Ageing Futures

Towards an inclusive cognitive interaction design

Abstract

This paper describes a research focusing upon the difficulties those aged 70 and over face when learning to interact with the personal computer. This paper explores some of the implications of the normal aging process in the context of the cognitive demands put upon older users by the computer. This paper describes a research working towards the design of computational products that provide an aging group of people with the foundations with which to apply the knowledge they have acquired through a lifetimes experience. The paper explains how a model might be developed that could aid designers in the development of computational products inclusive of those aged 70 and over.

There is an argument that computer literacy is beneficial for an older person’s well being (Nova Scotia Centre of Aging, 2001). Studies into the aging mind have revealed that the very cognitive functions required for satisfactory computer use and erudition are largely those that a person loses as they age (Zajicek, 2001). A number of studies have demonstrated that many older users have a desire to be adept with personal computers, but are unable to comprehend certain aspects of the apparatus (Goodman et al, 2003., Adler, 1996). In this paper we argue that the root of this problem resides in the apparatus, and not the people.

We have argued that much recent ‘inclusivity’ research has concentrated on the physical inabilities of aging, whilst paying rather less attention to cognitive alteration (see Vines, 2005). When the problems older users note when using computers are studied, as Goodman has shown, they are considered more cognitive than physical. (Goodman et al, 2003). Many of the interactional problems associated with the use of computer technology by the older population are associated with cognition; complication of the interface, misunderstanding of terms and certain functions, numerous obstacles for simple tasks and a lack of support, for example. (see Goodman et al, 2003). We suggest that these issues can be addressed by simply improving the design of computational products for older adults, taking into account their differing cognitive models.

A brief survey into research of the aged mind highlights potential conflicts between the current computing paradigm and potential users above the age of 70. Zajicek (2001) claims that for successful computer use there is a need to apply fluid intelligence; our ability to utilise abstract thought and build strategies for an unknown object or phenomena (Cattell, 1987). These fluid abilities decrease gradually as the brain ages (Stuart-Hamilton, 1996) and significantly so above the age of 70 (Park et al, 1996). This can be matched to a similar decline in working memory ability (Craik, 1986), hindering the manipulation of data in a given task or situation (Park et al, 1996; Schieber, 2003). Put simply, it is harder for those over the age of 70 to learn an abstract technology they may be inexperienced with, such as a personal computer.

However, there are also aspects of the aged cognitive profile that maintain functionality into older age. For example, the crystallised intelligence function (fixed, pre-learnt knowledge; Cattell, 1987); procedural memory (unconsciously retrieved knowledge of previously experienced tasks) and semantic memory (the knowledge of words and concepts) appear not to rescind in ability, and in some cases can actually improve into old age (Craik, 1977; Smith & Earles, 1996). Our study intends to explore and exploit these aspects of human cognition that function well in those aged 70 and over. By taking forward the notions of interactional familiarity to the older user, we suggest that designers may be able to improve both the learning experience and utilisation of the computer by older people.

Our initial explorations were performed based around creating tangible computer interfaces, with the purpose of being able to 'leverage real-world manipulation of real physical objects to provide a more natural interface' (Jacob, 2001, pp.5). In doing so, it was considered possible to devise a richer interface (Djajadiningrat et al, 2002), affording older users with an interaction that takes advantage of their differing cognitive abilities by unconsciously retrieving the semantic and procedural knowledge gained over a lifetimes' experience in the world. This early stage of investigation was fundamental in the development of the study, as although we can consider that whilst greater tangibility did aid the appropriation of certain aspects of computer-based applications over the typical desktop computer and its graphic user interface, it still did not provide the older user with a suitable platform with which to apply their past-experience. It still required an amount of fluid thought to understand the end product as it was still focused around the rules and functions of a computer, rather than those that are already known to the older adult.

Lakoff and Johnson's (1999) view of the neural model - that it is formed in the body and shapes our reasoning - suggests a model of reasoning whereby objects and phenomena are experienced and categorised, to produce concepts. If this model is useful, it suggests that experiences, stored over a lifetimes learning, may have an affect on the way in which we approach familiar environments and objects. Although Lakoff and Johnson do not state how age affects such conceptualisations, it is suggested that the acquisition of concepts and categorisations from experience are of most significance in adolescence and young adulthood, between the ages of 10 and 25 (Sroufe and Cooper, 1988). These concepts are stored as long term memories for later procedural and semantic unconscious retrieval. As fluid and working memory ability decreases, a person relies more and more on these already stored concepts of experience as the capability to create new concepts diminishes. Exploration of the interactions a prospective user over 70 may have experienced in this adolescent period may reveal opportunities to create new computational products that exploit such stored procedural knowledge – creating 'new' interactions that combine conscious action and unconscious thought. By understanding something of the composition of these memories, the designer might begin to understand how an older user may appropriate their product, object or artefact into an activity. Of course, appropriation of an item is personal, subjective upon their experience through life (Dourish, 2001). However, a designer that understands an older user's prior experience may also understand how they might approach their product: in understanding this, the designer can develop their product to aid its appropriation (Fig. 1).

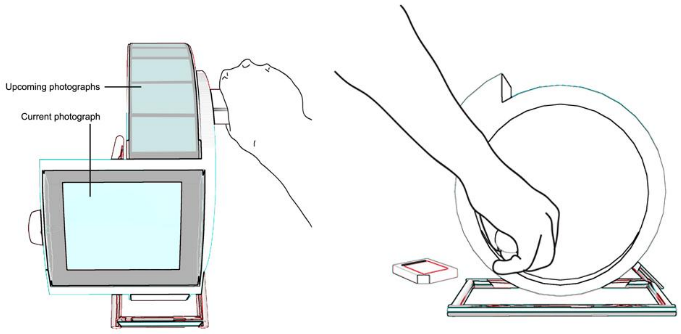

Fig. 1 'Photo Reel' - an exploration of formative interactional experiences combined with computational media – was developed with a group of users over the age of 70, and designed with reference to the Hodderdodder (3eye, 2002). It examines the use of digital photography in an older users home, along with prior interactional experience (in the form of a simplistic winding mechanism).

The study begins to look upon the technology - computation - in a manner akin to Dourish's (2001) foundations for embodied interaction; as a medium with which an activity can be improved, without altering its fundamental concept. Dourish (2001, pp.166) states, embodied interaction 'highlights the active nature of computer systems - the fact that they do things - in a different way; not as the actions of independent agents, but as augmentations and amplifications of our own activities. This encourages a focus not on the capabilities of the technology per se, but on how that technology is embedded into a set of practices. Why have a computer based activity such as e-mail – which forces a new set of rules, terminologies and procedures on the user – when we already have an established postal service? Taking a view on the Dourish stance of computation used as a medium, we could see instead the computation being incorporated into the practice of 'posting and receiving letters', rather than developing an abstract technology-focused system (Fig. 2).

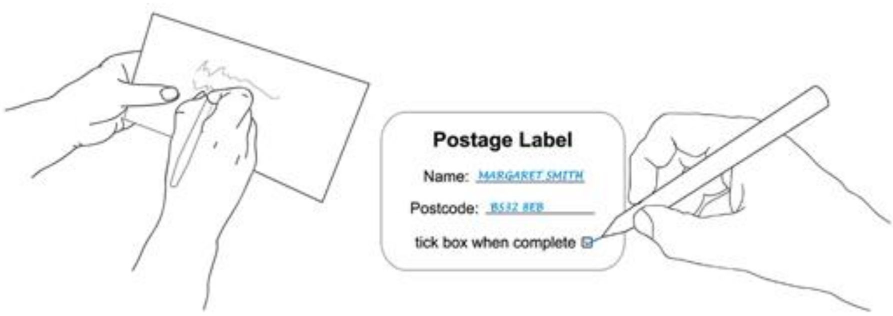

Fig. 2 Exploring computation within a practice/activity through examining its possible use within the established activity of sending and receiving post, as an alternative to electronic mail (e-mail).

By taking the position laid out above, it is possible to begin developing a model designers could utilise as an aid with which to investigate the formative experiences and interactions an older user may have stored in procedural and semantic memory. By taking the claim that the experiences gained in this 10-25 year old period during peak fluid intelligence and working memory ability form the strongest embodied concepts, it is possible to conceive a time span to investigate for the current population above the age of 70. For the purposes of clarification, let us take a reasonable cap on the target demographic of 95 years old. Somebody currently aged 95 (as of 2006) would have been aged 10 in 1921 and a 70 year old would have been 25 in 1961 – indicating a period between 1921 and 1961 with which to study for a user's formative experience profile.

The model being developed by this study is of particular use to designers as it is somewhat dynamic – it moves along with time and the users. As an example, for 70-95 year olds in 2008, the years of study would be 1923-1963; in 2050 the formative years would be 1965-2005. Certainly, within such 40 year periods would provide a vast amount of experiential change. Within the currently explored time period (1921-1961) it is possible to observe significant technological and social adjustment – wars, new materials, increasingly affordable and available wireless and communicative technologies – all of which have effect on the experiences of people existing throughout these periods. A most fascinating facet of embodiment – yet somewhat infuriating from a design perspective – is that any one person's experience through life is totally subjective; it is different to any others (Lakoff and Johnson, 1999). It would be the designer's role to devise the best-fit based upon the target user base, their formative experience profile, and the context(s) within which the planned product is to be used.

A claim of this paper is that the older user – and not the designer – is put in control of the objects, artefacts and systems they use and interact with. The designer still holds a significant role in this model however, being the mediator between the formative interactions experienced by those aged 70 and over at a younger age, and the new technology/media. Users should be collaborated with, in the design process as a way of examining a) what these formative experiences are; the interactions experienced, in what contexts they are experienced in and whether these are transferable to new technologies, and b) how these experiences formed a practice, or activity, that can then be augmented with computational power.

So begins tentative steps towards the development of a model which may aid designers in the creation of computational products for those aged 70 and above. In the context on this paper, embodiment allows a move towards the older user taking a central role in the development of the systems they will use – not only in a physical manner, but in an experiential sense. By understanding the experiences, objects and phenomena these people have encountered in their formative period, it should be possible for designers to create computational products and services that encourage the use of the healthy aspects of normally aged cognition. The designer should end enforcing their rules on the user, but instead acknowledge what it is that user both knows and wants to do; 'no designer can know what the system really is… … it is what it means to individual users and, like life, it means what it is experienced to be' (Lund and Waterworth, 1998, pp.3).

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