This paper significantly revises and expands a chapter in a handbook of research on synthetic emotions published in 2009. The authors extend the scope beyond emotions to all real world processes. The authors use a new adaptive method to create, improve, and correct algorithmic models (models in the form of algorithms) of emotional, learning, communication, memory, perception, biological, physiological, social, legal, and spiritual processes. The models are constructed from the sound symbolism that is indicated by the usage of the Arabic names of these processes in so-called muhkam text passages. These muhkam models have been validated by successful large-scale software implementations and by clinical emotions research. Naturally, models in the form of algorithms are easy to implement in intelligent technologies. These models also lend themselves to integration and interoperability because they share a small set of seven general concepts and their symmetrical combinations.

Keywords: Adaptive Modeling, Algorithmic Model, Biological Model, Emotional Model, Intelligent Technologies, Modeling Learning, Modeling Perception, Modeling Social Interaction, Muhkam, Sound Symbolism

INTRODUCTION

Models of real world processes to be emulated by intelligent technologies would ideally have the form of algorithms because computer programs are algorithms, too. We will introduce a method for constructing algorithmic models of real world processes. We will construct many such models for emotions and other types of human processes to demonstrate the modeling method.

In 2009, we were asked to discuss modeling emotions as a chapter of a handbook on synthetic emotions and sociable robotics (Adi,
2009) based on our theory of semantics (Adi, 2007). In this invited paper, we significantly revise and correct our previous results and expand our modeling to cover many types of human processes.

Our theory of semantics is a theory of sound symbolism which constructs algorithmic models of real world processes from their Arabic names. Although the sound symbolism has been validated in many words of twenty alphabetic languages, severe language change in other languages and the reliance of our modeling method on an old Arabic book make it impossible to use languages other than Arabic.

We first convert the symbolism of the typical three-sound word root of the Arabic name of a real world process into a general algorithmic model, a flowchart of interactions among three general process concepts (Adi, 2007). Since each general process concept represents many specific process concepts, a general algorithmic model is too vague to be useful. We must choose a specific concept for every general concept in order to translate the general model into a specific algorithmic model that we can implement in software.

Based on our current lists of specific process concepts, we have estimated that a general algorithmic model that consists of three general process concepts (a three-sound word root) can be translated into a huge number of specific algorithmic models to choose from, ranging from 15 billion to over 244 million trillions (18 zeros). As we develop more successful models, lists of specific concepts will grow, and these estimates will consequently grow very rapidly. This complex nature of sound symbolism is probably the reason why linguists were convinced that there is no useful sound symbolism at all (Saussure, 1916).

We found the solution to this model translation problem in a unique type of text passages called muhkam passages (Al-Qur’an, 1992, 3:7 & 11:1). Our theory of sound symbolism was derived by generalization from observations (induction) on sound usage in these same passages (Adi, 2007). This is why we sometimes speak of “muhkam sound symbolism.” For all practical purposes, “muhkam passage” means “a passage that connects reality with its models.” When such a passage mentions the name of a real world process—whose word root sounds give us a general model with general concepts—it also mentions practical concepts which suggest a narrow range of specific concept combinations to choose from (out of billions) in order to translate the general model into a small variety of adaptive specific models that fit the real world process.

We used muhkam passages to construct over a thousand specific algorithmic models of human processes (including emotions) and other real world processes from their Arabic names (Adi, 1989, 2007; Adi & Ewell, 1987a, 1987b, 1996). We implemented these models in software called Readware which performs large-scale cross-language intelligent text analysis in English, German and French. Readware outperformed all participants at the National Institute of Standards’ (NIST) Text Retrieval Conference (TREC Conference, 2000; Voorhees & Harman, 2000; Adi, Ewell & Adi, 1999, 2000; Adi, Ewell, Adi & Vogel, 2009).

Our algorithmic models are not only easy to implement in intelligent technologies, they also lend themselves to integration and interoperability because, as we shall see later, they share the small set of seven general concepts of muhkam sound symbolism and their symmetrical combinations.

The objective of this paper is to demonstrate our adaptive modeling method by constructing and discussing many specific algorithmic models of many different types of human processes. We will do so in the following sections:

1. A short review of emotional modeling. We also include here some comments about how our work relates to the work of others.
2. Muhkam algorithmic modeling: a method to construct algorithmic models of real world processes from their names based on muhkam sound symbolism. The method is introduced in detail and demonstrated by an example.
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