'Meanings of Things': Affordance as a Resource for Rich-Interaction

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ABSTRACT
In this concept paper, we propose a view on affordances from a phenomenological point of view and argue that affordance serves as a carrier to communicate meaning between users and a technology. By focusing on ambient, pervasive and ubiquitous computing technologies, we provide interaction designers with a conceptual framework to envision their designs, which could result into supporting "appropriate" experience for users. We conclude that affordance emerges from user's interaction with the system and designers cannot design them. This framework provides designers with some envisioning support that would help them improve their designs.

Keywords
Affordance, Phenomenology, Meaning, Rich-Interaction.

Categories & Subject Descriptors: H5.0. Information interfaces and presentation (e.g., HCI); H1.2. Models and Principles: User/machine systems.

INTRODUCTION

Today's ambient, pervasive and ubiquitous computing technologies are part of user's every day activities. Having non-traditional computer-based looks, these technologies at the one hand allow users to naturally interact with them to effortlessly and seamlessly achieve their goals and tasks. On the other had they do not focus on how users perceive, understand and experience these technologies. In this position paper, we make a case for Rich-Interaction as solution for the ambient, pervasive and ubiquitous computing technologies. Conceptually, Rich-Interaction in a technology allows its users a sort of richness in terms of *visibility* and *manipulability* and provides users with *control* over their interaction with the technology. One of the ways to achieve Rich-Interaction is through close and meaningful coupling between function, interaction and form of technologies [3].

A designer usually tries to convey some specific meanings to the users through the designed system. His primary goal is to translate these meanings into the designed product, with 'appropriate' function, interaction and form for their systems. He designs the system based on some field-studies or from his own experience or by using any other techniques. Finally, the designed system will have a combination of functions, interactions and forms that will represent designer beliefs. However, there is no absolute guarantee that all the users will interpret the same meanings the designer is trying to convey through the technology. HCI strategies for designing and evaluating systems have started utilizing the philosophical stances about how meanings are conveyed through a system [10]. In this position paper, we use a philosophical point of view to investigate the relationship between Rich-Interaction and the notion of meaning. We use the concept of 'affordance', coined by Gibson [7], as a resource to communicate meaning through Rich-Interaction. In the following part of this paper, first, different philosophical views on meaning are discussed. Secondly, the notion of affordance is interpreted. And finally, we show how affordance can serve as a communication link between users and systems, in order to support Rich-Interaction.

ESTABLISHING THE NOTION OF MEANING

Shedroff [11] explains that meaning is a distinct level of cognitive significance that reason about how people understand their environments and the knowledge they actively construct based on the world they experience. Meaning can be seen as a deepest level of understanding of a specific situation. From the phenomenological point of view, the world is already filled with set of meanings and a specific meaning arises from the way we interact with the

world. Dourish [1] points out that *the source of meaning is not a collection of idealized entities but it can be found in the real world in which we act, and which acts upon us.* Meaning does not belong to the system as such but it is in the way we use the system to fulfill our needs. Interestingly, Dourish also talks about three aspects of meaning, namely – ontology, intersubjectivity and intentionality. Ontological aspect of meaning provides the structure of a system (in terms of its entities and their relationships) from which meaning can be created. Intersubjectivity emphasize on how the meaning can be shared amongst different parties. And the intentional aspect of meaning refers to the 'directedness' of the meaning, i.e. it emphasizes on meaning as a relationship between one entity and some other entities. In his work, Dourish also refers to "Philosophical Investigations" by Wittgenstein [12] that focuses on 'meaning of languages'. Wittgenstein argues that meanings are not attached to the language or its linguistic expressions, but rather with the way in which the language is used. He compares language with human activities, and argues that meaning of a language can only be determined by the way the language is used in a particular activity to accomplish something. To him 'truth' was not in the statement itself, but in the appropriateness of the statement i.e. the context in which the statement is used.

In an interaction with the system, it is the users who create, communicate & maintain meaning by himself and not the designers [1]. This especially imposes researchers to establish new approaches to understand users and their activities. Formal methods, in HCI for design and evaluation, sometimes fail to implement this notion of meaning. There are three main reasons for this [5,6]. First, the formal methods view meanings as a predetermined entity and often controllable by the designer's. Second, formal methods presume that problems to be solved are well-defined and unambiguous. Third, today people do different kind of activities with their systems that are not only goal oriented. And importance should now be given to how meaningful and valuable these systems are for users.

AFFORDANCE

J.J. Gibson [7] termed the concept of 'affordance'. He describes, *"the affordances of the environment are what it offers users, what it provides or furnishes, either for good or ill."* Affordance can be thought of as a combined 'user-environment' system whole and not as user-only or environment-only views. Affordance is not a property of an environment but it is better thought of as the common ground between the user and his environment. E.g. the glass of a window will afford a person looking outside, because the person has eyes to which the glass is transparent. But in the rainy or foggy atmosphere the same window will not afford that person the same clarity for looking what is going on outside. Dourish [1] defines the concept of affordance as three-way relationship between the environment, the organism and an activity. I.e. when we talk about affordances it shows the compatibility between the environment, the organism and an activity. There are different interpretations available about Gibson's original definition of affordance. For example, Norman [9] categorizes affordance into real and perceived affordances. Gaver [4] categorizes affordance into perceptible, false and hidden affordances. To our interpretation, what the environment affords to its user is what the user perceives about his environment. Hence, affordances are by definition 'perceptible'. Clearly, there would be more to the environment then what the user actually perceives about it but for the users what he perceives is all really matters to him. There can be either 'true' or 'false' affordances. Gibson suggests that the concept of affordance depends heavily on how the action and perception, between the user and his environment, are coupled. In his definition of affordance he indicates that affordances could be specified either for "good or ill".

Affordance should not only specify the perceived action possibilities but also the details of these actions. For example, let's look at different types of ball, a cricket ball, a rugby ball and a football, etc. These balls afford their users to hold and throw them in different ways. Clearly the size, shape, and weight of each ball afford its user to use it in a very specific way. Michaels & Carello [8] extend Gibson's concept of affordance and ague that affordances are not only concerned with action opportunities the user is capable of but also with his 'intentions'. Here the intentions indicate the goal-oriented behavior of the user. Clearly if there are no intentions to use the system (within the environment) then it does not matter to a user what the system affords and hence those affordances become of no importance.

AFFORDANCE AS A CARRIER FOR MEANING

Interactive systems can be thought of having three main properties that are relevant to users namely – function, interaction and appearance (form). Hence, in order to see what an interactive system has to offer to its users, we can consider function, interaction and appearance as the three different types of affordances. Figure 1 shows the affordances of a measure cup. It is not an interactive system per se, but it provides good illustration for three system affordances.

Figure 1 Functional, Interactional & Appearance-based Affordances

(a) Functional Affordances: Functional affordances inform users the general purpose of the system and its function related features. They are very similar to product semantics. Functional affordances can be provided through making the function more visible to users. The problem of back-box interactions (e.g. of a digital music player) could be solved utilizing these types of affordances. They heavily depend on the appearance of the system. In figure 1 the main function of the plastic cup is to measure the volume of a liquid or any other material. It provides the volume indication in a certain scale that can be read by humans.

(b) Interactional Affordances: Interactional affordances inform the users how to operate the system. They tell users what actions are required. In previous section we discussed an example of different types of game balls. The shape and the texture of the ball speak about how this ball should be played. In figure 1 the handle of the measure cup tells the users how to hold it and the shape of the mouth of the cup tells users about how to pour materials in and out.

(c) Appearance-based Affordances: Appearance-based affordances provide its users all the sensory (visual, audible, etc.) information about the system. They provide users with a general idea about the system, like, for example, what the purpose of the system is, etc. These affordances are the base for functional and interactional affordances. Figure 1 shows a measure cup and this product itself speaks about its purpose from its appearance.

Gibson mentions in his definition of affordance that affordances could be either for 'good' or for 'ill'. This means that the concept of affordances can be used for unpredictable or undesired system behaviors. These affordances are termed as 'false affordances' by Gaver [4]. They either do not provide sufficient information or provide ambiguous information to the users and hence sustain the aspect of unpredictability. Apple's eMate computer (which is no longer in the market now) shown in Figure 2 is an example of False Affordance. The contrast control and voice control buttons, above the keypad, do not revile the intended result for the users. The buttons appear to be toggling push buttons but actually they are sliding buttons.

Figure 2 – An example of False Affordances

We can use the concept of false affordance at three levels: at functional, at interactional and at appearance. Figure 3 shows an interactive pillow. We will use this example to illustrate how false affordances could help augment subjective human aspects like fun, pleasure, enjoyment, etc. for Rich-Interaction.

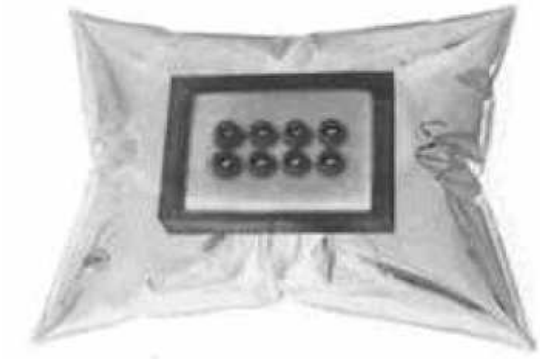

Figure 3 – The Pillow (By Tony Dunne)

The Pillow, designed by Tony Dunne [2], uses the concept of the false affordance at all three levels. The transparent plastic pillow encloses an LCD screen that is fitted into a plastic brick so that the simple geometric shapes it displays are blurred as they flow across the form (Figure 5.2). Dunne uses the *Appearance-based false affordance* in a way to display information that is physically or conceptually blurred, although its shape is like an actual pillow. This

being harmless creates curiosity amongst the users. The *Functional false-affordances* are presented through some kind of understandable sound generated by the pillow. The pillow also works as a radio that gathers the electromagnetic information from mobile phones, taxis, commercial radios, etc. from the nearby places. But this information is distorted and fragmented to produce an intriguing rather than informative experience. Hence this – radio – function is not apparent from the product's form itself but evokes pleasant surprise and fun among the users. The Pillow displays electronic information in an impressionistic, ambiguous way, hence, it also utilizes the *Interactional false affordances*. The sound and the visual information coming out of the pillow are relatively blurred, but still make the user feels pleasant about the interaction.

However, if we view affordance from a phenomenological point of view, affordance cannot be designed. This is because affordance is the common ground between users and the system and the ontology of the system affordance arises by the way users interact with the system. Hence, affordance is an emergent property of user's interaction with the system. It is true that designers can design a specific ontology of affordance but it is not guaranteed to be same as user's ontology about the system. Here, we add a new dimension to affordance by adding the notion of meaning. We believe that affordance serves as a carrier for communicating meaning. Like meaning, affordance also arises through user's interaction with the system, in the real-time and real-space.

DISCUSSION

To achieve Rich-Interaction in a system, the system should be able to provide visibility, manipulability and control to its users. Ambient, pervasive and ubiquitous computing technologies do offer effortless and seamless ways to interact with the technologies but to some extent they fail to focus on how meaningful and how valuable the technology is to the users. This paper does not solve this problem but adds a phenomenological view to understand these technologies. The notion of affordance that is initiated in this paper challenges interaction designers to *envision* affordances that could also support the users' meaning-making process in a seamless, effortless and natural way but also allow them to perceive, understand and have control over it. Ambient, pervasive and ubiquitous technologies often incorporate subjective human aspects like pleasure, enjoyment, fun, etc. These qualities are not devices or tools of the technology but they are better thought of as the outcome or the result of the users' interpretation during their interaction with the technology [13]. Figure 3 is an example showing how these subjective qualities can be augmented through the notion of affordances.

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