

# EMERGE

## Emergency Monitoring and Prevention

EMERGE intends to model the typical behavior of elderly people with medical risks following an integrated approach that uses ambient and unobtrusive sensors, in order to detect deviations from typical behavior, reason on acute disorders, and prevent emergencies.

### Objectives of the Project

Ongoing demographical and social changes in most European countries will result in a dramatic increase in emergency situations and missions within the next years. Already today, 44 % of emergency medical services (EMS) system resources are dedicated to patients over 70 years.

On the downside, this will result in higher costs for the EMS, which already have to cope with cost restrictions today, in substantially diminished service quality, or, in all probability, in both of these. Unfortunately, a high quality and affordable EMS in case of an emergency is an essential prerequisite for the independent life of elderly people in their preferred environment.

EMERGE tries to improve emergency assistance through early detection and proactive prevention. Ambient and unobtrusive sensing is used to enhance user acceptance. As a consequence, the quality of life for elderly people can increase. Costs for EMS can be leveraged for the elderly as well as for public health and society.

The main goal of EMERGE is to develop and implement a model for recurring behaviors and experiences of elderly people following an integrated approach in order to detect deviations from their typical behavior and to reason on acute disorders in their health condition.

The project's objectives are, therefore, to

- identify and model the most promising application scenarios for integrated emergency assistance,
- transfer the emergency model into an application design,
- identify and engineer suitable ambient information technology,
- engineer an adequate system architecture and platform, and
- validate the models and the engineered system in laboratory and field trials.

### Project Description

The approach in EMERGE is to reason about situations based on information collected from ambient, unobtrusive, and non-invasive sensors in the home environment of elderly people. This raises the challenge to cope with inherently unreliable and imprecise data, as well as the need to adapt the system to the specific conditions and demands of the assisted persons.

*"Ambient and unobtrusive sensing is a major user requirement for high acceptance of emergency monitoring in everyday life"*

In EMERGE, we will tackle this problem with an intelligent sensor fusion approach in combination with a sound emergency model, describing the environment, individual diseases, parameters to monitor, potential emergency situations, and corresponding treatment options.

In order to reach the goal of EMERGE we will do the following work:

- Use ambient intelligence technology for unobtrusive monitoring of elderly people's situations at home. EMERGE uses non-body-mounted sensors for environment and activity tracking, building automation facilities, and location tracking. Body-mounted sensors to monitor vital functions are used only if this cannot be done in an ambient way.
- Sensor fusion combines sensor data from different sources in an intelligent way in order to cope with the inherent imprecision and unreliability of the environmental data.
- Situations and upcoming emergencies will be detected in a reasoning process by
  - detecting situations based on fused sensor information, and
  - identifying conspicuous situations based on the knowledge in the emergency model.

### Practical Example

The impact of the prototypical solution will be measured with tests in a controlled environment in an Assisted Living Laboratory and two real-life evaluations.

We will evaluate from the professional point of view, the technological point of view, and the user point of view in a two-step evaluation:

1. The solution will be tested with small case scenarios in the Assisted Living Laboratory of Fraunhofer IESE, which represents a close-to-real life environment of elderly people.
2. A real-life evaluation will then be conducted with case studies at two partner sites.



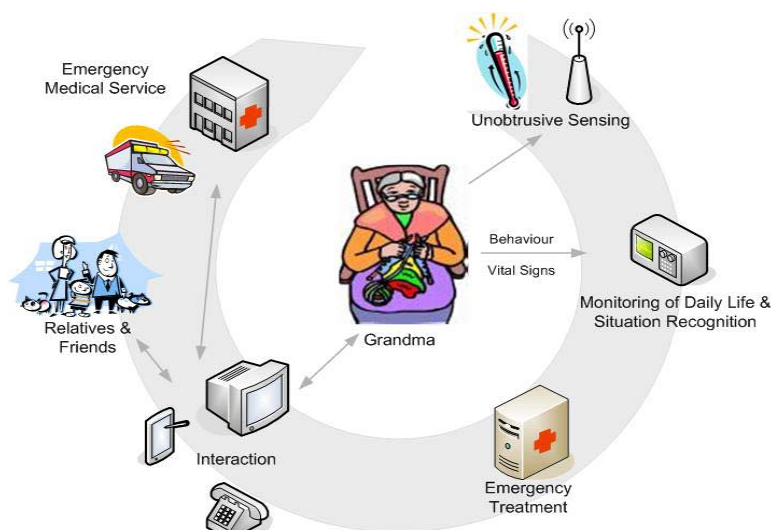
- Anticipated emergency situations are resolved with a stepwise approach:
  1. Natural interaction with the affected person by means of appropriate ambient intelligent devices.
  2. Integration of relatives and caregivers.
  3. Notification of a public EMS system providing a) acute medical care, b) telemedical counseling, or c) activation of social or rescue services depending on the specific emergency situation.
- A systematic validation of the models and the engineered prototype will be performed in a two-step evaluation: a lab test and two field trials. The goal is to receive feedback on chronic diseases, useful environmental sensors, and helpful interaction to resolve upcoming or acute emergency situations.



## Expected Results & Impacts

The outcome of EMERGE will be the emergency model, the validation of its feasibility and usability in a lab test and field trials, and finally, if our approach is successful, medical and technological guidelines for emergency monitoring and prevention for elderly people with ambient and unobtrusive sensors.

We expect that our work will have an impact on standard operating procedures in medical science, where medical guidelines for diagnostics and therapeutical treatments are provided.



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