
Benefits and Challenges of Long Term Self-Tracking to Prevent Lonely Deaths and Detect Signs of Life

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Abstract

We explore the benefit of a new long-term self-tracking application for the elderly population. In the last few years, there has been a significant increase in number of people dying alone or remaining undiscovered for a long period time in Korea and Japan. This is often referred to as a *lonely death*, and it is expected to increase due to the hike in the number of one-person

households. We believe that an opportunity exists for a long term self-tracking, which can help monitor, prevent, and detect these lonely deaths, using various smart sensors and IoT devices. Furthermore, we believe that long-term tracking technology can increase social interactions and engagement for aging populations and possibly reduce their health as well as lonely death risks.

Author Keywords

Long term self-tracking; Privacy; Lonely death.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous; See <http://acm.org/about/class/1998> for the full list of ACM classifiers. This section is required.

Introduction

The lonely death is “godoksa” in Korean and “kodokushi” in Japanese, which is the phenomenon of people, often elderly, dying alone without anyone noticing. It can be days, weeks, or months until someone discover the remains. Lonely deaths of people

are common for people who had no ties with their relatives or neighborhoods.

According to Census Statistics in Korea[1], 33.5 percent of senior citizen households are single-person households, with the number totaling 1.3 million. Data from the welfare ministry reports that there were 338 lonely deaths in Seoul in 2015. The statistics includes deaths that remained undiscovered for some time as well as those who died without any family members or relatives. Researchers expect that the lonely death problem in Korea is likely to increase, as the number of single-person households is increasing rapidly. In Japan, the situation is more serious. The Japanese government does not report the official statistics, and they are incomplete. However, the estimated number was around 32,000 in 2009 according to Japan's national broadcasting network report [2]. Japan is experiencing a "super-aging society" [3]. According to 2014 estimates, 33 percent of the population is over the age of 60, and 25.9 percent are above 65. Lonely deaths are expected to sharply rise in Japan.

We believe that a long-term tracking can help prevent and detect lonely deaths, and further assist in monitoring, and improving health of elderly populations. With the advancement in smart sensors, and IoT devices, we hope that long-term tracking technology can help address these critical social issues.

Causes for Lonely Deaths

There are several possible causes for lonely deaths, which stem from cultural and socio-economical reasons.

Change of family structure: One primary reason is due to the change in the family structure, and rapid

growth in aging society. Three-generation households were commonplace not so long ago in Korea and Japan. However, more people are remaining single, while couples are having fewer children. Lonely deaths are highly attributed to a hike in the number of one-person households.

Increased social isolation: One other reason is due to the increased social isolation. Elderly people who live alone are more likely to lack social engagements, and contacts with family members, relatives, and neighbors. Therefore, socially isolated elders are more likely to die alone and remain undiscovered.

Other reason: Early retirement, divorces, worsened health and higher youth unemployment, among others, increase social isolation and single-household that could lead to the lonely deaths of people in the middle-aged and youth brackets.

Cultural issue: McDonald[4] in New York Times reported that the "Japanese trait of uncomplaining endurance," discourages people in need from seeking help from neighbors and authorities." and he mentioned that "Victims of lonely deaths have been described as 'slipping through the cracks' between governmental and familial support In particular, older men are particularly susceptible and vulnerable because of pride and an unwillingness to ask for help. These cultural traits are also prevalent in Korea.

Lonely and Poor: Making matters worse, people living alone are often reported to be poor. According to Statistics from Korea Government[1], the average income of one-person households in South Korea was 3.51 percent lower than the same period in the

previous year. It is similar in Japan. Many incidents of lonely deaths have involved people who were receiving welfare or had few financial resources[4].

Preventive measures

In Korea, in order to prevent lonely deaths, currently, social workers, volunteers, or caretakers visit the homes of elderly people living alone at least once a week started in 2007. These caretakers usually keep in contact with elderly citizens and are instructed to call them frequently.

Also, there is an effort to increase social awareness and engagement about lonely deaths. In Japan, some districts[5] have begun campaigns and movements to prevent lonely deaths, which include scheduled social events and checking in on the well-being of elderly citizens. Also, they encourage neighbors to keep an eye out for each other. This can keep the isolation low and reduce the risk of lonely deaths.

Opportunity for long-term self tracking

The actual vulnerable people who are exposed to lonely deaths would be much higher than current social workers and volunteers can handle. There is an opportunity for a long term tracking technology that can automate and better manage this process, and be more responsive for a much larger exposed population.

In addition, long-term tracking and sharing of data among community members, neighbors, medical professionals, social workers, and close friend groups can maintain, and increase social engagements and reduce isolations.

Also, in Korea, smart LED[6,7,8] and smart home devices[8] have been deployed to the houses for underprivileged senior citizens aged 65 or older. The sensor, which detects the movement of the resident, automatically notifies the apartment management center if there is no movement detected for a certain period of time. The system will be activated only when the resident wants.

However, these devices are only deployed to small number of elders who were getting welfares, and use old 2G technologies[6,7]. Due to the significant advancement in low cost smart sensing, and IoT devices such as a light emitting diode lighting sensor, carbon dioxide sensor, and data on energy use, we expect that these devices and networking technologies can effectively monitor elders' activity.

Often, elders do not have anyone to talk to and that would be the main cause of their loneness as shown here: "From where I see it, the elderly just want someone to talk to. What's most important about elderly welfare is to prevent them from feeling lonely." Other AI devices such as an AI speaker, VR, and enhanced chatbot technologies can increase social interactions, and connect and engage elders more with outside. Hence, there is a potential for tracking data from IoT devices can lower the social isolation.

Each person behaves differently, and his/her living patterns and styles vary. Therefore, long term self-tracking needs to be customized and personalized for each person. With the power from the latest AI/machine learning technologies, long-term tracking data can be used to train, and provide more personalized prevention and detection method for each elder.

Challenges

One of the major challenges is to cope with privacy: what data to share, and whom to share with. Since long term tracking data would include personal, medical, and behavior data. If maliciously used, then it can significantly harm the elders. Therefore, privacy-preserving technologies such as data anonymization, safely allowing sharing, and encryption methods have to be addressed.

Developing interaction technologies, which elders can easily use, is the next technical challenge. Supposedly, elders do not need to control devices, as they are passively monitored from smart devices. However, if something goes wrong, such as reset, power outage, etc., the control and interaction interfaces must be easy to use.

As mentioned, many of vulnerable elders are poor, and may not be able to afford smart devices. Developing low-cost easily deployable long-term self-tracking devices would be necessary to cover and help more elders.

Developing a more engaging social app can lower social isolation, increase vitality, and determine what data need to be collected and shared. Therefore, interdisciplinary approach is needed to plan and develop socially good long-term self-tracking apps involving researchers from different fields.

Conclusion

Lonely deaths have become an increasingly important social problem in Korea and Japan. Long term tracking can possibly help detect, mitigate, and prevent lonely deaths, and provide a viable solution using smart sensors and IoT devices.

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