0.02</td>
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<td>10. Affect. Emotion</td>
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<td>priznati</td>
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<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>
Meronymic relations express **mereological structure** of the EMOTIONS emergent entities in terms of **constituent entities**:

\[ A \text{ isPartOf / co-ocuresWith } B, \ B \{A,\ldots, Xn} \]

**informational (un)directional binding network structure** creates the basis of part-whole **metonymic profiling**

\[ A \text{ FOR } B, \ B \text{ FOR } A \]

**Function:** recreating the **embodied feeling**

**Construction:**

\[ [\text{EMOTION in } X] \]

- fear in **heart** 2,775
- fear in **stomach** 79

**Feel**
### 09. Animate Cause (CAUSER causes in a sequence EVENT)

<table>
<thead>
<tr>
<th>NT Lem</th>
<th>Collocative</th>
<th>Gram</th>
<th>Source</th>
<th>SourceFrame</th>
<th>Target</th>
<th>TargetFrame</th>
<th>TypoOfRelation</th>
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<tr>
<td>radost</td>
<td>činiti</td>
<td>is_obj4</td>
<td>činiti</td>
<td>03. Mat_structure.Don Činiti [PART čini makesPartOf]</td>
<td>radost</td>
<td>10. Affect. Emotion</td>
<td>ont.meronymy.JOY is WHOLE that is CREATED (by PARTS).</td>
</tr>
<tr>
<td>ljubav</td>
<td>dogoditi</td>
<td>is_obj4</td>
<td>dogoditi</td>
<td>07. Sequence/Time.Happen [EVENT happens]</td>
<td>ljubav</td>
<td>10. Affect. Emotion</td>
<td>ont.meronymy.LOVE is EVENT that HAPPENS, HAPPEN FOR</td>
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<tr>
<td>strah</td>
<td>uzrokovati</td>
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<td>08. Animacy.Process.Cause</td>
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<td>10. Affect. Emotion</td>
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<tr>
<td>radost</td>
<td>živjeti</td>
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<td>10. Affect. Emotion</td>
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<td>značiti</td>
<td>is_obj4</td>
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<td>radost</td>
<td>10. Affect. Emotion</td>
<td>ont.meronymy.JOY is EMOTION has REPRESENTATION has</td>
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<tr>
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<td>is_obj4</td>
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<td>09. Animate.Cause.[CAUSER causes in a sequence EV</td>
<td>strah</td>
<td>10. Affect. Emotion</td>
<td>ont.meronymy.FEAR is AFFECT PROCESS that is CAUSED</td>
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<td>is_obj4</td>
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<td>09. Animate.Cause.[CAUSER causes in a sequence EV</td>
<td>gadenje</td>
<td>10. Affect. Emotion</td>
<td>ont.meronymy.DISGUST is AFFECT PROCESS that is CAUSED</td>
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<td>is_obj4</td>
<td>izazivati</td>
<td>09. Animate.Cause.[CAUSER causes in a sequence EV</td>
<td>radost</td>
<td>10. Affect. Emotion</td>
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</tr>
<tr>
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<td>ponos</td>
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</tr>
<tr>
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<td>09. Animate.Cause.[CAUSER causes in a sequence EV</td>
<td>sram</td>
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<tr>
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<td>is_obj4</td>
<td>izazivati</td>
<td>09. Animate.Cause.[CAUSER causes in a sequence EV</td>
<td>tuga</td>
<td>10. Affect. Emotion</td>
<td>ont.meronymy.SADNESS is AFFECT PROCESS that is CAUSED</td>
</tr>
</tbody>
</table>
The next step in “emotion” OMLCC is to identify the collocations (typeOfRelations) that violate the mereological structure for any constituent of the linguistic construction.

Ex. fear comes {ACTOR.MOVER comes to X}, joy gives {AGENT.GIVER gives X to Y}

The violation is defined as non-existent ontological/mereological relation between any two lexical units that are syntactically joined in the linguistic construction.

The metaphoric relation (function)

\[ A_{\text{EMOTION}} \text{ ISnot B, A has not elements of B} \]
but process A and B together and map elements of B with A

Via knowledge of the language, entity A maps the properties of the entity B, activating mereological structure of the entity B: \( B \text{ hasParts}\{C,...,Y\} \).
### Violation of meronymic relations

<table>
<thead>
<tr>
<th>Corpus</th>
<th>Constructions</th>
<th>Ontology</th>
<th>Emotion</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Verb</th>
<th>Phrase Structure</th>
<th>Frame</th>
<th>Relation</th>
<th>Type</th>
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<tr>
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<td>postojati</td>
<td>FORCE_Structure holds OBJECT SpatialRelation Locative</td>
<td>01. Existence. Exist</td>
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<td>GUILT</td>
<td>Isnot OBJECT that EXISTS. EXIST FOR CATEGORIZED</td>
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<td>postojati</td>
<td>FORCE_Structure holds OBJECT SpatialRelation Locative</td>
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<td>ont.violation</td>
<td>LOVE</td>
<td>Isnot OBJECT that EXISTS. EXIST FOR CATEGORIZED</td>
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<td>Isnot AGENT that ACTS. ACT FOR APPRAISAL. COPING. POWER/CONTROL,</td>
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<td>LOVE</td>
<td>Isnot AGENT that ACTS. ACT FOR APPRAISAL. COPING. POWER/CONTROL,</td>
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<td>LOVE</td>
<td>Isnot OBJECT that is NOT HAVE. NOT HAVE FOR EXPERIENCER</td>
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<td>Isnot OBJECT, VISUAL that LOOKS like X. LOOKS FOR REACTION</td>
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<td>hvatati</td>
<td>FORCE_Structure holds OBJECT SpatialRelation Locative</td>
<td>05. Force. Catch</td>
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<td>05. Force. Entice</td>
<td>ont.violation</td>
<td>ANGER</td>
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<td>05. Force. Hold</td>
<td>ont.violation</td>
<td>FEAR</td>
<td>Isnot FORCE_STRUCTURE that HOLDS X. HOLD for APPRAISAL. COPING.</td>
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<td>širiti</td>
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<td>05. Force. Spread</td>
<td>ont.violation</td>
<td>JOY</td>
<td>Isnot OBJECT that is SPREAD. SPREAD FOR EMOTION. CONTAGION</td>
</tr>
</tbody>
</table>

Corpus + Constructions + Ontology + Emotion

Metaphoric TypeOfRrelations (Violet)

10. Affect. Emotion
Attributes
id: 01039
Inbound Links from:
08. Animacy. Process. Cause - ont.meronymy ANGER is AFFECT. EMOTION that is CAUSED.
08. Animacy. Process. Cause - ont.meronomy ANGER is AFFECT. EMOTION that is CAUSED.
09. Perception. See. PERCEIVER sees PERCEPTION that is OBJECT of PERCEPTION - ont.meronomy ANGER is AFFECT. EMOTION that is CAUSED.
10. Affect. Calm down - ont.meronomy ANGER is EMOTION that can be CALMED. CALM for AFFECT. EMOTION.
11. Cognition. State. Waking (AGENT awakes COGNIZER) - ont.violation ANGER in not AGENT that is WAKEN. WAKE for EXPERIENCE.
13. SocBehaviour. Work. Steel - ont.violation CULT is not METAL that is STEEL. STEEL for INTENSITY FIRE.
<table>
<thead>
<tr>
<th>Corpus</th>
<th>Constructions</th>
<th>Ontology</th>
<th>Emotion theory</th>
<th>Multilayer Visualization</th>
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<tbody>
<tr>
<td>Data about the usage:</td>
<td>Data about construal:</td>
<td>Emergent model of the world:</td>
<td>Model about the particular domain:</td>
<td>Particular construal of domain:</td>
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<tr>
<td>What lexical items?</td>
<td>What type of constructions?</td>
<td>What type of relations?</td>
<td>What type of relations for that domain?</td>
<td>Ordinate layering of the classes</td>
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<td>How many?</td>
<td></td>
<td>Things and connections that exist in the world as we know it (embodied model of the world) – METONYMY</td>
<td>Things and connections that exist in the best possible (scientific) model of the domain)</td>
<td>Ascription of the words/nodes to classes</td>
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<td>Conventionalization Entrenchment</td>
<td>Perspectivization</td>
<td></td>
<td></td>
<td>Node Properties</td>
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<td></td>
<td></td>
<td>Connections that violate the knowledge about the world – METAPHOR</td>
<td></td>
<td>Constructions of relations</td>
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<tr>
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<td>Relation Properties</td>
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<td>Multilayering</td>
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</table>
Towards Visualization of linguistic conceptualization

The ontological model of lexical concepts and constructions (OMLCC) enables us to:

- define established meronimic relations of emotion
- define metaphorical mapping as violation of meronimic relations to form extensions and create new meanings.
- define functions of the specific construction in the multilayered conceptual network
- formalize identification of metaphoric constructions and other types of figurative speech, (compare cross-culturally metaphorical networks).
- reveal correlation between syntactic-semantics construal and different types of metaphoric mapping (ontology violation)
- Results of the analysis will be presented: Cro Metaphor Repository: www.ihjj.hr/metafore

EmocNet research group: www.emocnet.uniri.hr
Thank you!
Happy to answer some questions.
bperak@ffri.hr