Health-e-Child (HeC)

ICT for Health

The Health-e-Child project aims at developing an integrated healthcare platform for European paediatrics, providing seamless integration of traditional and emerging sources of biomedical information. The long-term goal of the project is to provide uninhibited access to universal biomedical knowledge repositories for personalised and preventive healthcare, large-scale information-based biomedical research and training, and informed policy making.

Objectives of the Project

- ✓ To gain a comprehensive view of a child's health by vertically integrating biomedical data, information, and knowledge, that spans the entire spectrum from genetic to clinical to epidemiological;
- ✓ To develop a biomedical information platform, supported by sophisticated and robust search, optimisation, and matching techniques for heterogeneous information, empowered by the Grid;
- ✓ To build enabling tools and services on top of the Health-e-Child platform, that will lead to innovative and better healthcare solutions in Europe:
  - Integrated disease models exploiting all available information levels;
  - Database-guided biomedical decision support systems provisioning novel clinical practices and personalised healthcare for children;
  - Large-scale, cross-modality, and longitudinal information fusion and data mining for biomedical knowledge discovery.

Motivation:

There is a compelling demand for the integration and exploitation of heterogeneous biomedical information for improved clinical practice, medical research, and personalised healthcare for the citizens of the EU.

Project:

The Health-e-Child project focus will be on individualised disease prevention, screening, early diagnosis, therapy and follow-up of paediatric heart diseases, inflammatory diseases, and brain tumours. The project will build a Grid-enabled European network of leading clinical centres that will share and annotate biomedical data, validate systems clinically, and diffuse clinical excellence across Europe by setting up new technologies, clinical workflows, and standards.

Project Description

Like most activities in society today, medical practice as well as research is intimately dependent on information technology. From DNA sequencing to laboratory testing and epidemiological analysis, clinicians and researchers produce as well as search for information, as part of their daily routine and decision making. Taking advantage of technology has improved dramatically the quality of these activities' results, facilitating better health-care provision and more advanced biomedical research. Nevertheless, the current state of affairs is still severely restricted with respect to the kind of information that is available to clinicians. None of the current long-term targets of the field, e.g., personalised medical care, distributed medical teams, multidisciplinary biomedical research, etc. can be realised given the present level of technology support.

Vertical integration of information across biomedical abstraction, including all layers of biomedical information (i.e., genetic, cell, tissue, organ, individual, and population layer) to provide a unified view of a person's biomedical and clinical condition is the corner stone of the HeC project.

Health-e-Child aims at filling the gap between what is current practice and the needs of modern health provision and research. Its goal is to eventually overcome some constraints, e.g. clinicians focusing on a particular genre of information, etc. of today's systems and empower clinicians to further advance their profession. Ultimately, with the Health-e-Child system, information will have no conceptual, logical, physical, temporal, or personal borders or barriers, but will be available to all professionals with the appropriate level of clearance.

The vision is for the Health-e-Child system to become the universal biomedical knowledge repository and communication conduit for the future, a common vehicle by which all clinicians will access, analyze, evaluate, enhance, and exchange biomedical information of all forms. It will be an indispensable tool in their daily clinical practice, decision making, and research. It will be accessible

at any time and from anywhere, and will offer a friendly, multi-modal, efficient, and effective interaction and exploration environment.

Clearly, any effort towards this vision requires significant change in the biomedical information management strategies of the past, with respect to functionality, operational environment, and other aspects. Contrary to current practice, the vision requires that the Health-e-Child system be characterised by the following:

- Universality of information: handle "all'' relevant medical applications and manage "all'' forms of biomedical content.
- Person-centricity of information: synthesise all available information about each person in a cohesive whole.
- Universality of application: comprehensively capture "all'' aspects of "all'' biomedical phenomena, diseases, and human clinical behaviours.
- Multiplicity and variety of biomedical analytics: provide a rich and broad collection of sophisticated analysis and modelling techniques to address the great variety of specialised needs of its applications.
- Person-centricity of interaction: The primary concern of any user interaction with Health-e-Child should be the persons involved.
- Globalness of distributed environment: be a widely distributed system, through which biomedical information sources across the world get interconnected to exchange and integrate their contents.
- Genericity of technology: For economy of scale, reusability, extensibility, and maintainability, Health-e-Child should be developed on top of standard, generic infrastructures that provide all common data and computation management services required.

With respect to medical applications, Health-e-Child focuses on paediatrics, and in particular, on some carefully selected representative diseases in three different categories: paediatric heart diseases, inflammatory diseases, and brain tumours.

Impact:

The activities and outcome of the Health-e-Child will have substantial impact on:

- **Strategy:** Enhancing the *level and quality* of medical services offered in Europe and will significantly advance medical research, beyond what is traditionally possible and *improvement of the competitiveness* in the area of medical service provision and will facilitate the adoption of new policies in member state.
- **Technology:** *Bringing forward information-based medical technology* and *integration of mostly separate areas*, i.e., vertical information integration, advanced medical querying, Grid infrastructures, disease modelling, medical imaging, knowledge discovery and data mining, and decision support.
- **Society and economy:** *Improvement of the success rate* in resolving difficult medical cases, *saving children's lives*. Furthermore, such improved medical decision making will often result in *lowering medical cost* and/or treatment duration.

To ensure its impact, the Health-e-Child project will carry out various networking activities, beyond the provision of the system and its underlying research. An important part of the networking activities as well as of the general project strategy will be the establishment of strong liaisons with other national and international research initiatives. Added value will be achieved by carrying out the project at a broad European level.

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