Chapter 11
Machine Dreaming

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ABSTRACT

Active sleep modes, alternative logics, non-parametric programming, and extended interfaces are being incorporated into the processing capabilities of complex computer systems. While system disconnected FSMs have only minimal capacities for achieving dream-like forms of cognitive processing, internet-connected systems can meet human-based criteria for dreaming. The internet includes periods low data flow (system sleep). Non-parametric and fuzzy logic processing extends system capacity and increases the possibility of alternative and/or unexpected outcomes. Neural-net processing increases the chance that results attained will be indeterminate and hallucinatory. At the interface, such machine dreams are bi-directionally incorporated into the dream consciousness of interacting humans. In order to function in the human-defined environment, artificial systems require the capacity to achieve dream equivalent states.

INTRODUCTION

From the anthropomorphic perspective, dreaming is restricted to humans, the only organism with a cognitive processing system able to report what is perceived to be a dream. Dream equivalent processing as based on shared characteristics and human based definitions are, however, within the capacity of modern computer systems. In the human, dreaming and dream-like cognition is utilized in functions with individual and species survival value including: feedback into sleep-associated operative processing, emotional integration (particularly as part of the response to significant physical and/or psychological stress), alternative problem solving, threat avoidance, and creativity (Pagel, 2008; Revonsuo, Tuominen, & Valli, 2015). AI and other machine systems are being developed with the capacity for accomplishing dream-like mentation. This goal is not routinely stated and is in many cases not understood as part of the objective by the programmers and theorists involved in the process. But current predicate logic systems have demonstrated set limitations in their ability to function in the common-sense human environment (Parisi, 2007). Particularly in robotics, an obvious need has developed for systems able to integrate and interact better with humans in the same manner that humans interact with one another. In order for systems to function in the common-sense based human environment better than systems limited to predicate

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logic, they are likely to require the capacity for achieving human equivalent processing capabilities. As based on many of the defined criteria for dreaming, some current machine systems have been developed utilizing both hardware and software that can function in a dream equivalent manner.

BACKGROUND: THE PROBLEM OF DREAM DEFINTION

Dreaming is an almost ubiquitous personal experience, and as such, many definitions for dreaming have been developed and routinely utilized. For each individual experiencing dreaming, the experience seems concrete and obvious. There has been a strong tendency for each individual dreamer to presume that what he or she experiences as a dream is the same for every other individual who dreams. However, what one individual understands to be a dream is often far different from what another experiences or construes to be a dream. This has led to a situation in which there are multiple definitions and no concrete or overall inclusive definition, so that for any group, a series of often different, recurring and set definitions are used for dream (Pagel & Meyers, 2002). This problem of confused and even contradictory definitions has led to significant problems for researchers and investigators in the fields of dream study. For the sleep physician dreams are sleep-associated mental activity. For the psychoanalyst, dreaming defined by bizarre and/or hallucinatory content occurs in both wake and sleep. For one group, dreaming is a state of consciousness. For the other, dreaming is a form or type of thought. In some epistemologies, even the oldest of definitions, such as the dream as a message from god, are still used and believed (Buckley, 2009).

The problem of definition was confounded further in the last decades of the twentieth century when a wide spectrum of neuroscientists and clinicians decided, despite a lack of experimental evidence, that the electrophysiological state of Rapid Eye Movement Sleep (REMS) was equivalent to dreaming. Defined as REMS, dreaming apparently needed no further definition (Pagel, 2011). Aristotle described a definition as a description of the "essence or essential nature" of the topic and as such, each definition applies and reflects an aspect, an essence of the state (Eco, 1984). In an attempt at clarification, in the year 2001, a multi-specialty panel of dream researchers and therapists developed a multi-axis definition paradigm for dreaming (Table 1) (Pagel, Blagrove, Levin, et. al., 2001).

One approach that can be used to avoid the problems of definition is to limit an approach to the associated and describable characteristics of the state. Researchers avoid defining 'dream' and focus on measurable factors (variables) known to be associated with the state such as recall frequency, content,

Table 1. Definitions for dreaming - a classification system paradigm

A Definition of Dream Has Three Characteristic Continua		
Wake/Sleep	**Recall**	**Content**
Sleep	No Recall	Awareness
Sleep Onset	Recall	Day-Reflective
Dreamlike States	Content	Imagery
Routine Waking	Associative Content	Narrative
Alert Wake	Written Report	Illogic
	Behavior	Bizarre/Hallucinatory

Source: Pagel J. Blagrove M. Levin R. et. al., 2001

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