Models of Desire, Need and Attention[*]

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Desire plays an important role in the explanation of behavior in general (for example, Bratman's Belief-Desire-Intention theory). However, there is neither much literature, nor even consensus about the meaning and definition of desire. For example, H.G. Frankfurt (2004) called the notion of desire "rampantly ubiquitous" and wrote:" Moreover, its various meanings are rarely distinguished; nor is there much effort to clarify how they are related. These matters are generally left carelessly undefined in the blunt usages of common sense and ordinary speech". Author presents here his closely linked mathematical models of desire, need and attention. They are based upon the principle proclaiming that animals and humans alike strive to maximize pleasantness of their internal state. What follows from this principle is that for such a subject (S), (one of) the most important characteristic of any phenomenon (X) should be how much X influences process of maximization of the Pleasantness of the State of this Subject (PSS** in short); the measure of such an influence is the magnitude and direction of the PSS change (Δ PSS). I propose that terms such as 'desire,' 'want,' and their cognates describe PSS change associated with (caused by) a phenomenon (an object, event, etc.): $\mathbf{DESIRE_{S,X}} = \Delta \mathbf{PSS_{S,X}};$ **(1)**

$$\text{if } \Delta PSS_{S,X} > 0, \text{ then X is called desirable;}$$

$$\text{if } \Delta PSS_{S,X} < 0, \text{ then X is called undesirable.}$$

The magnitude of the PSS change is what is called "strength of desire":

$$\mathbf{STRENGTH \ of \ the \ DESIRE_{S,X}} = |\mathbf{DESIRE_{S,X}}| = |\Delta \mathbf{PSS_{S,X}}| \qquad \mathbf{(2)}$$

This model of desire has an experimental support (Ovsich, Cabanac, 2012).

Another inference from the principle of PSS maximization is that the more X affects process of PSS maximization (i.e. the bigger is a PSS change created by X) the more attention a subject (S) should pay to it:

$$\mathbf{ATTENTION_{S,X}} \sim |\Delta \mathbf{PSS_{S,X}}| \qquad \mathbf{(3)}$$

In the first approximation:

$$\mathbf{ATTENTION_{S,X}} = |\Delta \mathbf{PSS_{S,X}}| = k \ |\mathbf{DESIRE_{S,X}}| = k(\mathbf{STRENGTH \ of \ the \ DESIRE_{S,X}}) \qquad \mathbf{(4)}$$

Considering that an overall attention at any given moment ($ATTtotal_t$) is distributed between a number (1 to n) of phenomena and that it has an upper limit ($ATTmax_t$):

$$\mathbf{ATTmax_t} >= \mathbf{ATTtotal_t} = \mathbf{ATT_{1,t}} + \mathbf{ATT_{2,t}} + \ldots + \mathbf{ATT_{n,t}} \qquad \mathbf{(5)}$$

Combining (4) and (5): $\mathbf{ATTmax_t} >= \mathbf{ATTtotal_t} = k|\mathbf{DES_{1,t}}| + k|\mathbf{DES_{2,t}}| + \ldots + k|\mathbf{DES_{n,t}}|$ **(6)**

If we sort the right part of equation so that $ATT_{1,t} > ATT_{2,t} > \ldots > ATT_{n,t}$, then the number one ($ATT_{1,t}$) will be given to the phenomenon having the most attention or being at the "center" of attention and this will be the phenomenon corresponding to the strongest positive or negative desire.

Desire and need are closely related. As R. Audi (1993) wrote, "Human needs are innate and quickly give rise to desires" (29). S. L. Rubinshteòin (1957) has declared that "desire is a concrete form of the need's existence". Process of need's satisfaction provides a good illustration of how (6) works. At any given moment a subject has number of needs at the different levels of their satisfaction represented by the correspondent desires. All things equal, with dissatisfaction of a need correspondent desire will grow in strength with time and will get more attention in accordance with (4). Such an "attention promotion" will be reflected by the movement of the correspondent member $ATT_{n,t}$ in the (5), (6) from the right to the left until $ATT_{n,t}$ will become a number 1, i.e, until this desire and its object will get in the center of attention, that makes satisfaction of this particular desire to be the first priority of the subject's actions. This converges with one of the basic postulates of Ethology, as described by Cabanac (2000): "One basic postulate of Ethology is that behavior tends to satisfy the most urgent need of the behaving subject (Tinbergen, 1950; Baerends, 1956)", because the 'most urgent need' of this postulate corresponds to the strongest desire.

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** Emotional pleasantness/unpleasantness is an important component of the PSS (Ovsich, 1998)