Unified Emotional Processing: Towards a Common Framework for Computational Models of Emotion

Author

***Abstract*—Current Computational Models of Emotion (CMEs) often operate as isolated systems, characterized by architectural rigidity and fixed execution cycles. This fragmentation hinders the unification of complementary affective mechanisms in CMEs and limits the exploration of diverse emotional theories through their implementation in CMEs. To address these challenges, this article presents a framework designed to integrate heterogeneous affective components of CMEs into unified processes. Unlike traditional models, the proposed framework decouples domain-specific implementations, employing an ontology-based semantic controller to align disparate terminologies and a dependency coordinator to enable configurable execution cycles. An empirical validation using synthetic components derived from five major emotion theories demonstrates the framework's capacity to syntactically register, semantically align, and execute flexible operational sequences. The results show that rather than advancing monolithic, single-purpose CMEs, this work contributes an integrative architectural approach that broadens the methodological possibilities for studying emotion. In particular, it facilitates more direct and empirically grounded comparisons across different emotion theories by allowing them to be executed with shared components within a single controlled environment.**

***Index Terms*—Component orchestration, computational model of emotion, extensibility, modular architectures, semantic interoperability.**

I. Extensive
listings of labels/theories extracted per model

II. Complete Test-Case Table for Case Study 2

References

[1] P. Gebhard, "Alma: a layered model of affect," in *Proceedings of the fourth international joint conference on Autonomous agents and multiagent systems*, 2005, pp. 29–36.

[2] S. Ojha, J. Vitale, and M.-A. Williams, "Eegs: A transparent model of emotions," *arXiv preprint arXiv:2011.02573*, 2020.

[3] S. Jain and K. Asawa, "Emia: emotion model for intelligent agent," *Journal of Intelligent Systems*, vol. 24, no. 4, pp. 449–465, 2015.

[4] M. S. El-Nasr, J. Yen, and T. R. Ioerger, "Flame—fuzzy logic adaptive model of emotions," *Autonomous Agents and Multi-agent systems*, vol. 3, no. 3, pp. 219–257, 2000.

[5] S. C. Marsella and J. Gratch, "Ema: A process model of appraisal dynamics," *Cognitive Systems Research*, vol. 10, no. 1, pp. 70–90, 2009.

Thanks
Thanks.

TABLE I: List of Outputs Produced by the Models Based on the Established Configuration. The Outputs Were Taken from the Articles Reporting Each Model.

Model	Identifiers
ALMA [1]	satisfaction, disappointment, fear, relief, joy, distress, hope, fears-confirmed, pride, shame, gratitude, anger, admiration, reproach, liking, disliking, exuberant, dependent, relaxed, docile, bored, disdainful, anxious, hostile, openness, conscientiousness, extraversion, agreeableness, neuroticism
EEGS [2]	goal conduciveness, desirability, praiseworthiness, appealingness, deservingness, familiarity, unexpectedness, intensity, decaytime, threshold, joy, distress, happy_for, sorry_for, appreciation, reproach, gratitude, anger, liking, disliking, source, action, target, datetime, otherinformation[], actionname, actionvalence, actiondegree, objectname, familiarity, perception, active-pursuit, interest, replenishment, action/emotion, source, target, approval, person/object, perception, openness, conscientiousness, extraversion, agreeableness, neuroticism, positive, negative
EMIA [3]	desirability, expectedness, outcome_probability, suddenness, cause_harm, decay, intensity, happy, sad, anger, fear, surprise_negative, surprise_positive, event_ID, event_name, object, time_stamp
FLAME [4]	desirability, intensity, decay, joy, sadness, disappointment, relief, hope, fear, pride, shame, reproach, admiration, anger, gratitude, gratification, remorse, pain, tired, thirst, hunger, positive, negative
EMA [5]	relevance, perspective, desirability, likelihood, expectedness, causal attribution, controllability, changeability, hope, joy, fear, sadness, anger, guilt, surprise, seek_information, suppress_information, shift_responsibility, wishful_thinking, distance, positive_reinterpretation, planning, seek_instrumental_support, make_amends, procrastination, resignation, avoidance

TABLE II: Unified List of Variability Scenarios Used in Case Study 2

Case	Category	Term	Theory	Description
1	Theory–Term Mismatch	fear	pad	Term exists but is unrelated to the PAD theory.
2	Theory–Term Mismatch	pleasure	lazarus	Term exists but has no relation to Lazarus in the ontology.
3	Theory–Term Mismatch	pleasure	unknown_theory	Known term paired with a non-existent theory.
4	Typographical Error	unknown_term	pad	Non-existent term combined with a known theory.
5	Theory–Term Mismatch	joy	pad	“Joy” is not linked to PAD in the ontology.
6	Correct Reference	anger	ekman	Control case: term and theory correctly related.
7	Theory–Term Mismatch	anger	lazarus	Known term paired with an unrelated theory.
8	Theory–Term Mismatch	joy	lazarus	Term present in the ontology but not linked to Lazarus.
9	Theory–Term Mismatch	novelty	occ	Variable appears in other theories but not in OCC.
10	Theory–Term Mismatch	arrogance	ekman	Emotion class exists but is unrelated to Ekman theory.
11	Correct Reference	arousal	pad	Control case: exact PAD variable.
12	Theory–Term Mismatch	pleasure	occ	Term mapped across theories (PAD→OCC) to test semantic relations.
13	Theory–Term Mismatch	novelty	occ	Same variable paired with the OCC theory.
14	Theory–Term Mismatch	control	pad	Variable exists but is not part of PAD dimensions.
15	Lexical Variation	satisfaction	pad	Synonym in lowercase; evaluates lexical similarity.
16	Lexical Variation	joyfulness	pad	Multi-word synonym of “joy”.
17	Lexical Variation	Anger	ekman	Capitalization variation.
18	Typographical Error	angerous	ekman	Single-edit misspelling of “anger”.
19	Lexical Variation	Fear	scherer	Capitalization test with Scherer theory.
20	Theory–Term Mismatch	anxiety	occ	Related but non-exact term in OCC.
21	Lexical Variation	Disgust	plutchik	Capitalization variation for Plutchik theory.
22	Lexical Variation	relaxation	pad	Grammatical-form variation (“relaxation”).
23	Theory–Term Mismatch	joy	unknown_theory	Known term paired with a completely unknown theory.
24	Typographical Error	pleasureable	pad	Misspelling (“pleasurable”→“pleasureable”).
25	Lexical Variation	calmness	pad	Synonym not explicitly defined in the ontology.
26	Lexical Variation	Depression	pad	Capitalization and unrelated emotion.
27	Lexical Variation	contentment	pad	Synonym test for “satisfaction/joy”.
28	Lexical Variation	enthusiasm	pad	Related but non-exact affective term.
29	Lexical Variation	annoyed	ekman	Adjectival form related to “anger”.
30	Lexical Variation	worry	pad	Synonym for negative affect in PAD.