Design philosophies Applied in an Elder Home Monitoring System

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Summary

We describe design philosophies that guided a set of implementation decisions in an automated elder monitoring system. These features were deployed in a field test, and the philosophies are contrasted with field test data. The results are discussed with specific emphasis on system intrusiveness and cognitive effort from the elder.

Introduction

The Independent LifeStyle Assistant ^{TM} (I.L.S.A.) is a Honeywell Laboratories program to develop innovative, high-potential technology for elder homecare applications. This paper discusses design philosophies for I.L.S.A, how they guided the implementation of an initial feature set, and the results from a six month field test in clientsí homes and apartments that provided feedback on our design and implementation.

Aims and objectives

A list of key impedances to independent living was identified through home-care analysis, interviews with geriatric experts, discussions with adult children caregivers, and literature reviews. A set of initial I.L.S.A. features was determined using Six-Sigma analysis methods. Implementation plans consistent with these philosophies were then created for the feature set. The design philosophies include the following:

A) Wherever possible, the physical appearance and components used by the I.L.S.A. system should not be intrusive to the client.

B) Direct communication between the client and the system should be limited to the telephone and web pad. I.L.S.A. should also minimize itís communication of system and client status such that the interference on the clientís lifestyle can be lessened.

C) The client should not be required to directly provide data about his/her own status. I.L.S.A. should make use of available data from the clientís interaction with the system to determine the clientís status.

D) I.L.S.A. should avoid demanding excessive effort (especially cognitive effort) from the client (e.g., for system setup).

These philosophies led us to the following implemented design decisions:

A) The LED indicators of motion sensors were disabled so that I.L.S.A. feedback outside of the web and phone interfaces was minimized. Interactive devices such as switches were avoided for the same reason.

B) I.L.S.A.ís status is not reported to the client, although the client may initiate an inquiry through the web pad. By default, only telephone reminders for medication are sent to clients if missed medications were not detected. Functional modes were introduced to allow for the suppression of I.L.S.A. communications.

C) ILSA deduced client status entirely from passive interactions, with the exception of indicating home/away status, and acknowledging telephone reminders.

D) Clients are not required to train I.L.S.A. Clients need to contact caregivers to change initial settings such as sleep time and medication times.

Method

The field test included subjects living at home and at an independent care facility. Age and computer literacy varied widely across the population. We installed sensors in each subjectís home, equipped each with a web pad, and provided one to three hours of training and orientation. Clients and their caregivers were requested to submit monthly and weekly surveys to report any anomalies and changes in attitude towards I.L.S.A. Participants were invited to attend two Focus Group sessions, and had access to technical support during normal business hours. SF-36 and Mini-Mental cognitive evaluations were administered to the clients regularly to monitor their health and cognitive levels, respectively. In addition to data collected from these activities, software components recorded the clientís physical activity within his/her home, as well as web activity through the I.L.S.A. web server, and phone interaction activity.

Results

Web interactions with the client provided interesting insight into their interest and understanding of the interface and the data presented. They were more comfortable with the interface than with the tablet-style device used for presentation. Some cognitive scores improved during the test period.

Discussion

Many of our design philosophies and implementations have been validated through this limited evaluation, but some have been challenged in interesting ways. For example, Focus Group comments suggest that many elders would like some greater degree of ìintrusivenessî from I.L.S.A.ó at least to the degree of understanding when and how it is working. Similarly, most elders were unaware of setup features that they did have access to and expressed a desire for more of themó implying that we may have been overly cautious in our implementation of Design Philosophy D above.

Conclusion

- Automated telephone systems are disturbing to lifestyle and cognitively overwhelming, violating both the intrusiveness and cognition design precepts.
- Clients want more interaction with the system on their terms, but this feature needs to be adjustable to client capability.
- Passive operation is required, even for healthier and more cognitively able clients because of aversion to change.
- Clients want to contest the conclusions presented by the automation and provide direct feedback.

References

Related publications and associated research links may be found at the following URL.
http://www.htc.honeywell.com\projects\ilsa