allows implementation of various actions such as seeking, fleeing, escaping, queuing, etc. However, the unique contribution of our work is the scientific approach used to model the cognitive aspects of an individual. For example, this model would illustrate the conjoint effects of emotion sharing, spreading attitudes (Walther, 2002) and nonverbal gestures of crowd members. An individual's cognitive state is treated as a vector of scalar state variables, each representing a basis emotion, for example fear, anger, surprise etc. Each emotional component in turn is influenced by two factors – (1) a self-decay, that represents the subsiding of reactive emotions over time, and (2) a stimuli-driven factor that depends on perceived stimuli. The state vector itself is quantized into a discrete value which is then used to generate new actions or maintain existing actions. Figure 1.2 illustrates this approach.

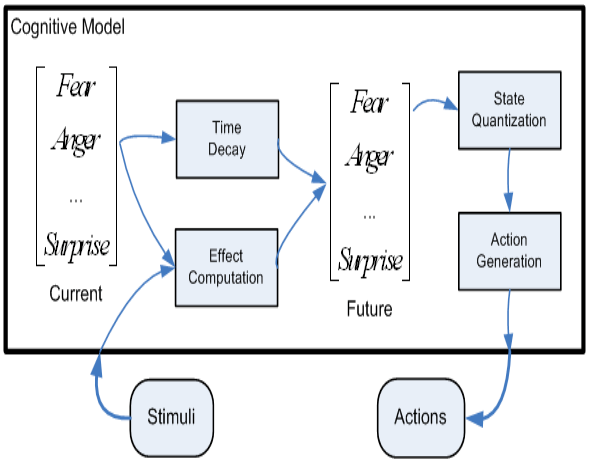

Figure 1.2. Illustration of key model parameters

There are several challenges associated with each model component. For example, the model must realistically handle multiple stimuli and their cumulative effect on each emotional component. One particular challenge is the presence of contradictory stimuli, for example fear inducing stimuli such as an explosion and fear reducing stimuli such as positive emotions on the faces of crowd members. We have developed an approach based on basic human psychology that handles the repeated and cumulative effect of similar and contradictory stimuli on each state. Another challenge is that the model must also handle action generation in a way that produces realistic and feasible behaviors. Our model addresses this issue by associating priorities and preempt-ability with each action, along with an algorithm that resolves and fuses new actions with existing actions. The working model incorporates various scenarios and has the capability to simulate typical crowd behavior assuming different cognitive states under each of these scenarios.

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