



COMPETENCE CENTRE - BME

Biomedical engineering is the field of one of the fastest growing modern industries in the world. An important reason for this is population aging. Another important reason is the exceptionally fast development of new technologies and medical techniques in this field. In Slovenia biomedical engineering has a long tradition. Therefore, the biomedical engineering industry is one of the few industries in Slovenia that develops, manufactures, and under its own brand, markets and sells high technology products worldwide. Slovene biomedical companies are the hidden champions of the global market, thriving on the demanding global market mainly because of their strong focus on the development of high technology. However, the development of high technology is very fast and unpredictable. This presents a challenge for relatively small companies, as these can not remain specialized for the type of technology they are strongest at, but must follow the development of an increasingly wide range of very different technologies. The proposed Biomedical Engineering Competence Center (CC BME) is the Slovene industry's answer to the challenges of the global market.

CC BME's long-term common goal is to establish Slovenia, on the global map, as an incubator of the most innovative companies with, from a marketing perspective, the most interesting biomedical devices in the world. BME has to become one of Slovenia's recognizable brands.

The Competence Center BME's long-term common strategy is the permanent establishment of a large virtual research and development group of companies and the academic sphere from the field of biomedical engineering, which will have a suitable critical mass of knowledge and human and material resources for fast transfer of research findings into selling products and revolutionary technological breakthroughs on the global market.

With its establishing partner line-up BME is designed to integrate the best that Slovenia has to offer from the field of biomedical engineering, both in scientific and in technological and economic terms. Integrating R&D capabilities and an interdisciplinary approach to solving R&D tasks within BME, opens for the participating partners entirely new development opportunities in a field that has a great potential for development both in the academic sphere and in the economy. BME's program allows greater concentration of investments in the field of new technologies and medical applications, closer cooperation between the scientific sphere and the economy, and a faster flow of knowledge into products and services with high added value.

The submitted initial three-year program is primarily focused on research and development of products and applications that reduce the invasiveness of medical treatments, and increase kindness and diagnostics frequency. Projects within the program are designed to synergistically connect scientific, development, manufacturing and market potential in Slovenia towards the development of winning products on the global market. Projects comprise of a synergistic combination of developing new therapeutic sources and new or significantly improved control and diagnostic sensors, and control directly or from the remoteness of the actual devices, patient or therapeutic procedure.

The partners' ambition is that BME become the central knowledge institution for applied research in the field of biomedical engineering in this part of the EU, and an important link between the institutions that develop new fundamental knowledge and the economy, and in doing so, a catalyst for the transfer of new technologies into commercial use.

Within the frame of CC BME is active 5 projects:



- PhysiCoDerm
- SAMinZDRAV (leading partner is Gorenje, d.d.)
- SmartMed
- TOF-PET
- MINMED

PROJECT »SAMinZDRAV«

The final objective of R&D project is to investigate and demonstrate the preferred implementation technology of components for building a system that will unobtrusively acquire and evaluate the parameters of functional health. This system will help people to prolong their independent and healthy living. Research will be based on the iGorenje architecture, a proprietary platform of the project's partner Gorenje, which connects the household appliances and home devices through the integration scheme called XMC. Three levels of technological processes and sensor components will be researched in the relationship to the iGorenje architecture:

- Assessment of functional health by observing the way the user utilizes household appliances and other home devices
- Acquiring the parameters of functional health by using sensor components and computer processing algorithms that are added on household appliances and home devices
- Acquiring the parameters of functional health and facilitate independent living by using separate computer devices and algorithms associated with household appliances and living environment.

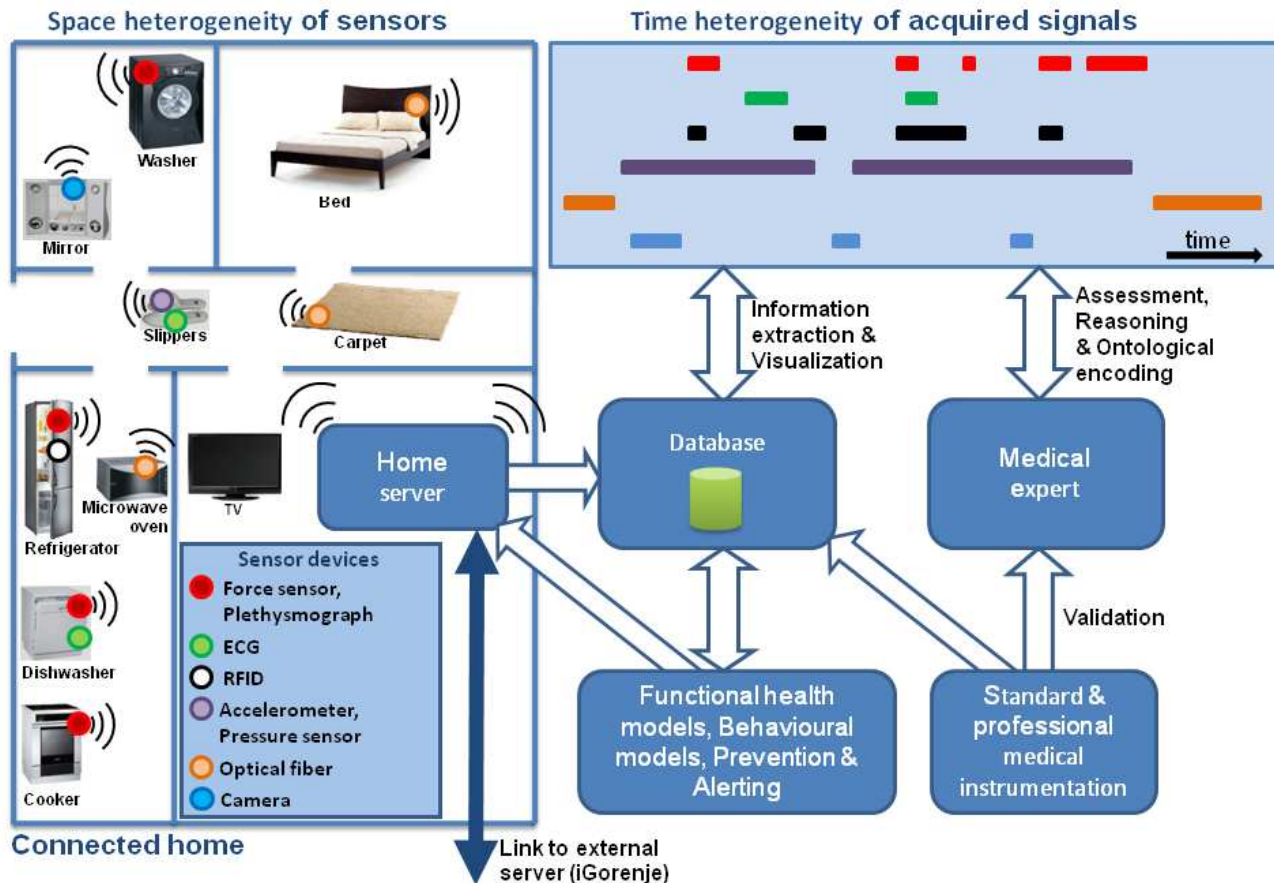




Figure 1: Project scheme

Figure 1 illustrates the concepts for extracting the parameters of functional health in a way that substantially exceeds the current state-of-the-art and includes many innovative components. The proposed project SAMinZDRAV provides research and technology verification, which will lead to the development of new components, technologies and complex algorithms. They will be based on the subsequent implementation of a distributed system for monitoring parameters of functional health and prolonging independent living.

Research will focus on two broad categories of activities. The first group comprises new functionalities of home devices. The following technologies and methodologies will be explored and validated by laboratory technological demonstrators:

- Identification of the ways of utilization of household appliances and estimation of correlations between the utilization and the parameters of functional health.
- Acquisition, processing, evaluation and classification of information obtained by additional sensors and algorithms prepared for an installation in household appliances.
- Design and construction of separate components with new, innovative measurement and analysis of the parameters of functional health. These components will operate unobtrusively and autonomously in living environment (e.g. in bed).

These techniques of data acquisition will generate time series of heterogeneous, multi-modal information flows or signals. Another group of research activities is, therefore, focused on fusion, interpretation and validation of information within the iGorenje architecture in order to:

- Design miniaturized components for wireless communication with long-term autonomy.
- Study and develop new security protocols for flexible adaptation of the distributed and scalable networks of intelligent biomedical sensors.
- Formulate protocols for optimal integration and synchronization of large volumes of multi-modal, temporally heterogeneous data on functional health in the monitored persons.
- Explore approaches to specialist medical validation by using standardized medical devices and indirect evaluation and ontological coding.

Continuing development in the fourth project year, which is no longer in the framework of the requested research funding, will be based on these results. Optional implementation of new prototype solutions is expected to be installed in the controlled environment of medical institutions as well as unsupervised homes. This will help grow the health and functional models of behaviour and the decision rules for the prevention and follow-up. Entirely new infrastructure will appear, which will support development and expand new services for various user types (e.g. elderly, people with special needs, etc.).