



Table 1. Examples of emoticons with different numbers of sets of semantic areas; [M] – mouth; [E<sub>L</sub>], [E<sub>R</sub>] – eyes; [B<sub>1</sub>], [B<sub>2</sub>] – emoticon borders; [S<sub>1</sub>] – [S<sub>4</sub>] – additional areas;

No. of sets	Emoticon	S <sub>1</sub>	B <sub>1</sub>	S <sub>2</sub>	E <sub>L</sub>	M	E <sub>R</sub>	S <sub>3</sub>	B <sub>2</sub>	S <sub>4</sub>	...
1	∖(.ω.)∕	∖	(	.	ω	.	N/A	)	∕		
1	(---;)	(	N/A	—	N/A	—	:	)			
<div style="display: flex; justify-content: space-around;"> <span>SET 01</span> <span>SET 02</span> </div>											
2	(^^)人(^^)	(	N/A	^	N/A	^	N/A	)	人	(^^)	
2	☆- (●≧▽)人(▽≦●)- ☆	☆-	(	●	≧	▽	N/A	)	人	(▽≦●)-	☆
<div style="display: flex; justify-content: space-around;"> <span>SET 01</span> <span>SET 02</span> <span>SET 03</span> <span>SET 04</span> </div>											
4	(▽○)▣☆ω☆∕▽●	(▽○)	▣	☆	ω	☆	∕	▽	●		

### C. Unification of Database Naming

The data in every dictionary is divided into numerous categories, such as “greetings”, “affirmations”, “actions”, “hobby”, or “expressing emotion”. The number of categories however and their nomenclature is far from unification. Every dictionary provides its own category number and naming. To solve this problem we processed all of the category names with an affect analysis system, in which one of the procedures is to classify the words according to what emotion type they express [7]. The system uses a coherent classification of emotions based on Nakamura’s emotive expressions dictionary developed after a long time study on words describing emotional states in Japanese [8]. The names of categories from online emotion collections which revealed some emotional characterization were re-grouped according to Nakamura’s classification of emotions. Finally the emoticons from those collections were extracted from the Web pages. This way we extracted a large number of 11,416 emoticons. However, since some emoticons could appear in more than one collection from the seven, we performed a filtering to extract only the unique ones. The number of emoticons after the filtering was 10,157 (89%). This means that most of emoticons appearing in all seven collections were unique.

### D. Extraction of Semantic Areas

After collecting the sufficient database of emoticons divided into emotion classes according to the coherent emotion classification, we performed an extraction of all semantic areas appearing in the unique emoticons. The extraction was done according to the definition of an emoticon presented above. Firstly, we defined the possible emoticon borders and extracted all unique triplets of semantic areas for combined eyes and mouth together (E<sub>L</sub>ME<sub>R</sub>). From those triplets we extracted mouths (M) and pairs of eyes (E<sub>L</sub>,E<sub>R</sub>). Finally, having extracted the triplets E<sub>L</sub>ME<sub>R</sub> and defined the emoticon borders we extracted all existing additional areas (S<sub>1</sub>,...,S<sub>4</sub>). All unique areas of this kind were summarized in order according to their co-occurrence in the database.

### V. DATABASE STATISTICS

The number of unique combined areas of E<sub>L</sub>ME<sub>R</sub> triplets was 6,142. The number of unique areas representing pairs of eyes (E<sub>L</sub>,E<sub>R</sub>) was 1,920. The number of unique mouth areas (M) was 1,654.

### VI. CONCLUSIONS AND FUTURE WORKS

In this paper we presented a short description of a database of emoticons to be used in further research on development of a

fully automatic emoticon analysis system. The database contains over ten thousand of unique emoticons collected from the Internet. These emoticons are automatically distributed into emotion classes with the use of previously developed affect analysis system. Finally, the emoticons are divided into semantic areas, like mouths or eyes and the hit-rate statistics of all their co-occurrence was calculated. The division of emoticons into semantic areas is based on Birdwhistell’s [5,6] idea of kinemes as minimal meaningful elements in body language, which he described in his theory of kinesics.

The database in its shape as described in this paper will be used in the emoticon analysis system. We will determine the possible emotion affiliations for every element in the database using Spearman’s correlation test. As the database contains over ten thousand of emoticons and several thousands of elements for each unique semantic area, in our assumption, the system based on this database will be capable to automatically annotate potential emotion types to any emoticon. There is finite number of semantic areas used by users in emoticons generated during online communication. We believe the database described here is sufficient enough to cover most of the possibilities. If this proves to be true, with the use of semantic area databases the system will potentially be capable of emotion classification of original emoticons generated by the users creatively and not appearing in the database as unique emoticons.

After implementation, we plan to evaluate the system’s performance in such areas like: 1) emoticon detection in a sentence (using kappa value); 2) emoticon extraction from a sentence (using balanced F-score); 3) division of emoticon into semantic areas (using accuracy); 4) emotion classification of emoticons (using balanced F-score for each of ten emotion types distinguished in this research).

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### REFERENCES

- [1] N. Suzuki and K. Tsuda, “Express Emoticons Choice Method for Smooth Communication of e-Business”, *KES 2006*, Part II, LNAI 4252, pp. 296 - 302, 2006.
- [2] D. Derks, A.E.R. Bos, J. von Grumbkow, “Emoticons and social interaction on the Internet: the importance of social context”, *Computers in Human Behavior*, 23, pp. 842-849, 2007.
- [3] K.C. Chiu, “Explorations in the Effect of Emoticon on Negotiation Process from the Aspect of Communication”, Master’s Thesis, Department Information Management, National Sun Yat-sen University, 2007.
- [4] M. F. Vargas, *Louder than Words: An Introduction to Nonverbal Communication*. Ames: Iowa State UP, 1986.
- [5] R. L. Birdwhistell, *Introduction to kinesics: an annotation system for analysis of body motion and gesture*. University of Kentucky Press, 1952.
- [6] Birdwhistell, R. 1970. *Kinesics and Context*. University of Pennsylvania Press, Philadelphia.
- [7] M. Ptaszynski, P. Dybala, R. Rzepka and K. Araki, “Affecting Corpora: Experiments with Automatic Affect Annotation System - A Case Study of the 2channel Forum”, In *Proceedings of The Conference of the Pacific Association for Computational Linguistics 2009 (PACLING-09)*, pp. 223-228, 2009.
- [8] Nakamura, A. *Kanjo hyogen jiten* [Dictionary of Emotive Expressions] (in Japanese). Tokyodo Publishing, Tokyo. 1993.