

MutualMonitor: Monitoring Activities of Elderly People Anonymously Using a Smartphone Application

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Abstract

The advancement in medicine and technology has led to the subsequent increase in the life expectancy of elderly people. However, due to their children moving away, and loss of spouse, friends and relatives, most of them are forced to live in isolation. A survey by the Japanese Ministry of Internal Affairs and Communication from 2015 stated that there are about 22 million households with elderly residents with age over 65, and moreover almost 6 million elderly live alone. Hospitals, and care homes are crowded, uncomfortable and expensive, while caretakers are expensive and few in number. Home monitoring services are available, but they also have issues related to privacy and security. In this dissertation, we present an anonymous monitoring system through which it is possible to check day-to-day basic activities of the elderly such as medicine intake, shower, and food intake, and determine if the elderly is in normal state or requires some assistance. We do not disclose any personal information of the elderly to the monitor, hence making our system anonymous. Similarly, our intention is that our system, a smartphone application, will be used by elderly people to monitor each other and check daily activities to predict or prevent any emergency situations, making the monitoring process mutual.

One of the challenges of our system is that the elderly people should be able to use it effectively. Since the use of smartphones among the elderly has rocketed in recent years, we developed a smartphone application specially targeted for elderly. Moreover, we need the elderly to check the application regularly to predict or prevent any irregularity in the activities as quickly as possible. Hence, to amplify its use, we send notifications regularly in the application as soon as an activity is detected, so that the monitor will be duly updated with the current activities of the elderly. Advent of different sensors such as light, motion, and power meter, can be effectively used to detect activities such as cooking, eating, bathing, etc. These data, obtained over a period of days, can thus be utilized to visually represent the time and duration of various activities. The application, MutualMonitor, displays timeline view of 7 activities: sleep, shower, medication, breakfast, lunch, dinner and entertainment. The graphical representation consists of the activity completion time of current and preceding days. Information about the duration of the activity is also provided. The users are then able to determine if the elderly is in a normal condition or not, judging by the duration and state of completion of the activity, and report whether the situation is normal or suspicious. We created a dataset which includes some suspicious situations and conducted experiments with MutualMonitor application with several participants in order to determine the monitoring capabilities of the users. As a result, more than 75% of the notifications were responded by the users, and more than 70% of suspicious situations were identified correctly.