

Classification of Wordnet Personality Adjectives in the NEO PI-R Taxonomy

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Abstract:

This work describes the process of classification of a set of personality-trait adjectives within the facet list of the NEO PI-R taxonomy related to the Five Factor Model. The classification process is not only based on adjective words but primarily on their lexical semantics as it is expressed by the synset-gloss attached to the adjectives in the Wordnet lexical base. This classification will provide a good coverage and support for the study and the computational implementation of psychological behaviors in conversational agents.

Keywords: Personality traits adjectives, FFM and NEO PI-R taxonomies, Wordnet.

1 Introduction

1.1 Context

In the Embodied Conversational Agents (ECA) community, research has focused on the expression of emotions through virtual characters modalities (face, gesture, speech...) but some authors have claimed that if an agent has a body it also has a mind [5]; by ‘mind’ they mean agents that can achieve practical reasoning upon the world, as required for example by non-player characters in games, by assistant agents in help systems or in tutoring systems. Authors have proposed mixed agent architectures exhibiting both rational reasoning modules (often based on BDI-agents) and psychological reasoning modules [4, 13]. In these architectures, the psychology of the agent influences both the expression of emotions through the body modalities but also has an impact on the decision making process.

Although presented here as separate notions, the rational and the psychological reasoning capacities of an agent actually work in quite an intricate manner [6, 9]. This is the reason why we have proposed an architecture dedicated to the study of the nature of their relationships: the Rational and Behavioral architecture (*R&B*)¹. *R&B* is a generic framework enabling the computational definition and the experimentation of various rational/psychological strategies. In recent work based on *R&B* [15], we have pro-

posed a model where personality traits are implemented in terms of influence operators altering the rational process of the assistant agent.

1.2 Motivation

For the time being, the *R&B* architecture has been implemented only with few arbitrary-chosen personality traits (e.g. a lazy-gloomy-cheerful... agent). This being insufficient to validate the genericity of the architecture, we need to implement a large class of psychological features, especially personality traits. In the literature about Psychology, various taxonomies have been proposed to cover the human personality (see Section 1.3 for some examples) but they are too generic for a computational implementation: 3 classes in Eysenck’s PEN system [7], 5 classes in FFM [10]. Some authors have tried to refine these classifications by adding sub classes, called *facets* (see Table 1) but the definitions attached to the facets are still too general to be directly implemented in terms of computational operators.

Our proposition is to enhance the precision of a standard taxonomy by refining the facets into sub classes, called *schemes*, with two main features: 1) a scheme represents a unique atomic behavior in the taxonomy; 2) a scheme is defined by a set of glosses associated with personality trait adjectives. To achieve this work we rely on two main standards: the FFF/NEO PI-R taxonomy for trait classes and facets and the Wordnet lexical data base for personality trait adjectives and glosses. This process was achieved in two phases: 1) the classification of a set of adjectives describing persons into the FFF/NEO PI-R taxonomy; 2) the process of clusterization of the schemes. In this paper, we present the first phase. The second phase is described in [16].

1.3 Works on personality adjectives

The Five Factor Model (FFM) is the most successful paradigm to day for personality traits representation. It is a convergent research from

1. <http://www.limsi.fr/~jps/research/rnb/rnb.htm>

many authors in Psychology for 20 years on. The FFM [10] is based on five large classes of psychological traits, often named Big Five model or O.C.E.A.N., by taking the first letter of the name of each class (they are listed in Table 1-col 1). Contrary to Cattell’s classification into 16 factors [2] supported by Eysenck’s personality questionnaires (EPQ) [7], FFM is based on the *lexical hypothesis* of Allport [1], stating that “personality vocabulary provides an extensive, yet finite, set of attributes that people speaking a given language have found important and useful in their daily interactions”.

The NEO PI-R facets The FFM is a very generic classification so many authors have tried to refine this taxonomy by dividing the FFM classes into facets. Table 1, reproduced from [12], gives an attempt to align three of the facet lists proposed in the literature. The facet lists of Table 1 have many similarities although their facet number varies from 16 to 18 and 30. The **NEO PI-R** (Neuroticism Extraversion Openness Personality Inventory Revisited) facet list proposed by Costa and McCrae [3] (see Table 1-col 3) is a long standing model that provides the more precise facet list. For these reasons, we will rely on it for the work presented in section 2.

The Wordnet lexical data base In order to refine the facets into more precise categories (that we call schemes), and following the lexical approach, a first attempt was to define a scheme as a set of personality adjectives. However words can have several senses attached to them with quite distinct meanings. For example, the adjective ‘kind’ has three senses: Tolerant, Genial, Openhearted (see Table 4) that can be classified into two distinct FFM classes and three distinct NEO PI-R facets: *resp.* A-compliance, E-warmth, A-tendermindedness. This example shows that the word level is not sufficient to represent precisely the schemes. We have to work at the lexical semantics level.

The Wordnet lexical data base [8] comes handy when one has to treat a large amount of lexical data and one has to access the lexical semantics of words. In Wordnet, a word is attached to several so-called *synsets* that define a unique lexical sense described by a gloss (also called a short phrase — see Table 4 for examples). Moreover, because the Wordnet data base is freely accessible, it makes it easy to build a computer aided system for the classification process. Note that Wordnet has been used to support research on

affective computing, e.g. in the ‘Wordnet affect’ project of Strapparava *et al.* [21, 20]; however their work is dedicated to the recognition of affects in texts, not to the expression of psychological behaviors by rational agents and their classification is *ad hoc*.

It was decided to achieve a classification of a set of personality adjectives in terms of their Wordnet synsets/glosses while using the FFM / NEO PI-R taxonomy. This process has been carried out in two main stages, described in the next section:

Stage1: Adjective collecting. We collected a set of the personality trait adjectives (P_a) from Internet resources; then the adjectives were associated with their synset-gloss pairs in Wordnet; finally the synset-gloss pairs not related to personality description were discarded.

Stage 2: Classification. Remaining synset-pairs were manually classified within the FFM / NEO PI-R Taxonomy to generate a resource (XML file) of 60 psychological schemes containing 1,356 classed items.

2 Classification process

2.1 Stage 1: Personality adjectives selection

Using Wordnet, it is possible to extract a list of words according to their Part-of-Speech attribute (here, adjective) or related to a given word (e.g. all its synonym, antonym, meronym ...). However Wordnet lacks the possibility to extract a list of words related to a particular semantic domain (e.g. ‘person personality’). Moreover, Wordnet aiming at covering exhaustively the English language, it does not provide information regarding the actual frequency of a given word or synset in everyday usage. Hence, the generation of a list of personality adjectives P_a was done in 4 sub steps S_{1-4} , described in the next paragraphs.

S1: Adjectives collecting. In order to work on actually used personality adjectives, we have collected a corpus of personality adjectives (C_{coll}), from ten different Internet sources explicitly claiming to provide “lists of adjectives describing personality traits” (the sources are summarized in Table 2). C_{coll} contains 1055 distinct adjectives, providing a first order approximation of the linguistic domain related to personality traits adjectives. Moreover, for each personality adjective a , we have associated a weight w_a

Table 1: Facets for the Big five trait domain: three approaches (alignment according to John et al. judgment, based on (John et al., 2008))

OCEAN Classes	Lexical facets ($N = 18$) (Saucier & Ostendorf, 1999)	NEO-PI-R facets ($N = 30$) (Costa & McCrae, 1992)	CPI-Big five facets ($N = 16$) (Soto & John, 2008)
Extraversion	Sociability	-	-
	Assertiveness	Gregariousness	Gregariousness
	-	Activity	-
	Activity/Adventurousness	Excitement seeking	(<i>O Adventurousness</i>) ^a
	-	-	Social confidence (vs Anxiety)
Agreeableness	-	Positive emotions	-
	Unrestraint (<i>A Warmth/Affection</i>) ^a	-	-
	Warmth/Affection	(<i>E Warmth</i>) ^a	-
	Modesty/Humility	Modesty	Modesty (vs Narcissism)
	-	Trust	Trust (vs Suspicion)
Conscientiousness	-	Tender-Mindedness	Empathy/sympathy
	Generosity	-	Altruism
	Gentleness	Compliance	-
	-	Straightforwardness	-
	-	-	-
Neuroticism	Orderliness	Order	Orderliness
	Industriousness ^b	Achievement striving	-
	Reliability	Dutifulness	Industriousness ^b
	Decisiveness	-	-
	(<i>O Perceptiveness</i>) ^a	Self-discipline	Self-discipline
Openness	-	Competence	-
	Insecurity	Deliberation	-
	Emotionality	Anxiety	Anxiety
	Irritability	-	-
	-	Angry hostility	Irritability
Neuroticism	-	Depression	Depression
	-	-	Rumination-compulsiveness
	-	Self-consciousness	(<i>E Social confidence (vs Anxiety)</i>) ^a
	-	Vulnerability	-
	-	Impulsiveness	-
Openness	Intellect	Ideas	Intellectualism
	-	Aesthetics	Idealism
	Imagination/creativity	Fantasy	-
	-	-	Adventurousness
	-	Actions	-
Openness	-	Feelings	-
	-	Values	-
	Perceptiveness	-	-

a. Facet names in italics correspond to a secondary attachment of an already existing facet.

b. Despite a same name in two classifications, Industriousness doesn't have exactly the same meaning, explaining that the two aren't aligned.

(depending on the number of lists in which a given adjective appears) representing its usage frequency in resources (called *salience*).

S2: Representativity improvement with Wordnet.

To reinforce the weight of the most salient adjectives, we have used the functional relation synonym for each word in $\mathcal{C}_{\text{coll}}$ by adding 1 to the weight of any adjective in $\mathcal{C}_{\text{coll}}$ found to be synonym of another adjective from $\mathcal{C}_{\text{coll}}$ (i.e. $\forall a \in \mathcal{C}_{\text{coll}}$, if $\exists a' \in \mathcal{C}_{\text{coll}}$ such as $a \in \text{synonym}(a')$ then $w_a = w_a + 1$). The maximum weight is thus theoretically of 11, although the

observed maximum weight is 9.

NOTE: We have also considered the possibility of adding to $\mathcal{C}_{\text{coll}}$, all the Wordnet synonyms of adjectives from $\mathcal{C}_{\text{coll}}$, but the synonym relation of Wordnet generates a lot of senses that exceed the personality trait domain. Actually, $\text{synonym}(\mathcal{C}_{\text{coll}})$ provides an extended list of 5,139 words of which 2,986 are distinct, which we considered too large to be processed.

S3: Selection of Wordnet entries. To make $\mathcal{C}_{\text{coll}}$ technically compatible with Wordnet, words from $\mathcal{C}_{\text{coll}}$ absent from Wordnet ($\mathcal{C}_{\text{WN}}^{\text{abs}}$) or present

Table 2: Sources of personality adjectives for the corpus $\mathcal{C}_{\text{coll}}$

N°	Sources	Count
1	http://personal.georgiasouthern.edu/~jbjoy/Adjectives.html	315
2	http://www.keepandshare.com/doc/view.php?u=12894	182
3	http://www.lingolex.com/personalidad.htm	52
4	http://www.lesn.apstate.edu/fryeem/RE4030/character_trait_descriptive_adje.htm	183
5	http://www.mckinnonsc.vic.edu.au/la/lote/german/materials/describe/pers-adj.htm\#top	362
6 ^a	http://www.learnenglish.de/grammar/adjectivepersonality.htm\#positive	277
	http://www.examples-help.org.uk/parts-of-speech/personality-adjectives.htm	
7 ^b	http://www.esldesk.com/vocabulary/adjectives.htm	445
8	http://jobmob.co.il/blog/positive-personality-adjectives	130
9	http://www.nonstopenglish.com/exercise.asp?exid=440	20
10	http://www.scribd.com/doc/2212798/Adjective-List	80
Total		2046
Total of union (words different)		1055

a. List 6 is merged from two closely related sources.

b. List 7 is taken from a list of general adjectives, from which we selected those about persons.

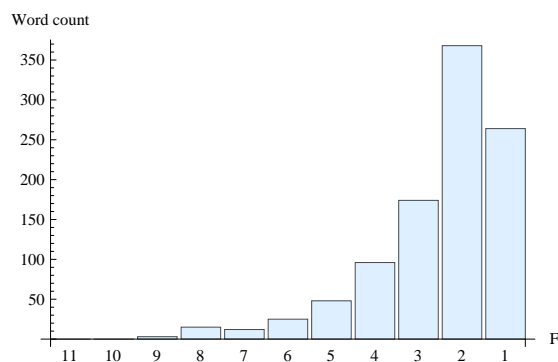


Figure 1: Histogram of salience of personality adjectives in the corpus \mathcal{C}_{WN}

but not as adjectives ($\mathcal{C}_{\text{WN}}^{-\text{adj}}$) were deleted from $\mathcal{C}_{\text{coll}}$, with $|\mathcal{C}_{\text{WN}}^{\text{abs}}| = 29$ and $|\mathcal{C}_{\text{WN}}^{-\text{adj}}| = 21$. Note that $\forall a \in \mathcal{C}_{\text{WN}}^{\text{abs}} \cup \mathcal{C}_{\text{WN}}^{-\text{adj}}, w_a = 1$, indicating that Wordnet covers the most cited adjectives. We have thus obtained a list \mathcal{C}_{WN} of 1,005 distinct adjective entries existing in Wordnet, such as $\mathcal{C}_{\text{coll}} = \mathcal{C}_{\text{WN}} \cup \mathcal{C}_{\text{WN}}^{\text{abs}} \cup \mathcal{C}_{\text{WN}}^{-\text{adj}}$, which can be sorted from the most ($w_a = 9$) to the least salient ($w_a = 1$). The histogram of salience of the \mathcal{C}_{WN} adjectives is plotted in Figure 1 and adjectives a with $w_a \in [6..9]$ are given in Table 3.

S4: Selection of personality senses. Each adjective $a \in \mathcal{C}_{\text{WN}}$ has a Wordnet entry, which associates with a a set of lexical semantics (synsets). In Wordnet, each synset is unique and defines a unique sense with a

Table 3: Most salient \mathcal{C}_{WN} adjectives $Total = 55$. Alphabetical order is used when same w_a

w_a	Adjectives	Count
9	friendly, kind, lively	3
8	ambitious, calm, cheerful, clumsy, crazy, energetic, excited, funny, gentle, helpful, proud, quiet, silly, talented, warm	15
7	bad, brave, bright, courageous, generous, good, happy, lazy, nervous, sensitive, successful, tough	12
6	anxious, careless, charming, cooperative, determined, dull, eager, enthusiastic, exuberant, fair, faithful, fantastic, jealous, loyal, mature, nice, placid, pleasant, sad, shy, thoughtful, unusual, wise, wonderful, zany	25

gloss. It is thus possible to obtain from the \mathcal{C}_{WN} list of adjectives, a base \mathcal{B}_{all} of triplets $\langle \text{adjective}, \text{synset}, \text{gloss} \rangle$. For the 1,005 adjectives in \mathcal{C}_{WN} , we obtained 2,924 entailing 2,924 entries in \mathcal{B}_{all} . However, all those synsets are not necessarily related to personality description (cf. entries with a star in the third column in Table 4) and they must be eliminated. To do that, a selection has to be made within \mathcal{B}_{all} in order to keep only the triplets of \mathcal{B}_{all} that could make sense to describe a personality trait or the behavior of a person.

This process of selection has been carried out by two independent annotators A_1 and A_2 in three successive rounds: during the first round, A_1

Table 4: \mathcal{B}_{all} entries for adjectives from \mathcal{C}_{WN} ranked with $w_a = 9$

w_a	Adjective	No	Synset	Gloss
9	friendly		Pally	characteristic of or befitting a friend
9		*	Allied	of or belonging to your own country’s forces or those of an ally
9		*	Easy	easy to understand or use
9			Favorable	inclined to help or support; not antagonistic or hostile
9	kind		Tolerant	tolerant and forgiving under provocation
9			Genial	agreeable, conducive to comfort
9			Openhearted	having or showing a tender and considerate and helpful nature; used especially of persons and their behavior
9	lively		Vital	full of spirit
9		*	Eventful	filled with events or activity
9			Frothy	full of life and energy
9		*	Springy	elastic; rebounds readily
9			Alert	quick and energetic
9			Racy	full of zest or vigor

Table 5: Results of the 3-round selection process of personality senses from \mathcal{B}_{all}

Phase	Count	% \mathcal{B}_{all}
\mathcal{C}_{WN} words (col 2 in Table 4)	1,005	
\mathcal{B}_{all} initial triplets entries	2,924	100%
Round 1:		
triplets selected by A_1	1,771	60.6%
triplets selected by A_2	1,642	56.2%
A_1 / A_2 disagreements	449	15.4%
Round 2:		
disagreements left after A_1	241	8.2%
disagreements left after A_2	124	4.2%
Round 3:		
\mathcal{B}_{sel} final triplets entries	1,715	58.7%

and A_2 were both working on the complete base, whereas during the second one, A_1 annotated only the words on which they disagreed during round 1 and then A_2 annotated only on the remaining disagreements. Finally, in the third round, A_1 and A_2 met for a discussion phase to take a decision regarding the remaining disagreements, the default preference being to keep the triplet (as it could always be discarded later on).

The results of this first filtering are summarized in Table 5. While only two annotators were involved, the quality of the filtering is quite good a) because the convergence on two simple pre-defined classes was strong; b) because in case of disagreement the decision was postponed to the next step, where better informed decision was possible. We have obtained a base \mathcal{B}_{sel} of 1,715

triplets, containing 904 unique adjectives (each gloss being associated to at least one adjective, and each adjective to at least one gloss).

The final number of retained entries (58.7%) is a first result that confirms our claim about the necessity to work at the lexical semantics level (i.e. the synset-gloss) rather than the word level, as in previous classifications.

2.2 Stage 2: Facet association

Generation of the gloss-oriented base. In the next step, glosses appearing in \mathcal{B}_{sel} must be classified. Unfortunately, it sometimes occurs that Wordnet glosses are associated with more than one pair (adjective, Synset): for instance, the gloss “causing or fraught with or showing anxiety” corresponds to (nervous, Queasy), (anxious, Nervous) and (uneasy, Queasy). In such specific cases, we have chosen to merge entries having the same gloss, providing an alternative base $\mathcal{B}'_{\text{sel}}$ with gloss-oriented pairs (gloss, (adjective, synset)*), such as $|\mathcal{B}'_{\text{sel}}| = 1356$.

Adding poles to the NEO PI-R taxonomy. We have seen in section 1.3 that while several facet taxonomies are proposed for FFM, the NEO PI-R taxonomy is prominent and provides a precision of 30 facets. In NEO PI-R, each facet encompasses both the concept and its antonym, e.g. the facet A-Modesty can stand for adjectives like ‘mild’ as well as ‘arrogant’. Hence, similarly to Goldberg’s works on 50 bipolar scales [11], each facet was divided into two poles: noted +

for the concept and - for its antonym(s), thus resulting in 60 positions noted +/-NEO PI-R.

A first attempt at classifying a subset of \mathcal{B}'_{sel} entries over the 60 positions raised a major issue: despite the fact that the collected adjectives words were claimed by the resources to be personality-related, actually many of their corresponding synset-gloss pairs in Wordnet are also associated with other attributes of a person², which can be divided into five main categories:

- *physical descriptions*, e.g. “having a sturdy and well proportioned body”, (athletic, Muscular);
- *mental capacities* e.g. “characterized by quickness and ease in learning”, (bright, Smart), (smart, Bright);
- *judgmental qualities*, both physical or mental, e.g. “appealing to the emotions as well as the eye”, (lovely, Beautiful);
- *social roles*, e.g. “characterized by or indicating poverty”, (poor, Beggary);
- *mind states* are transitory (like emotions), e.g. “in an aroused state”, (excited, Thrillful).
- *errors* are items that don’t fit in any of the facets of categories, i.e. if they should have been eliminated during the selection (see 2.1).

Annotation protocol. Consequently, \mathcal{B}'_{sel} entries are manually classified either as one of the 60 +/-NEO PI-R poles or one of the five external categories listed above. The annotation of \mathcal{B}'_{sel} has been carried out by two independent annotators A_1 and A_2 , following exactly the same protocol in three rounds as the one described in the fourth step of section 2.1 with the difference that in the third round, in the few cases where a strong disagreement remained between annotators, the gloss was discarded. The annotation was done using a specific software tool displayed in Figure 2.

2.3 Results and analysis

The results of the annotation process are given in Table 6. We see that after three rounds, the two annotators managed to agree on more than 90% of the positions. Note that if here the first disagreement rate between the two annotators is more important than in 2.1, it shouldn’t be misinterpreted: the number of possible options (60) is far more important here than in 2.1 (just 2). Roughly, three cases led to a disagreement:

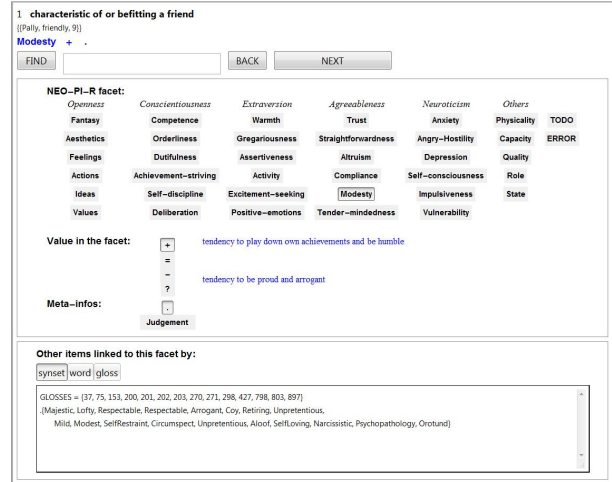


Figure 2: Screen plot of the tool used to associate entries of \mathcal{B}'_{sel} to +/-NEO PI-R facets

1. A mere error done by one of the two annotators. These errors disappeared at the end of the second round, when both annotators have had to recheck their own annotations by comparing them to the other annotator’s.
2. A disagreement regarding the interpretation of the glosses associated to the facets. They were sorted during rounds 2 and 3, by a discussion between the two annotators when a facet gloss was ambiguous. For instance, a strong degree of confusion has been observed between some facets like E-Assertiveness and A-Modesty, C-Achievement-Striving and C-Self-discipline or O-Ideas and O-Values.
3. A disagreement of interpretation regarding the gloss to annotate, especially when they are complex or composed: e.g. (“joyful and proud especially because of triumph or success”, ((exultant, Exultant), (prideful, Jubilant))) refers at the same time to a tendency to experience strongly positive emotions E-Positive-emotions and to a tendency to lack modesty A-Modesty. In such cases, annotators had to agree to favor one sense over another during round 3, or to ultimately discard the gloss.

Research in Psychology, especially on FFM or facets, involves multi-annotators (novices or peers) and is based on statically computed classes. Here our work is far less ambitious: 1) we already have 2×30 established classes to put the glosses into; 2) supposing a gloss is misplaced (the two annotators make the same error) this only jeopardize schemes having only

2. Again, this is in favor of the synset-gloss approach, which appears to be much more semantically detailed than the word level.

Table 6: Results of the 3-round classification of entries of $\mathcal{B}'_{\text{sel}}$ into the 60 NEO PI-R poles

Phase	Count	% $\mathcal{B}'_{\text{sel}}$
$\mathcal{B}'_{\text{sel}}$ entries	1,356	100%
Round 1:		
A_1 / A_2 facet disagreements	526	38.8%
A_1 / A_2 trait disagreements	376	27.7%
Round 2:		
facet disagreements after A_1	274	20.2%
trait disagreements after A_1	178	13.1%
facet disagreements after A_2	133	9.8%
trait disagreements after A_2	101	7.4%
Round 3:		
entries discarded	37	2.7%

one gloss (i.e. those with a small salience). We also discussed the possibility of allowing multiple membership of the glosses to the classes: 1) it could increase annotators agreement 2) it could handle some inherently ambiguous or polysemic glosses (a few Wordnet glosses can be rather vague). Finally, it was decided to provoke more annotator disagreement (which is better with two annotators) at the price of giving a single interpretation to vague glosses.

The final distribution of gloss-oriented pairs into the different categories (30 facets + external cases) is summarized by Figure 3. Although some facets like C-Dutifulness and A-Tender-mindedness appear to have gathered significantly more glosses, we can see that all NEO PI-R facets have had some associated pairs (with a minimum of 2 for O-Aesthetics). An XML file providing all the glosses, words and synsets associated to those categories is freely available on the web³.

3 Conclusion and further work

In this work, we have classified a large set of personality-trait adjectives within the facet list of the FFM / NEO PI-R taxonomy, which is based on the Wordnet lexical semantics given as synset-gloss couples. This classification provides a good coverage and makes available a resource for the study and the computational implementation of psychological behaviors in conversational agents. Further work will exploit the clusters of synset-gloss pairs to define, in a formal representation, a set of psychological be-

haviors to be implemented in the *R&B* framework.

References

- [1] G. W. Allport. *Personality: A psychological interpretation*, 1937.
- [2] R. B. Cattell, H. W. Eber, and M. M. Tatsuoka. *Handbook for the sixteen personality factor questionnaire (16 PF)*. Champaign, Illinois, 1970.
- [3] P. T. Costa and R. R. McCrae. *The NEO PI-R professional manual*. Odessa, FL: Psychological Assessment Resources, 1992.
- [4] Joao Dias and Ana Paiva. Feeling and reasoning: A computational model for emotional characters. In *Progress in Artificial Intelligence*, volume 3808 of *LNCS*, pages 127–140. Springer Berlin / Heidelberg, 2005.
- [5] Tiago Doce, Joao Dias, Rui Prada, and Ana Paiva. Creating individual agents through personality traits. In *Intelligent Virtual Agents (IVA 2010)*, volume 6356 of *LNAI*, pages 257–264, Philadelphia, PA, 2010. Springer-Verlag.
- [6] Phoebe C. Ellsworth and Klaus R. Scherer. Appraisal processes in emotion. In Richard J. Davidson, Klaus R. Scherer, and Hill H. Goldsmith, editors, *Handbook of affective sciences*, Series in affective science, pages 572–595. Oxford University Press, New York, NY, USA, 2003.
- [7] Sybil B. G. Eysenck, Hans Jorgen Eysenck, and Paul Barret. A revised version of the psychoticism scale. *Journal of Personality and Individual Differences*, 6(1):21–29, 1985.
- [8] Christiane Fellbaum. *WordNet: An Electronic Lexical Database*. MIT Press, 1998.
- [9] Nico H. Frijda. *The Laws of Emotion*. Psychology Press, 2006.
- [10] L. R. Goldberg. An alternative description of personality: The big-five factor structure. *Journal of Personality and Social Psychology*, 59:1216–1229, 1990.
- [11] L. R. Goldberg. The development of markers for the big-five factor structure. *Psychological Assessment*, 4:26–42, 1992.
- [12] Oliver P. John, Laura P. Naumann, and Christopher J. Soto. Paradigm shift to the

3. <http://fbouchet.vorty.net/projects/r&b/adjectives/neoipiradj.xml>

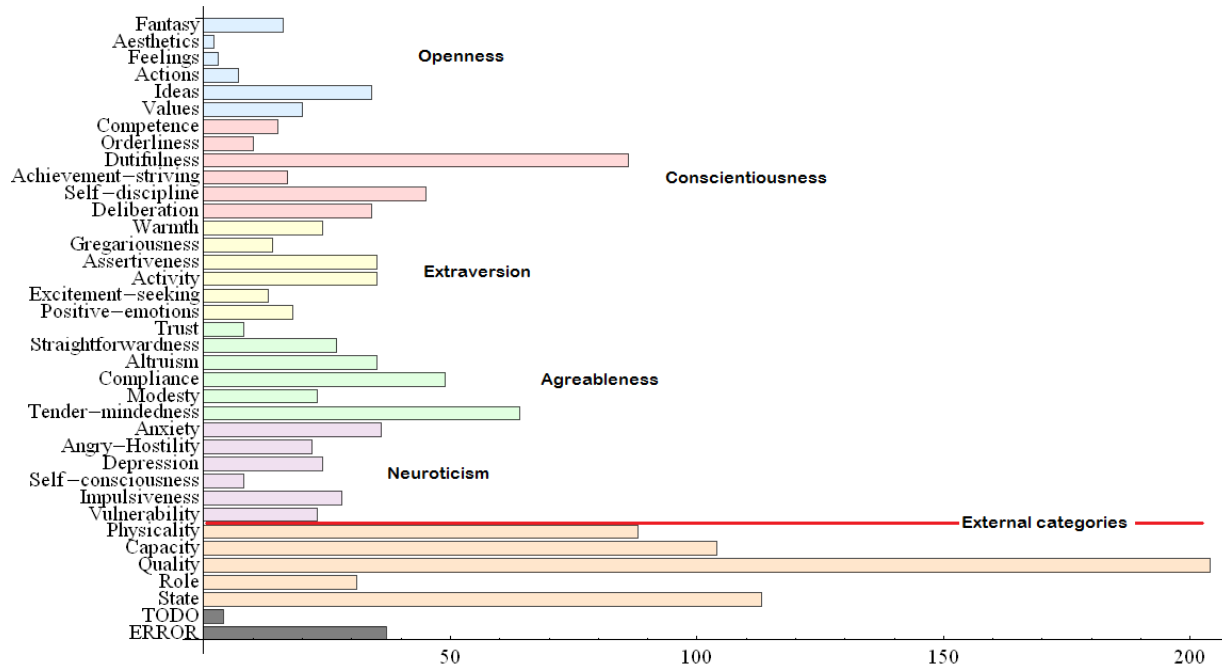


Figure 3: Number of synset-gloss pairs associated to each FFM / NEO PI-R facet

integrative big five trait taxonomy: History, measurements, and conceptual issues. In *Handbook of Personality: Theory and Research*. The Guilford Press, 3rd edition, 2008.

- [13] Mei Lim, Joao Dias, Ruth Aylett, and Ana Paiva. Improving adaptiveness in autonomous characters. In Helmut Prendinger, James Lester, and Mitsuru Ishizuka, editors, *Intelligent Virtual Agents*, volume 5208 of *Lecture Notes in Computer Science*, pages 348–355. Springer Berlin / Heidelberg, 2008.
- [14] N. Sabouret and J. P. Sansonnet. Learning collective behavior from local interactions. In *CEEMAS: Second International Workshop of Central and Eastern Europe on Multi-Agent Systems*, volume 2296 of *LNCS*, pages 273–282, Cracovia, Poland, 2002. Springer Verlag.
- [15] J. P. Sansonnet and F. Bouchet. Expression of behaviors in assistant agents as influences on rational execution of plans. In *Intelligent Virtual Agents (IVA 2010)*, volume 6356 of *LNAI*, pages 413–419, Philadelphia, PA, 2010. Springer-Verlag.
- [16] J. P. Sansonnet and F. Bouchet. Extraction of agent psychological behaviors from glosses of wordnet personality adjectives. In *Paper submitted at the Proc. of the 8th*

European Workshop on Multi-Agent Systems (EUMAS'10), Paris, France, 2010.

- [17] J. P. Sansonnet, N. Sabouret, and G. Pitel. An agent design and query language dedicated to natural language interaction. In *AAMAS:2002 First International Joint Conference on Autonomous Agents and Multi-Agent Systems*, Bologna, Italy, 2002.
- [18] G. Saucier and F. Ostendorf. Hierarchical subcomponents of the big five personality factors: A cross-language replication. *Journal of Personality and Social Psychology*, 76(4):613–627, 1999.
- [19] Christopher J. Soto and Oliver P. John. Ten facet scales for the big five inventory: Convergence with NEO PI-R facets, self-peer agreement, and discriminant validity. *Journal of Research in Personality*, 43(1):84–90, 2009.
- [20] Carlo Strapparava and Rada Mihalcea. Learning to identify emotions in text. In *Proceedings of the 2008 ACM symposium on Applied computing*, pages 1556–1560, Fortaleza, Ceara, Brazil, 2008. ACM.
- [21] Carlo Strapparava and Alessandro Valitutti. WordNet-Affect: an affective extension of WordNet. In *Proc. of the 4th Int. Conf. on Language Resources and Evaluation*, pages 1083–1086, 2004.