Fraunhofer
PORTUGAL

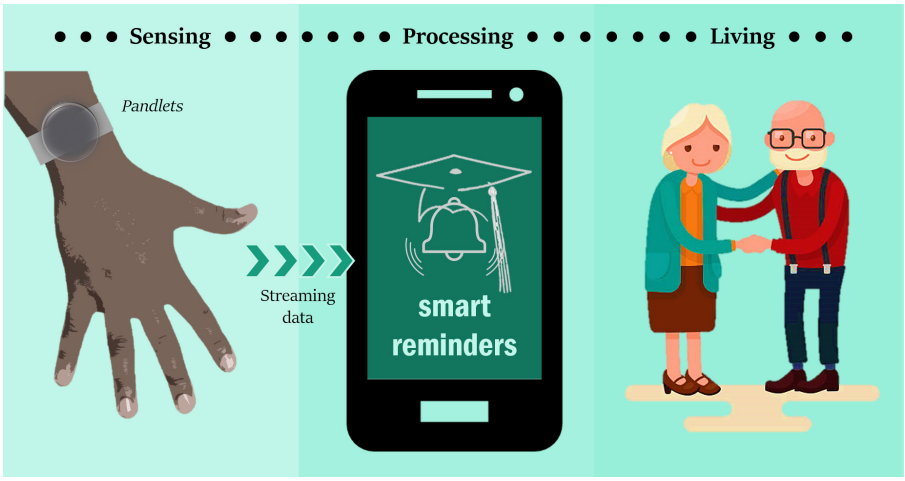

Fig1. *SmartReminders* operating principle.
Sources: (Hand) worldwhiteweb.net / *by Johanna Burai* | *(Elders) iStockPhoto.com.*

SMARTREMINDERS

EATING AND DRINKING RECOGNITION FOR TRIGGERING SMART REMINDERS

The problem

Nowadays, the increasingly ageing society of developed countries has raised attention to the senior population. **Senior isolation** is one of the alarming situations, since it potentiates risky and unhealthy behaviors, like **neglecting meals, ingesting a very low amount of fluids and improperly ensure pharmacological treatment**.

Eating, drinking and taking prescribed medication are intimately related daily activities. Medicine intake is frequently associated with meal periods and water ingestion. Therefore, when one of these activities is neglected or forgotten, this behavior is likely to propagate to the other activities, promoting a vicious cycle of dangerous conducts.

The solution

Looking at the problem in hands with technological goggles led to the conclusion that a smartphone application capable of triggering reminders in opportune daily moments may be very useful in such situations. To be able **to issue smart reminders to autonomously living seniors, relying on the knowledge of their current and past eating and drinking status**, is, therefore, the main goal of *SmartReminders*.

To that end, **an algorithm for real-time recognition of eating and drinking moments in free-living conditions** was developed, requiring only inertial data from the dominant wrist of the user.

Contact

Rua Alfredo Allen, 455
4200-135 Porto, Portugal

+351 220 430 300
info@fraunhofer.pt
www.fraunhofer.pt

System setup

SmartReminders only requires inertial data from the dominant wrist of the user. Data is collected and processed by a smartphone, which issues reminders at opportune daily moments based on the eating and drinking predictions of the recognition model. It is that simple.

Features

- User-independent
- Minimal obstructiveness
- Computationally efficient
- Real-time response in free-living conditions

Smart reminders? When?

Based on the prediction of meal periods and drinking moments in real-time and real-world conditions, **the issue of automatic reminders in opportune occasions** is possible.

These reminders can rely on the assessment of how long the user goes without drinking any fluids to infer on its hydration status and persuade the user to have a glass of water, for example. Other conclusions can yet be withdrawn from the developed solution in terms of medication-taking behavior. For example, if the user drinks something before a meal takes place it is quite probable that it took its before-meal medication. However, if the user did not drink anything, a reminder of which medicines to ingest should be triggered.

How does it work?

Reminders shall be issued based on the predictions of the eating and drinking recognition model. **Predictions are withdrawn every 10 seconds.** However, meal-related reminders are only enabled when the user is predicted to be eating for over 5 minutes. This is a preventive measure, since during a typical day there are many random gestures and even sequences of movements that resemble eating. In this sense, the 5 minute threshold optimized the trade-off between opportune timing and prediction certainty. On its hand, the model delivers the final decision on the drinking status with 10 seconds' delay.

The performance of the *SmartReminders* recognition model was assessed with a 16-h continuous acquisition of an independent user in free-living conditions. All the meal periods in the acquisition were identified, as well as 30 of the 35 drinking moments, resulting in an overall recognition weighted accuracy of 88%.

All in all, it is possible to conclude that the proposed method succeeded in addressing the predefined requirements, by being an efficient solution with very low obstructiveness, which functioning does not depend on the user. Therefore, it is safe to say that **the information returned from the algorithm shall provide an adequate basis in which to base the triggering of useful reminders for autonomously living elders**.

Recreating autonomous living for seniors

By promoting self-awareness, independence and overall healthy behaviors, *SmartReminders* brings convenience to seniors' lives. Moreover, it aims to ease care providers, which shall be more confident that their loved ones are ensuring proper self-care.

A simple solution that shall improve quality of life by **promoting safe and worry-free conditions of autonomous living for our elders**.

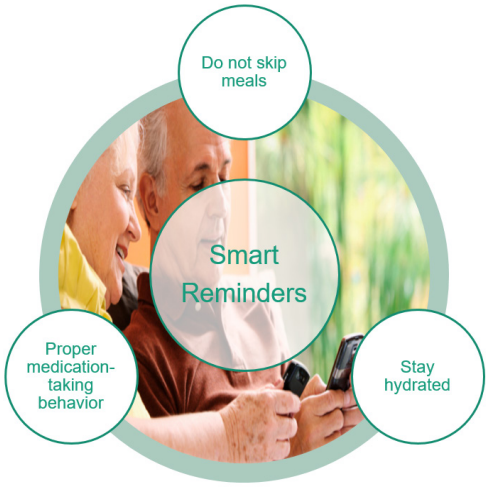

Fig2. Healthy behaviors promoted by *SmartReminders*.
Source: verizonwireless.com.