Overview of FP7 FET-Open Projects

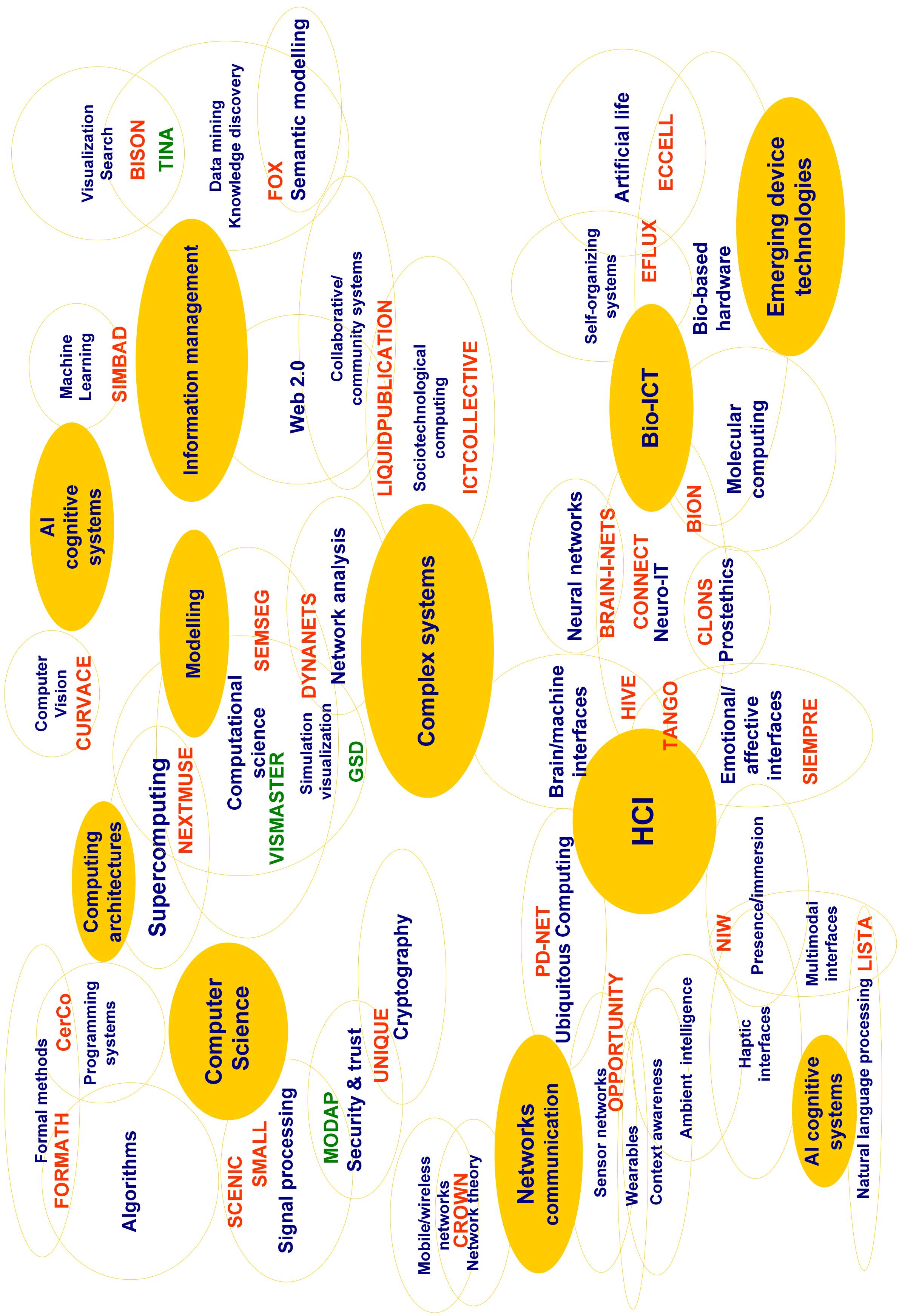
Research Projects and Coordination Actions (batches 1-7)

Future and Emerging Technologies

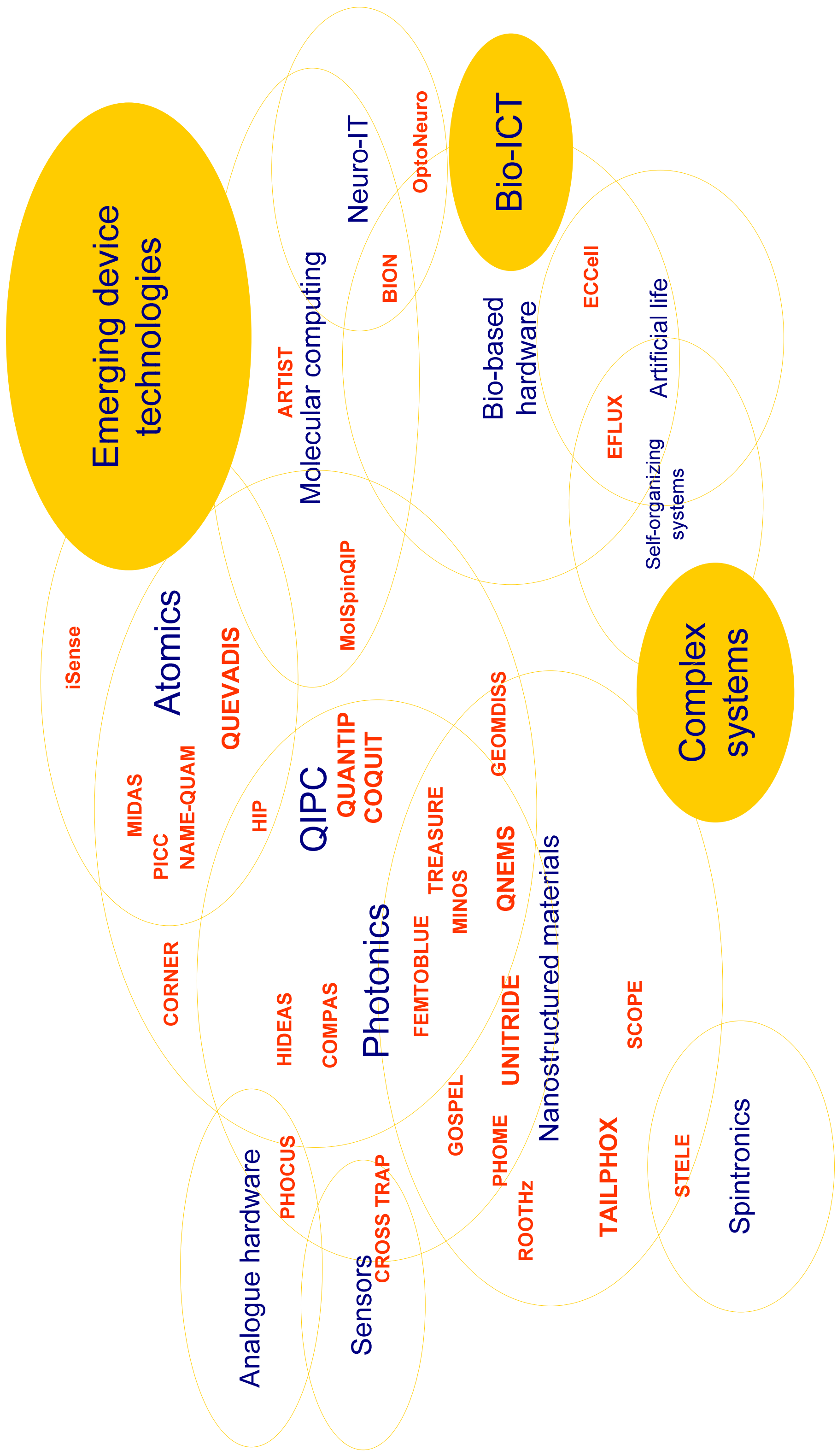
January 2010

European Commission
Information Society and Media

PROJECTS OVERVIEW



Visualization
Search
BISON
TINA
Data mining
Knowledge discovery
FOX
Semantic modelling
Machine Learning
SIMBAD
Information management
Web 2.0
Collaborative/ community systems
LIQUIDPUBLICATION
Sociotechnological computing
ICTCOLLECTIVE
AI cognitive systems
Computer Vision
CURVACE
Modelling
Computational science
SEMSEG
DYNANETS
Network analysis
Complex systems
Simulation visualization
GSD
VISMASTER
Supercomputing
NEXTMUSE
Computing architectures
Computer Science
Formal methods
CerCo
Programming systems
FORMATH
Algorithms
SCENIC
SMALL
Signal processing
MODAP
Security & trust
UNIQUE
Cryptography
Mobile/wireless networks
CROWN
Network theory
Networks communication
Artificial life
ECCELL
Self-organizing systems
EFLUX
Bio-based hardware
Emerging device technologies
Bio-ICT
Molecular computing
BION
Neural networks
BRAIN-I-NETS
CONNECT
Neuro-IT
CLONS
Prostethics
Brain/machine interfaces
HIVE
TANGO
Emotional/ affective interfaces
SIEMPRE
HCI
PD-NET
Ubiquitous Computing
OPPORTUNITY
Sensor networks
Wearables
Context awareness
Ambient intelligence
NIW
Presence/immersion
Haptic interfaces
Multimodal interfaces
LISTA
AI cognitive systems
Natural language processing


Emerging device technologies
Bio-ICT
Complex systems
Neuro-IT
OptoNeuro
BION
Molecular computing
ARTIST
Bio-based hardware
ECCell
Artificial life
EFLUX
Self-organizing systems
MolSpinQIP
iSense
Atomics
QUEVADIS
MIDAS
PICC
NAME-QUAM
HIP
QIPC
QUANTIP
COQUIT
GEOMDISS
TREASURE
MINOS
QNEMS
CORNER
HIDEAS
COMPAS
Photonics
FEMTOBLUE
UNITRIDE
Nanostructured materials
SCOPE
GOSPEL
PHOME
ROOTHz
TAILPHOX
STELE
Spintronics
Analogue hardware
PHOCUS
Sensors
CROSS TRAP

FET-OPEN PROJECTS

ARTIST aims at exploring alternative routes towards long distance (above 10 nm) information transport and storage at the atomic and molecular scale. It suggests new solutions for optical and electrical addressing of molecules, efficient inter-molecular communication and compatible data storage. It will implement new concepts and methods for molecular electronics based on nanoscale plasmonic waveguides, electrostatics and single charge injection by weak coupling to nanocapacitors. This proposal's overall goal will open the way to a completely new nano-scale technology for Information processing and storage.

BION will develop a new technology for the production of functional molecular assemblies, which can perform advanced tasks involving learning and decision making, and which can be tailored down to the nanoscale. BION will use data from neuroanatomy and neurophysiology as a guide for the fabrication of deterministic and statistical networks of polymeric non linear elements with adaptive properties. The polymer network shall be prepared using molecular deposition and self assembly techniques in two and three dimensions.

BISON will develop tools that support knowledge discoveries that transcend the boundaries of multiple domains. Bison will implement massively connected networks holding associations between pieces of content combined with novel graph analysis and processing methods, as well as idea-triggering, visual exploration tools. By providing a fundamentally new paradigm of associative, explorative access to heterogeneous information sources, BISON will support knowledge discoveries transcending the boundaries of multiple domains.

BRAIN-I-NETS is to apply and extend new cutting-edge experimental techniques to produce a set of rules for synaptic plasticity and network re-organisation that describe the actual adaptive processes that take place in the living brain during learning. The goal of this proposal is to port essential aspects of learning in the intact brain into current and next-generation neuromorphic hardware. New interchangeable software tools, that have recently been developed in the FP6 project FACETS, will be employed to carry out these investigations.

CERCO will construct a formally verified complexity preserving compiler from a large subset of C to some typical microcontroller assembly, of the kind traditionally used in embedded systems. The work involves the definition of cost models for the input and target languages, and the machine-checked proof of preservation of complexity (concrete, not asymptotic) along compilation. The compiler will also return tight and certified cost annotations for the source program, providing a reliable infrastructure to draw temporal assertions on the executable code while reasoning on the source. The compiler will be open source, and all proofs will be public domain.

CLONS will develop technological solutions to increase the quality of life for people affected by vestibular disorders. Two sensory neural prostheses will be developed and tested: CLONS1 for restoring vestibular information by stimulating the semicircular canals and CLONS2 for helping people affected by Ménière's Disease (experienced vertigo, dizziness and imbalance). Clinical trials will be carried out at the end of the project to assess the effectiveness of the CLONS demonstrators.

COMPAS will investigate the hitherto unexplored potential of the continuous variables (CV) approach to quantum computing. COMPAS will address all necessary steps on the way to mesoscopic CV processors. This includes the design of the physical implementation of non-Gaussian operations on light and atoms exploiting the measurement-induced or actual nonlinearities between light and atoms, the engineering of non-Gaussian photonic and atomic states, CV computing with cat states, error correction, entanglement distillation, and quantum repeaters.

CONNECT aims to create atlases of the brain's connectivity in different decades of life, to serve as a long-lasting reference for the neuroscience and medical community. In the last two decades there have been impressive advances in understanding brain function using new neuroimaging methods. However to understand brain function, it is also important to characterize its structure and connections. By developing new methods for characterizing micro-structural tissue properties and macro-structural connectivity, the goal is to enable diffusion MRI technology to become a powerful non-invasive clinical virtual biopsy tool.

COQUIT aims at designing quantum algorithms that can be implemented in terms of operations that are easily feasible on many particle quantum states and to investigate quantum devices with limited control. Typical examples are many particle quantum systems such as cold atoms in optical lattices or other multi-atom ensembles, which can be manipulated collectively but not individually. Such restrictions are currently one of the biggest obstacles against working quantum computers. Instead of improving the corresponding experimental methods, this project aims at a systematic study of the tasks which can be performed with currently available techniques.

CORNER will extend current quantum information theory to encompass correlated noise effects and explore them in basic experiments. The project will proceed along three interconnected research lines: I. FOUNDATIONS: The development of the general theory of memory channels and their properties; II. MODELS: The study of concrete noisy channel models and their capacities in various realistic settings; III. IMPLEMENTATIONS: The experimental proof-of-principle realizations of communication in the presence of memory effects both for classical and quantum information for public and private use of the channel. The final results of the project should pave the way for QI processing on a large scale, which involves fast communications and small processors.

CROSS TRAP seeks to develop a versatile method for standoff chemical identification of trace amounts of airborne pollutants, such as biochemicals, bacterial threats and explosive materials that can be fingerprinted using their characteristic vibrational Raman spectral signatures. The core idea is to enable a free-space scheme for coherent anti-Stokes Raman scattering (CARS) in the direction exactly reversed with respect to an outgoing laser excitation, so that the probe beam can be arbitrarily pointed in any unobstructed direction and an enhanced backward propagating signal detected at the laser source using a LIDAR-type apparatus. The radical advantage, as compared to incoherent light probing techniques, lies in coherent enhancement, which implies that light fields are phase-matched, so that the signal propagation is confined to very narrow solid angle and the signal magnitude scales quadratically with interaction length and the concentration of the resonantly vibrationally excited molecules.

CROWN aims to solve problems of 1) distributed interference awareness and 2) communicating over as many as possible concurrent channels in the same communication spectrum with minimal mutual interference, enabled by smart antenna systems. Europe is in the midst of a communications revolution facilitated, in part, by advances in wireless communications, such as wireless internet. In order to address inefficient network spectrum regulatory authorities have introduced an initiative to improve utilisation of the licensed spectrum by removing the regulatory barriers, thereby introducing the concept of dynamic spectrum licensing.

CURVACE aims to develop artificial compound eyes, composed of micro-lens arrays arranged on planar, curved, and flexible surfaces, integrated with individual adaptive photoreceptors and processed by neuromorphic vision filters to rapidly extract motion-related information. Compared to conventional cameras, artificial compound eyes offer a much larger field of view in a more compact form with less distortion, aberration, and blur. Curved versions of the artificial compound eyes will offer space within the convexity for embedding processing units, battery, or rate gyroscopes useful for motion-related computations.

DYNANETS will study and develop a new paradigm of computing through Dynamically Changing Complex Networks reproducing the way nature processes information. It will develop the theory and methods of dynamical networks and provide new insights into the underlying processes of nature, economy, and society. As a pilot study they will investigate the dynamics of the HIV and influenza epidemics from the molecule all the way up to the population.

ECCELL will develop the first programmable chemical cell. This will lead to a paradigm shift to digitally programmable chemical systems. Chemical cells must combine self-replication, self-containment and self-regulation of resources (metabolism) enabling evolution to qualify as alive. ECCell will employ novel families of fully synthetic hybrid informational polyelectrolyte copolymers (not simply DNA), which simultaneously support all three cell functionalities. The research will establish an effective IT interface between microelectronic and molecular information processing, by demonstrating its use to achieve a hard chemical synthetic systems objective (an artificial cell) opening a platform for programming a novel chemical living technology at the microscale.

EFLUX will develop new ICT technologies for microfluidics. The project builds on insights from comparative investigations of results on cooperation, adaptation, robustness and evolvability that could be utilized by future biomimetic and biology-inspired, reproducible and mutable ICT devices. Some of the aims are: (1) To develop IT-controlled microfluidics for the manipulation of artificial and natural cells. (2) To demonstrate by experiments how bio-complexity can increase by evolutionary modification. (3) To better understand the principles of information and evolution in natural and artificial bio (mimetic) IT systems (4) Build an "evolution machine" by the development of a (semi-)automated serial-transfer protocol using micro- or mini-fluidics.

FEMTOBLUE aims to create a new technological base for ultra-fast semiconductor laser diode devices producing femtosecond optical pulses in the blue and violet spectral range. This new technology will lay the foundation for miniature portable femtosecond lasers in the blue-violet range that will replace traditional sources, and will support developments in the fields of ultra-fast optical spectroscopy, high-resolution lithography, quantum optics, optical comb frequency standards, fluorescence decay analysis and biomedical diagnostics.

FORMATH is to make formal proof verification available to domains that were hitherto beyond the reach of proof systems. Mathematics is already playing a crucial role in the design of sophisticated systems that are used daily, in geometrical modeling, robotics, etc. This use of mathematics will increase, and correctness and reliable specification of these systems will become more and more important. The research work involves developing libraries of formalized mathematics concerning linear algebra, real number computation, and algebraic topology. The main originality of this proposal will be to structure these libraries as a software development, relying on a basis that has already shown its power in the formal proof of the four color theorem, and to address topics that were mostly left untouched by previous research in formal proof or formal methods.

FOX proposes a solid foundation of new aspects of data management brought to the fore by the web. The aim is to establish a model of Web-based XML data which accounts for the content, structure and distribution of the data, data evolution, and data incompleteness, in order to understand the dynamic and data-oriented features of the Web, and develop new efficient algorithms for organizing, transforming, and querying Web content.

GEOMDISS is investigating how dissipation influences the geometric phases and geometric pumping in quantum solid-state devices and assessing the role of geometric manipulations in future ICT applications. Since all realistic solid-state devices suffer from dissipation due to their coupling to uncontrolled environment with many degrees of freedom, the project is attempting to understand how the geometric effects are modified and whether they are still useful.

GOSPEL will develop new technologies for enabling slow and fast light propagation as a tunable feature in photonic devices. Controlling the speed of light offers a solution to a necessary, and often missing, function in broadband ICT systems: a time-delay/phase-shift line. The proposed research will address three slow and fast light device platforms: voltage tunable linear and nonlinear semiconductor photonic crystal waveguides with position controlled embedded quantum dots, active semiconductor waveguides based on quantum dots and advanced, specifically engineered optical fibers. The proposed fundamental research will produce new results in multi-disciplinary topics like semiconductor physics, quantum dots, photonic crystal design and fiber technology and it will represent a significant advancement across many sectors of ICT.

HIDEAS will develop technology that leads to a breakthrough in the information capacity of quantum communication. The vision is broadband quantum communication where all the physical properties of photons are utilized to store information. Working at the quantum level requires i) to produce in a controlled way quantum entanglement of light in high dimensional and multivariate spaces and ii) to create multimode quantum interfaces between light and matter in order to store high-D quantum states of light in long-lived matter degrees of freedom.

HIP will develop theory and demonstrators for large scale quantum information processing. HIP will exploit a fully integrated approach based on the simultaneous optimization of matter and light fundamental resources, and of discrete and continuous variables. HIP will develop a systematic hybridization of matter and light degrees of freedom, and their interchange and optimization at each step according to the desired goals and concrete needs. Integration will be carried out at all levels, including constituents, resources, tasks, operations, measurement, control, and optimization.

HIVE will investigate the possibilities for developing technologies that allow for fluent and non-invasive machine-brain interaction. The long term vision is to develop direct, unmediated brain interfaces for human-computer interaction. Despite the mediation of greatly advancing technology, human-machine and human-human communication rely on natural sensory systems at some level or another and current efforts to develop direct interfaces fall short of providing the means for practical interaction. HIVE is a 3-year project which will research new electromagnetic non-invasive stimulation paradigms to design and implement more powerful and controllable brain stimulation technologies. Based on electromagnetic modeling and experimentation using EEG and fMRI and single site stimulation, the project will develop advanced multi-site transcranial current stimulation targeting different applications and implementing real time monitoring.

ICTECOLLECTIVE aims to develop systematic exploration, understanding, and modeling of systems where ICT is entangled with social structures. The fundamental challenge for future social ICT is overcoming the acute lack of understanding of the driving forces and mechanisms of this complex system of interactions. The proposed interdisciplinary approach will support the integration of fragmented knowledge from different scientific disciplines concerning social aspects and consequences of ICT into a coherent form, amenable for use in policy-making decisions and of benefit to industry.

ISENSE is to create a novel-concept platform for a variety of integrated quantum sensors to be utilized in information and communication technology and systems. The proposal describes a set of scientific and technical breakthroughs for miniaturization and integration of future cold atom based devices. The research activities involve the development of a novel precision force sensor, integrated optical components for quantum sensors and miniaturized laser modules with sufficient spectroscopic stability. The proposal involves the demonstration of optical lattices based on short range force and gravity sensors.

LIQUIDPUBLICATION will explore how ICT can be used to enable a transition of the “scientific paper” and its traditional form (i.e., a crystallization in space and time of a scientific knowledge artifact) to a

Liquid Publication. The project explores how ICT and the lessons learned from the social Web can be applied to provide a radical paradigm shift in the way scientific knowledge is created, evaluated, and maintained.

LISTA is to develop scientific foundations for spoken language technologies based on human communication strategies. LISTA proposes to investigate how talkers react to changes in the environment, measure the relative success of these strategies using behavioral studies, model speech intelligibility/quality and study algorithms for rapid characterization of the listening context. The central objective of LISTA is to apply this information to develop novel techniques for artificial and live speech. LISTA can have impact in all situations where synthetic speech is embedded in devices such as computers and PDAs, mobile and fixed telephones, public information kiosks and other in-formation systems where live speech is used. In all these applications, the ability to increase intelligibility in noise has an immediate value, not only in terms of message comprehension but also in reducing overall time-of-interaction, noise pollution and individual noise exposure.

MIDAS will lay the foundation for creating a broad quantum-technological base by bridging the research between ultracold atom degenerate gases and solid state superconductors. Our understanding of fundamental and applied aspects of macroscopic quantum coherence/supercurrents in UCA- and SC-based devices will greatly benefit from active cooperation between leading teams in the two fields. From both fundamental and applied perspectives, the project may lead to several breakthroughs: 1) noise control, allowing high-fidelity quantum operations; 2) entanglement of collective variables, which are prerequisites for high-precision metrology, weak-signal sensing and teleportation near their ultimate quantum limits; 3) exploration of the feasibility of interfacing UCA and SC quantum storage/readout systems, so as to attempt closing the classical gap separating these two quantum technologies.

MINOS will develop new knowledge, methods and applications that can establish micro- and nano-optomechanical systems as a future key technology for nanoscience. Downsizing mechanics to micro- and nanomechanical systems allows entering a novel regime in which the mechanical properties can directly be manipulated by light and vice versa. These optomechanical effects open up a completely new field of controllable light-matter interaction on the micro- and nanoscale. At present, Europe is among the key players in this young and emerging field of micro- and nano-optomechanical systems (MOMS/NOMS). MINOS collects Europe's leading scientists in the field to foster European competitiveness and to constitute clear lead competences.

MOLSPINQIP will engineer new molecules and design new computational schemes to prove the validity of using molecular spin clusters as building blocks for scalable quantum-information architectures. The goal of implementing quantum information processes is certainly ambitious but molecular spin clusters have a great potential both as a self-standing quantum device and as components of more complex architectures. Important fallouts are expected in the discovery and characterization of new molecules, implementation of new quantum algorithms and the realization of novel instrumentation that will certainly lead to significant progress in probing arrays of nanomagnets.

NAME-QUAM will do work on quantum computing. The Project investigates the atom/molecule quantum matter technology for quantum information computational tasks. The engineering and control of moderate and long range quantum mechanical interactions in mesoscopic systems are the main targets of the Project. The possibilities offered by engineering and controlling moderate and long range interactions, and to realize strongly correlated many body systems for quantum computation and other quantum information tasks will be systematically studied.

NEXTMUSE will develop simulation technology. This technology will be robust and accurate enough to deal with the most challenging physical phenomena in industry (e.g. simultaneous fluid and solid mechanics in a ship under extreme wave loading). Input and output will be immersive and interactive, and the simulation highly automated. The technology will be nearly invisible to engineers who use it to develop competitive technologies for applications such as transport, energy, and healthcare.

NIW will investigate the use of haptic and auditory feedback in floor-based interfaces. NIW will expose walkers to virtual scenes presenting grounds of different natures, populated with natural obstacles and human artifacts, in which to situate the sensing and display of haptic and acoustic information for interactive simulation, and where vision will play an integrative role. Experiments will measure the ecological validity of such scenarios, investigating also the cognitive aspects of the underlying perceptual processes. Floor based interfaces will be designed and prototyped by making use of existing haptic and acoustic sensing and actuation devices, comprising interactive floor tiles and soles, with special attention to simplicity of technology. NIW will nurture floor and shoe designs which may impact the way we get information from the environment.

OPPORTUNITY will develop new systems for ambient intelligence based on activity recognition and context awareness. The aim is to develop mobile systems for the recognition of human activity in dynamically varying sensor setups. The systems are opportunistic and take advantage of sensing modalities that happen to be available, rather than forcing the user to deploy specific, application dependent sensor systems.

OPTONEURO is to develop a new optoelectronic technology for optogenetic neural stimulation. Stimulation requires a high intensity pulse of light. However intensities are not available with present spatial illumination sources such as LCD and OLED screens. The proposal aims to design, develop and produce an array of ultra bright electronically controlled microLEDS for the stimulation of excitable cells such as neurons. It could provide to neuroscientist and neuroprostheticists a device which can independently stimulate thousands of neurons in parallel.

PD-NET is to explore the scientific challenges and new technologies required to enable the emergence of large scale networks of pervasive public displays and associated sensors that are open to applications and content from many sources. In effect, the proposal provide the foundation for work on a brand new global communications medium for information access and interaction and to ensure that Europe is in the best possible position to benefit from this new medium. The project is highly innovative – no such pervasive display networks exist today and their emergence would represent a radical transformation in the way we think about information dissemination in public spaces.

PHOCUS is to design and implement a photonics realization of a liquid state machine (LSM), with the potential for versatile and fast signal handling. It target to achieve high computational performance with only a small number of photonics components, using dynamical systems with time delay to realize the required high dimensionality for the LSM. While numerical implementations of this concept exist, technical implementations are lacking. The consortium has identified delay-coupled optical systems as ideal substrates for LSMs. They allow achieving complex dynamics and thus the required mapping with only few elements. Moreover, photonic systems have proven to be robust and well-controllable, offering high processing speed and low power consumption. In order to succeed, the consortium intends to realise two different photonic systems to implement the LSM. The photonic implementation will be supported by modelling and theory, and complemented by studies on versatile electronic systems.

PHOME will develop new optical/photonic metamaterials. Metamaterials are composite, man-made materials, composed of sub-wavelength metallic building blocks, which show novel and unique electromagnetic properties, not occurring in natural materials. A particularly important class of such materials is the negative refractive index metamaterials (NIM). Serious obstacles have to be overcome before the impressive possibilities of optical/photonic metamaterials (PMM) can become real applications. The present project identifies the main obstacles and proposes specific approaches to deal with them; in addition, it intends to study novel and unexplored capabilities of PMM.

PICC seeks to identify tools for controlling ion crystal as their size is scaled up, develop strategies for implementing quantum dynamics of mesoscopic ion Coulomb crystals in a noisy environment and explore the capability of ion Coulomb crystals as quantum simulators. The targeted breakthrough is a ten fold increase in the number of entangled ions available for quantum operation operations. The long-term vision underlying this proposal is to engineer quantum correlations and entanglement in ion Coulomb crystals in order to exploit them for technological purposes of different kinds.

QNEMS is investigating the quantum properties of nanoscale electro-mechanical resonator systems, made of carbon nanotubes and photonic crystals, covering frequencies in the MHz and GHz range. The vibrations will be excited by electrical means. To overcome the thermal noise, cooling of the low-frequency resonators will be performed, using two cooling techniques; sideband cooling using coupling to an electromagnetic resonator, and optical cooling. The project addresses basic research; mid-term and long-term applications are expected in the areas of sensing and quantum information.

QUANTIP aims to develop the tools, components and concepts that will enable progress towards large-scale, integrated quantum photonic circuits for the development of advanced quantum systems for the purposes of quantum communications, information processing and metrology. A range of discrete integrated quantum photonic components will be developed and then integrated to form proof-of-principle demonstrators of fully-integrated prototypes, where all major components are integrated onto a single chip. This project will establish a new major research direction in Europe for the development of Quantum information science (QIS) using the integrated quantum photonic platform.

QUEVADIS aims to study quantum computation and information processing in a model where information processing is achieved by dissipation or decoherence. The starting point of the proposal is a recent result showing that if system-environment interaction is engineered in a certain very specific way, then universal quantum computation can be achieved simply by letting the system decohere.

ROOTHz addresses the bottleneck of Terahertz Science and Technology, where the fabrication of room temperature, continuous wave, compact, tunable and powerful sources (at low cost, if possible) is the prime challenge. For this sake we propose to exploit THz Gunn oscillations in novel (narrow and wide bandgap) semiconductor nano-devices, which have been predicted by simulations but not experimentally confirmed yet. It aims at the fabrication of solid state emitters and detectors at THz frequencies by exploiting the properties of both wide and narrow bandgap semiconductors and the advantages provided by the use of novel device architectures such as slot-diodes and rectifying nano diodes (nano-channels with broken symmetry so called self-switching diodes, SSDs). The fabrication of THz detectors will complement this objective and allow the demonstration of a simple THz detection/emission subsystem at the conclusion of the proposal.

SCENIC investigates signal processing techniques for complex acoustic behavioral modeling. The project will develop a comprehensive set of methodologies and analysis tools that will enable acoustic systems to become aware of their own characteristics and geometry and those of the environment that they operate in. This will enable advanced space-time processing solutions to take advantage of the additional information provided by the environment's acoustic response.

SCOPE will explore quantum physics to design, fabricate and study new superconducting circuits. The quantum physics of superconducting circuits will be applied in new ways to realize circuits where the single charge quantum plays the dual role of the flux quantum in classical Josephson junction circuits. Building on the recent advances in superconducting quantum bit circuits, SCOPE will theoretically model, design, fabricate and measure a specific set of circuits which probe the little-explored regime of equally strong Josephson and charging energies, yet well isolated from dissipation so as to achieve strong quantum behavior of the phase or charge.

SEMSEG is researching a segmentation method for unsteady flow that has the elegance and specificity of (steady) vector field topology, but which provides correct results for unsteady flows as well. Similar to the case of steady flow, where these topological techniques have proven useful for many years, it is expected that the new approach will have an important role in the analysis and discussion of time-dependent flow scenarios.

SIEMPRE aims at developing new theoretical frameworks, computational methods and algorithms for the analysis of creative social behavior within small groups of people. Social interaction is one of the fundamental components of human life, widely studied in psychology, receiving a growing interest from ICT scientific communities. The proposal is concerned with synchronization and in particular on emotional synchronization, which is likely to be an important driver of collaborative processes. The research activities will be focused on ensemble musical performance. Experimental scenarios will highlight the subtle and complex social interaction taking place between expert quartet musicians during live musical performance, and in listening to this music by non-expert audiences. Concrete objectives are models, techniques and algorithms for the extraction of social features based on the analysis of synchronization processes underlying expressive movements, audio and biometric signals during interpersonal creative communication.

SIMBAD will explore similarity-based pattern analysis and recognition methods, from the theoretical, computational and applied perspectives. SIMBAD will solve problems that feature based approached have been unable to tackle. In the last few years, researchers in pattern recognition and machine learning are becoming increasingly aware of the importance of similarity information. By abandoning the realm of vectorial representations one is confronted with the challenging problem of dealing with (dis)similarities that do not necessarily obey the requirements of a metric. This undermines the very foundations of traditional pattern recognition theories and algorithms, and poses totally new theoretical and computational questions.

SMALL will explore a new model of signal processing based on sparse representations. Sparse representations have had a substantial impact in signal compression and are at the heart of today's coding standards (JPEG, MPEG, and MP3). Recent theoretical advances have highlighted their potential to impact all fundamental areas of signal processing: signal acquisition (Compressed Sensing - sampling at a dramatically reduced rate), pattern recognition (Support Vector Machines, a state-of-the-art classification technique) and signal manipulation (e.g. separation and enhancement such as digital re-mastering).

STELE will explore new approaches to nanoscale devices. The large amount of heat generated in such devices is one of the most fundamental obstacles for reducing the size of electronics. The project turns the problem around by using electrically controlled local heating of magnetic nano-circuits to achieve fundamentally new functionality, relevant to several key objectives of the information and communication technology. Particular emphasis will be put on investigating and technologically evaluating the interplay of spin, charge, and heat in magnetic structures of sub-10 nm dimensions. Use of such structures could lead to further miniaturization of electronic devices.

TAILPHOX addresses the design and implementation of Silicon phoXonic crystal structures that allow asimultaneous control of both photonic and phononic waves. The final goal is to push the performance of optical devices well beyond the state of the art. By merging both fields (nanophotonics and nanophononics) within a same platform, novel unprecedented control of light and sound in very small regions will be achieved.

TANGO will construct an exact mathematical theory of emotional communicative behavior. Many everyday actions take place in a social context and affective information forms an important channel of social communication. TANGO aims to take these two familiar ideas one step further by focusing on the essential interactive nature of social communication, in the domain of non verbal communication based entirely on body language and communicative prosody. The research plan involves the investigation of interactions in real life contexts, showing agents in daily life situations such as communication or navigation.

TREASURE targets engineering of an integrated terahertz (THz) emitter at room temperature, based on a parametric optical process in an AlGaAs device, combining strong material nonlinearity and high optical confinement. The approach is based on a quasi-phase-matching scheme in the whispering-gallery cavity of a microcylinder containing self-assembled quantum-dots. The TREASURE source can bring several crucial advantages such as: room temperature operation, electrical pumping, compactness, THz power in the microwatt range, custom emission wavelength, spectral purity, and the perspective of two-dimensional array schemes.

UNIQUE focuses on the problem of counterfeiting and tampering with integrated circuits, and aims to develop an integrated approach to protect hardware systems against counterfeiting, cloning, reverse engineering, tampering, and insertion of malicious components. New hardware labeling and authentication schemes, based on physical properties of the underlying hardware components using sub-micron physical security primitives such as the new concept of Physically Unclonable Functions, will be developed. The proposed methodologies and tools will support the development of new counterfeit-resistant products in a variety of areas such as consumer electronics, and the automotive, avionic and pharmaceutical industries.

UNITRIDE proposes to investigate the building blocks of an emerging semiconductor technology for high-performance photonic devices operating in the near infrared (NIR). They will make use of nitride semiconductors to engineer electronic quantum confinement at the nanometer scale to realize unipolar devices relying on intersubband (ISB) transitions. The proposal will have significant impact in broad-band communications and sensor applications.

FET-OPEN COORDINATION ACTIONS

GSD addresses the use of future and emerging technologies to address simulation and analysis of global problems such as climate change, to facilitate an improved dialog between scientists and other stakeholders such as policy makers.

MODAP deals with the emerging interdisciplinary topic of data mining of mobility data while preserving individual privacy, and will further the activities of a privacy observatory.

TINA aims to develop tools for the analysis and visualisation of the relationships between scientific research projects and proposals. These tools will help to identify emerging research trends.

VISMASTER deals with the emerging interdisciplinary topic of Visual Analytics and the establishment of a coherent European research community.

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