ECLT past projects

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MEMEX

Project Title: MEMories and EXperiences for inclusive digital storytelling – MEMEX
Start Date-End Date: 01/12/2019 - 30/11/2022
ECLT project leader: Prof. Marcello Pelillo
Coordinator: FONDAZIONE ISTITUTO ITALIANO DI TECNOLOGIA
Funding Scheme: H2020-SC6-TRANSFORMATIONS-2018-2019-2020, Topic DT-TRANSFORMATIONS-11-2019

Abstract:

MEMEX promotes social cohesion through collaborative, heritage-related storytelling tools that provide access to tangible and intangible Cultural Heritage (CH) for communities at risk of exclusion. The project implements new actions for social science to: understand the NEEDS of such communities and co-design interfaces to suit their needs; DEVELOP the audience through participation strategies; while increasing the INCLUSION of communities. The fruition of this will be achieved through ground breaking ICT tools that provide a new paradigm for interaction with CH for all end user. MEMEX will create new assisted Augmented Reality (AR) experiences in the form of stories that intertwine the memories (expressed as videos, images or text) of the participating communities with the physical places / objects that surround them. To reach these objectives, MEMEX develop techniques to (semi-)automatically link images to their LOCATION and connect to a new opensource Knowledge Graph (KG). The KG will facilitate assisted storytelling by means of clustering that links consistently user data and CH assets in the KG. Finally, stories will be visualised onto smartphones by AR on top of the real world allowing to TELL an engaging narrative. MEMEX will be deployed and demonstrated on three pilots with unique communities. First, Barcelona's Migrant Women, which raises the gender question around their inclusion in CH, giving them a voice to valorise their memories. Secondly, MEMEX will give access to the inhabitants of Paris's XIX district, one of the largest immigrant settlements of Paris, to digital heritage repositories of over 1 million items to develop co-authored new history and memories connected to the artistic history of the district. Finally, first, second and third generation Portuguese migrants living in Lisbon will provide insights on how technology tools can enrich the lives of the participants.

Project website: memexproject.eu

AI4EU

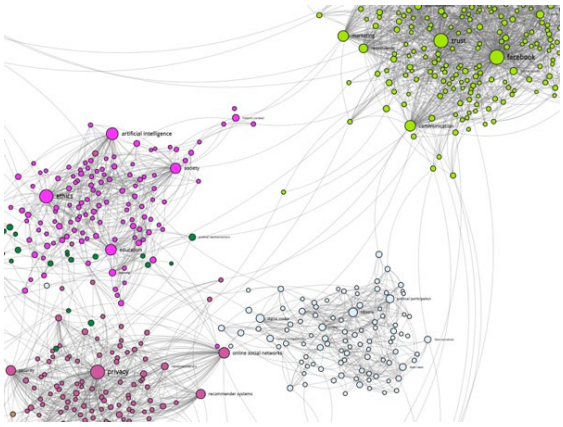
Project Title: A European AI On Demand Platform and Ecosystem (AI4EU)
Start Date-End Date: 01/01/2019-31/12/2021
ECLT project leader: Prof. Marcello Pelillo
Project Coordinator: THALES SERVICES SAS
Funding Scheme: Call Identifier H2020-ICT-2018-2020, Topic ICT-26-2018-2020
Consortium: 79 institutions

Abstract:

Artificial Intelligence is a disruptive technology of our times with expected impacts rivalling those of electricity or printing. Resources for innovation are currently dominated by giant tech companies in North America and China. To ensure European independence and leadership, we must invest wisely by bundling, connecting and opening our AI resources. AI4EU will efficiently build a comprehensive European AI-on-demand platform to lower barriers to innovation, to boost technology transfer and catalyse the growth of start-ups and SMEs in all sectors through Open calls and other actions. The platform will act as a broker, developer and one-stop shop providing and showcasing services, expertise, algorithms, software frameworks, development tools, components, modules, data, computing resources, prototyping functions and access to funding. Training will enable different user communities (engineers, civic leaders, etc.) to obtain skills and certifications. The AI4EU Platform will establish a world reference, built upon and interoperable with existing AI and data components (e.g. the Acumos open-source framework, QWT search engine..) and platforms. It will mobilize the whole European AI ecosystem and already unites 80 partners in 21 countries including researchers, innovators and related talents. Eight industry-driven AI pilots will demonstrate the value of the platform as an innovation tool. In order to enhance the platform, research on five key interconnected AI scientific areas will be carried out using platform technologies and results will be implemented. The pilots and research will showcase how AI4EU can stimulate scientific discovery and technological innovation. The AI4EU Ethical Observatory will be established to ensure the respect of human centred AI values and European regulations. Sustainability will be ensured via the creation of the AI4EU Foundation. The results will feed a new and comprehensive Strategic Research Innovation Agenda for Europe.

Project website:

- **AI4EU** [new website]
- **AI4EU**
- **AI4EU Observatory on Society and AI (OSAI)**



VIGIE

Tender Title: VIGIE 2020-661 - A research agenda on Digital Media and Human WellBeing
Start Date-End Date: 2020 – 2022
ECLT project leaders: Prof. Guido Caldarelli
Partner: Centre National de la Recherche Scientifique (CNRS)
Università Ca' Foscari Venezia - European Centre for Living Technology (ECLT)
Universidad Politécnica de Madrid
Reference number: CNECT/2020/OP/0035

Abstract:

The study will build a multidisciplinary research view across pertinent scientific fields on the **impact of social media on our brains**, on us as individuals and on **society**. It will put particular emphasis on the use of and access to data across all research fields. It will organise **consultations and a conference**, and work on federating a new community. A final report will detail the current state of the art, analyse areas where research is needed in order to deal with social media opportunities (e.g. collective networked approaches) and threats (e.g. misinformation), and propose a multidisciplinary research agenda.

Objectives:

Given the prominence of **digital media** - in particular social media - in our daily lives and the opportunities and threats resulting from their ever-increasing use, it is important to analyse scientifically their impact on our **behaviour as individuals** and on **decision making in our society**. Questions to be asked include among others: Does the ever-increasing stream of information to which citizens are exposed and the pervasive use of screens in digital devices alter individuals' perception of reality and their interpersonal relations, both in the physical offline and virtual online world?
How does **exposure to digital media** (including screens) effect development of children and young adults?
Prior to this tender, a high-level symposium on the subject was held in October 2019 in Rome to get a first overview of scientific understanding of the impact of social media and digitally mediated communications and interactions on society and individuals.
The symposium included 25 experts from various disciplines ranging from cognitive and neuro-sciences, over computer science and network science to social psychology and behavioural economics.
One of the outcomes of the workshop was a proposal to distinguish between three levels: a ‘Microscopic level’, where social media affect us at the level of the brain as individual users; a ‘Mesoscopic level’, where social media change the way we create an online identity and interact online as compared to our offline interactions; a ‘Macroscopic level’, mediated by social media, were we collectively create structures - groups, opinions, narratives - that in turn affect us as individuals.

Project website

Artificial intelligence assisted performance and anomaly detection and diagnostic

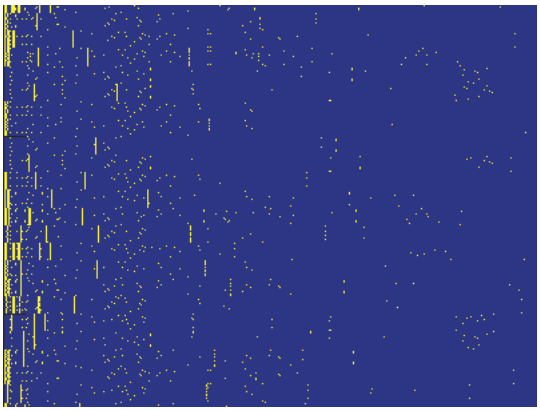
Project Title: Artificial intelligence assisted performance and anomaly detection and diagnostic
Start Date-End Date: 01/02/2020 - 30/04/2021
ECLT project leaders: Prof. Marcello Pelillo, Dr. Sebastiano Vascon
Coordinator: SATE
Funding Scheme: Tender ESA ITT AO/1-9845/19/UK/AB

Abstract:

The objective of the work is to define, design and validate a machine-learning-based method for the detection of Radio Frequency (RF) anomalies and the identification of the associated root causes, with the purpose of accelerating the RF equipment performance evaluation activity, supporting the domain experts in their analysis throughout the whole development, from design to qualification and Assembly, Integration and Test (AIT).

The study to be carried out aims at exploring the feasibility and demonstrating the use of Artificial Intelligence (AI) techniques to support RF experts in the anomaly detection and root-cause identification activity of antennas, or RF systems in general, performed in the development of the equipment from its design to the qualification and AIT phases, with the final purpose of reducing significantly the diagnosis time by a factor of 10÷100 (from about 2 weeks, typically required nowadays for antennas diagnostics, to about 1 day or less) while guaranteeing a minimum required performance in anomaly detection and root-cause identification.

The proposed solution has the objective to evaluate the status of the AUT or DUT, detecting the presence of potential anomalies and identifying the most likely root cause associated to it, in relation to possible flaws arisen during the development process, from design to qualification and AIT phases, including also defaults related to the measurement facility involved. Therefore, the project activity shall consist of a step-by-step process with iterations to design, implement and test a supervised machine-learning-based diagnostic tool capable of detecting RF systems anomalies and isolating the associated root causes, exploiting as much as possible the already existing data and information about antenna anomalies and EM diagnostic methods, in order to accelerate the whole diagnostic process.



BLOOM project

Project Title: Building Lead Optimization Over large Molecular spaces (BLOOM)
Start Date-End Date: 2014-2019
ECLT project leader: prof. Irene Poli, ECLT Università Ca' Foscari Venezia
Funding Scheme: GlaxoSmithKline

Abstract

A principal problem that the drug discovery research field confronts is to identify small molecules, modulators of protein function, that are likely to be therapeutically useful. Common practices rely on the screening of vast libraries of small molecules (often 1-2 million molecules) in order to identify a molecule that specifically inhibits or activates the protein function, known as a Lead Molecule. Such a molecule interacts with the required target, but generally lacks the other essential attributes required for a drug candidate (ADME properties). In this project we address the problem of building the optimal lead molecule by developing a multi-objective optimization procedure based on nature-inspired computation and statistical predictive models for high dimensional spaces. The challenging task is to discover the optimal lead molecule through testing only an extremely small number of candidate molecules.

HUME-NASH MACHINES PROJECT

Project Title: Hume-Nash machines: Context aware models of learning and recognition
Start Date-End Date: 01/10/2015-30/09/2018
ECLT project leader: prof. Marcello Pelillo, ECLT Università Ca'Foscari Venezia
Funding Scheme: Samsung Global Research Outreach (GRO) program

Abstract

The project aims to develop algorithms for the analysis of multimodal "social signals" emerging among several subjects engaged in an interaction scenario. One of the fundamental issues in the recognition of social signals is that, by definition, they do not exist in isolation, but are a result of the interaction of two or more agents. This calls for a context-aware approach which takes into account local environmental information, and game theory appears to be a natural, yet unexplored framework to use. The main idea behind the project is that the social cues detected, their evolution and their interplay among the interactants can be modeled as strategies in a multi-agent evolutionary signaling game thereby allowing us to determion the agents' interactions and intentions, and the whole group dynamics. These cues will be captured using the multimodal audio/visual appearance of the interactants which include, for example, gaze, gesturing, body posture, global/local body motion, speech features, etc.

In this project ECLT will collaborate with Samsung Collaborative R&D Dept.

GREEN-WIN

Project Title: Green growth and win-win strategies for sustainable climate action
Start Date-End Date: 01/10/2015-31/12/2018
ECLT project leader: prof. Sander Van Der Leeuw and prof. Irene Poli
Funding Scheme: H2020 Societal Challanges 5 (Climate action, Environment, resource efficiency and raw materials)

Abstract

The GREEN-WIN project will develop a major international transdisciplinary research collaboration to apply a solutionoriented approach targeted at increasing the understanding of links between climate action and sustainability and overcoming implementation barriers through win-win strategies. The project will critically assess where and under which conditions win-win and in particular green growth strategies work in practice and where fundamental trade-offs must be faced. We thereby focus on four critical barriers that have been identified by practitioners and policy makers. First, we develop transformative narratives highlighting opportunities in climate and sustainability action in order to contribute to overcoming cognitive barriers and empowering people. Second, we examine climate and sustainability finance policies and governance arrangements in order to contribute to overcoming financial barriers to mitigation and adaptation. Third, we substantiate the economics of green growth in order to contribute to overcoming economic and collective action barriers to de-carbonisation. Towards this end we introduce major innovations into the GEM-E3 computable general equilibrium model required to discover green growth strategies. These include developing a network-based model of technological diffusion, and introducing financial market constraints and adaptive expectations of agents. Fourth, we contribute to overcoming economic and institutional barriers through identifying win-win strategies, sustainable business models and enabling environments in three action fields of coastal zone flood risk management, urban transformations and energy poverty eradication and resilience. We embed all these activities within a sustained international dialogue involving stakeholders from policy, research, civil society and the private sector, and an open knowledge management and capacity building strategy to promote knowledge transfer and learning beyond the project lifespan.

Consortium

Global Climate Forum

- The Institute of Environmental Sciences and Technology, Autonomous University of Barcelona
- E3-Modelling
- Environmental Change Institute, Oxford University
- Ecole d'Economie de Paris University
- College London
- The Ground_Up Project
- Deltares
- Institute for Advanced Sustainability Studies
- Global Green Growth Institute
- Jill Jaeger
- European Centre for Living Technology at Università Ca'Foscari di Venezia

- Institute of Environmental Sciences at Boğaziçi University
- Center for Remote Sensing and Ocean Sciences, Udayana University
- University of Cape Town
- 2° Investing Initiative

Project website
http://green-win-project.eu

MEDIUM

Project Title: Medium. New pathways for sustainable urban development in China medium-sized cities
Start Date-End Date: 01/09/2015-31/08/2018
ECLT Project Leader: prof. Irene Poli, ECLT
Funding Scheme: EuropeAid EU-CHINA Research and Innovation Partnership ICI+/2014/348-005

Abstract

The Chinese city-building strategy is currently undergoing a shift. The 'National New-type Urbanization Plan' announced in March 2014 sets out to promote urbanisation as a main driver of the country's economic growth. By 2020, medium-sized cities are likely to receive a large number of rural migrants due to the forthcoming gradual deregulation of the hukou system. If managed well, urban growth in these cities may allow innovative ideas to emerge, and so give rise to new job opportunities and alternative models of urban development. Therefore, medium-sized cities should not replicate the experience of megacities but turn instead towards new governance approaches and instruments to achieve sustainable development in accordance with their size and distinctive demographic transition.

This project focuses on the economic and social dimensions of urban sustainability. It aims at building the capacity of local governments of medium cities to develop socio-technical innovations and meet the challenge of rural migrant integration. More specifically, four main goals are targeted:

- to get accurate quantitative and qualitative knowledge of socio-economic characteristics of medium cities;
- to foster cross-fertilization of ideas and bring stakeholders' input into urban governance;
- to build long-term cooperative networks with local universities and train young experts of Chinese cities;
- to identify new business opportunities for EU companies

Consortium

- Centre National de la Recherche Scientifique CNRS (Coordinator)
- Hangzhou Normal University
- Institut d'Etudes Politiques d'Aix en Provence IEPAIX
- Università Ca' Foscari Venezia - ECLT
- Spiatial Foresight GmbH
- Associated partners
- Université de Lausanne
  Université de Neuchâtel

iNSPiRe

Project Title: iNSPiRe Development of Systemic Packages for Deep Energy Renovation of Residential and Tertiary Buildings including Envelope and Systems
Start Date-End Date: 01/10/2012-30/09/2016
ECLT project leader: prof. Irene Poli
Funding Scheme: Collaborative project - FP7-2012-NMP-ENV-ENERGY-ICT-EeB

Abstract

Most of the energy consumption in Europe is due to heating and cooling used for domestic, tertiary and industrial purposes; This energy is largely produced by directly burning fossil fuels with a negative environmental impact. RES directive and the SET Plan focuses its attention on the use of RES to drive systems for heating and cooling in order to reduce greenhouse gas emissions and the dependence on energy import, and to reach the 20/20/20 target. For this reason the European Union energy policy gives high priority to energy savings and use of renewable energy sources. The project iNSPiRe aims at conceiving, developing and demonstrating Systemic Renovation Packages, through the innovative integration of envelope technologies, energy generation (including RES integration), energy distribution, lighting and comfort management systems into deep energy renovation of buildings, both in the residential and tertiary sectors. During the project Multifunctional Industrialized Renovation Kits will be developed, manufactured and installed at three Demo Case Studies. The optimal integration of such systems will lead to major cumulative energy savings with respect to consumption prior to renovation (therefore to extreme reductions of the CO2 emissions), assuring at the same time enhanced users comfort conditions. The final target of the systemic renovation packages will be to reach an overall Primary Energy consumption of the building lower than 50 kWh/m²/year. The project iNSPiRe triggers a scenario of fast decarbonization, by promoting the transition of the construction sector to a fully industrial phase, hence optimizing the materials utilization and manufacturing/installation/maintenance/ dismantling processes. The exploitation of the project results will make available on the market reliable and cost-effective products, suitable for the deep energy renovation of existing buildings, fostering the connection between construction and industry sectors, and creating new jobs.

Consortium

- ACCADEMIA EUROPEA BOLZANO (IT)
- FUNDACION CARTIF (ES)
- FACHHOCHSCHULE STUTTGART HOCHSCHULE FUR TECHNIK (DE)
- HOGSKOLAN DALARNA (SE)
- FRAUNHOFER-GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V (DE)
- UNIVERSITAET INNSBRUCK (AT)
- UNIVERSITA CA' FOSCARI VENEZIA, ECLT (IT)
- GRUPPO INDUSTRIALE TOSONI (IT)
- GUMPP & MAIER GMBH (DE)
- CLIMATEWELL CORETECHNOLOGIES AB (SE)
- BARTENBACH LICHTLABOR GMBH (AT)
- TRIPAN-LEICHTBAUTEILE WIMMER GMBH (AT)
- SIKO SOLAR (AT)
- CYCLECO (FR)

- ACCIONA INFRASTRUCTURAS S.A (ES)
- MANENS-TIFS S.P.A. (IT)
- VAILLANT GMBH (DE)
- BSRIA LIMITED (UK)
- INSIGHT PUBLISHER LTD (UK)
- LOCAL ENVIRONMENTAL INITIATIVES (FREIBURG) ICLEI EUROPEAN SECRETARIAT INTERNATIONALER RAT FUR KOMMUNALE
- UMWELTINITIATIVEN EUROPASEKRET GMBH (DE)
- UNION INTERNATIONALE DE LA PROPRIÉTÉ IMMOBILIÈRE (BE)
- CAE SERVICES GEIE (BE)
- WOHNBAU LUDWIGSBURG (DE)
- EMPRESA MUNICIPAL DE LA VIVIENDA Y SUELO DE MADRID S.A (ES)

Project website
http://inspirefp7.eu/

MICREAGENTS

Project Title: MICREAGENTS - Microscale Chemically Reactive Electronic Agents
Start Date-End Date: 01/09/2012-31/08/2015
ECLT project leader: prof. Norman Packard
Funding Scheme: STREP - FET Proactive ICT-2011 9.6

Abstract
The goal of the project is to create a programmable microscale electronic chemistry forming a bridge between electronic and chemical computing. Microscopic reactive electronic agents will contain circuit elements on autonomous pairwise self-assembling microchips (called lablets, target ≤ 100 μm), that selfmodify via reversible nanoscale coatings, directing their reversible association to form twin complexes (called gemlabs), and controlling entry to and chemical reactions in the enclosed transient reaction compartments. The lablet device integrates transistors, supercapacitors, energy transducers, sensors and actuators, involving electronically constructed nanofilms, and will be essentially genetically encoded, translating electronic signals into constructive chemical processing and recording the results of this processing. This will provide an unconventional form of computation that microscopically links reaction processing with computation in autonomous mobile smart reactors. This corresponds to a radical integration of autonomous chemical experimentation and represents a novel form of computation intertwined with construction. The self-assembling smart micro reactors can be programmed for molecular amplification and other chemical processing pathways, that start from complex mixtures, concentrate and purify chemicals, perform reactions in programmed cascades, sense completion, and transport and release products to defined locations. The project defines a continuous achievable path towards this ambitious goal, making use of a novel pairwise local communication strategy to overcome the limitations of current smart dust and autonomous sensor network communication. It will provide a technical platform spawning research in new computing paradigms that integrate multilevel construction with electronic ICT. The 8 groups from 8 countries

incl. NZ are all pioneers in the multidisciplinary areas required to achieve the project goals, with a common grounding in IT.

Consortium

- Ruhr-Universität Bochum (3 groups) (DE) - coordinating institution
- Hebrew University of Jerusalem (IL)
- Rijksuniversiteit Groningen (NL)
- University of Glasgow (UK)
- Syddansk Universitet (DK
- Vysoka Skola Chemicko- Technologicka v Praze (CZ)
- Università Ca'Foscari Venezia, ECLT (IT)
- University of Auckland (NZ)

Project website

https://micreagents.eu

Emergence by Design

Project Title: MD - Emergence by Design
Start Date-End Date: 01/11/2011-30/10/2014
ECLT project leader: prof. David Avra Lane
Funding Scheme: Collaborative project - FET-Open ICT-2011.9.1

Abstract

The main objectives of MD are to develop the foundations of a theory of innovation processes that concatenates design and emergence and to explore some of the implications of such a theory with respect to two important practical problems: how to structure processes for making and monitoring innovation policy; and how to design ICT that enhances the generative potential of networks of innovators. The key breakthroughs required to achieve these objectives include the formulation of new concepts of emergence appropriate for processes of social change and a new approach to model pragmatics that focuses on the role of models for constructing narratives that can motivate effective coordinated action. Theory development will proceed by means of a dialogue between historical case studies and experiments with agent-based models that exhibit various types of emergent phenomena. The policy problems will require the development of new approaches to monitoring innovation cascades, in particular to identify new patterns of social interaction and new attributions of functionality and to evaluate the generative potential of on-going relationships among innovating agents.

Consortium

- Università Ca' Foscari Venezia, ECLT - coordinating institution
- Chalmers Tekniska Hoegskola AB (SE)
- Tech4i2 Limited (UK)
- Stichting The Hub (NL)
- Stichting Nederland Kennisland (NL)
- Institut National de Recherche en Informatique et en Automatique (FR)

- Factlink BV (UK)
- Euclid Network (UK)
- Uniwersytet Warszawski (PL)

Project website
cordis.europa.eu/project/id/284625

BIOSOLAR PROJECT

Project Title: BIOSOLAR - Nanostructured matrices for dye-sensitized solar cells
Start Date-End Date: 01/11/2012-30/10/2013
ECLT project leader: prof. Irene Poli and dott. Davide de Lucrezia
Funding scheme: EDISON - ECLT joint research project

Abstract

The Biosolar Project: a Living Technology approach to photovoltaic cells Sunlight energy conversion first appeared on Earth 3,5 Bya to support Life's energy demand by means of the photosynthesis process. Photosynthesis is the natural conversion of sunlight energy into chemical power occurring in a broad range of organisms such as plants, algae and bacteria. Photosynthesis occurs in two stages:

In the first stage, light-dependent reactions capture the energy of light and use it to make the energy-storage molecules ATP and NADPH.

During the second stage, the light-independent reactions use these products to capture and reduce carbon dioxide.

The light-dependent reactions cycle is our source of inspiration for the development of novel organic photovoltaics. In the light-dependent reactions, one molecule of the pigment chlorophyll absorbs one photon and loses one electron. This electron is passed to a modified form of chlorophyll called pheophytin, which passes the electron to a quinone molecule, allowing the start of a flow of electrons down an electron transport chain that leads to the ultimate reduction of NADP to NADPH. In addition, this creates a proton gradient across the chloroplast membrane; its dissipation is used by ATP synthase for the concomitant synthesis of ATP. Not all wavelengths of light can support photosynthesis. The photosynthetic action spectrum depends on the type of accessory pigments present. For example, in green plants, the action spectrum resembles the absorption spectrum for chlorophylls and carotenoids with peaks for violet-blue and red light. In red algae, the action spectrum overlaps with the absorption spectrum of phycobilins for blue-green light, which allows these algae to grow in deeper waters that filter out the longer wavelengths used by green plants. Most organisms that utilize photosynthesis to produce oxygen use visible light to do so, although at least three use infrared radiation (3). The rationale is to refactoring the photosynthesis process in order to exploit the unmatched light absorbing capability of natural pigments to increase conversion efficiency by means of broaden spectrum absorption Our approach at exploiting multiple chromofores to broaden energy absorption based on a combination of natural dyes embedded onto hydrophobic matrix to enhance charge separation. This challenging task requires a complex blend of interdisciplinary approaches ranging from organic chemistry and biochemistry to nanoscience supported by mathematical modeling and statistics to cope with the inherent complexity of the system.

Consortium

- EDISON - ECLT joint research project

INSITE PROJECT

Project Title: INSITE - The Innovation Society, Sustainability, and ICT
Start Date-End Date: 01/03/2011-28/02/2014
ECLT project leader: prof. David Avra Lane
Funding scheme: Coordination and Support Action - FET Open ICT-2009.8.0

Abstract

Our society is organized around a positive feedback dynamic that produces innovation cascades. In these cascades, new artifacts are inextricably linked with transformations in social organization and the generation of new "needs" for individual and society. Besides desired effects, these cascades produce disruptive changes in the environment and in society itself, ultimately leading to sustainability crises. The usual, but inadequate, response to these is more innovation, unleashing new cascades, and new crises. The core challenge in improving our responses is to link current, reductionist, models of past causalities with novel approaches to increase the number of dimensions in which phenomena are perceived, so that we may get better at anticipating the unanticipated consequences of innovation cascades. INSITE will pave the way for novel ICT approaches that will do so, since only through ICT can complex dynamics be "grasped" in sufficient detail to allow us to do the reverse of customary science: anticipate and complexify, rather than reduce and simplify. To further INSITE's main objective to build a community dedicated to meeting the challenge described above, we will recruit people from a variety of fields to join us in working groups to (1) prepare case studies that illuminate the dynamics of innovation cascades involving ICT, from printing to the internet, (2) develop a roadmap indicating the kinds and uses of models to understand and guide these dynamics in the direction of sustainability, (3) devise experiments to elucidate innovation dynamics, in the context of multiplayer online computer games, (4) envision practices and technologies to enable networks of innovators to engage in experiments in "participatory policy", and (5) explore the implications in theory and practice of reconceptualizing technology to include its social dimensions, leading to a notion of "generalized ICT" that includes such diverse things as cities, urban systems and museums.

Consortium

- Università Ca' Foscari Venezia, ECLT (IT) – coordinating institution
- Chalmers Tekniska Hoegskola AB (SE)
- Centre National de la Recherche Scientifique (FR)
- Medizinische Universitaet Wien (AT)
- Universidad de Alicante (ES)
- Université de Lausanne (CH)
- University College Cork, National University of Ireland (IE)
- Mediacontech (IT)
- The Hub Bruxel scrl (BE)
- Euclid Network (UK)
- Tech4i2 Limited (UK)
- Association pour la Recherche et le Développement de Méthodes et Processus Industriels (FR)

COBRA project

Project Title: COBRA Coordination of Biological & Chemical IT Research Activities
Start Date-End Date: 01/12/2010-30/11/2013
ECLT project leader: prof. Irene Poli
Funding scheme: Coordination Action - FET proactive ICT 2009.8.9

Abstract

COBRA is a coordination action to help organize the international CHEM-IT community towards the next major science and technology revolution, involving the integration of information processing with production during deployment. The industrial revolution mechanized production with factories, and the information revolution mechanized information processing with computers. The next large-scale technological revolution most likely involves their integration and its decentralization, as found so far only in living systems and it is now clear that significant scientific and technical progress towards this integration is imminent. The EC-sponsored CHEM-IT projects are spearheading the development and exploration of the first simple systems integrating production and information processing. This is done at the nano-bio-info interface, involving cellular engineering, protocells, artificial neurons and programmable information chemistry. At the centre of this work is a desire to create ICT-based systems with living and intelligent desirable properties that current technologies lack (such as robustness, autonomy, self-repair, adaptation, learning and local intelligence, as well as self-replication and evolution). The potential long-term impact of this emerging enabling technology will be considerable, as even minor progress on making technology more life-like and intelligent can improve processes in all sectors of society. CHEM-IT addresses issues of sustainability in production and deployment, and the information explosion of ubiquitous nanoscale systems. The proposed project on the coordination of biological and chemical IT research activities (COBRA) seeks to engage the European research community to construct the first roadmap for how best to develop ICT-based integrated information processing and production technology.

Consortium

- Manchester Metropolitan University (UK) – coordinating institution
- University of Southern Denmark (DK)
- Friedrich Schiller University Jena (DE)
- Ruhr University Bochum (DE)
- Università Ca' Foscari Venezia, ECLT (IT)

GSDP PROJECT

Project Title: GSDP Global Systems Dynamics and Policy
Start Date-End Date: 01/10/2010-30/09/2013
ECLT project leader: prof. Sander van der Leeuw
Funding scheme: Coordination and Support Action - FET Open ICT-2009.8.0

Abstract

GSDP is an initiative to develop a research program for the study of global systems in an ongoing dialogue with decision makers. GSDP will operate as an open network evolving through workshops, working papers, publications, and open conferences. It will consolidate an international community of researchers engaged in dialogues with decision-makers, and will generate a variety of research and decision-support projects in Europe and elsewhere. The first two years will provide answers to three questions. What do we need? What do we know? What are we struggling with? In the third year, these answers will be transformed into a research program for global systems science by first producing a set of components and then combining them into a coherent picture. The researchers involved come from computer science, physics, economics and many other fields. Besides the participation of the official partners, the project will rely on a growing network of currently about 100 researches and stakeholders from Europe, the U.S. and China. The work will be broken down into seven work packages plus a management work package. They operate in parallel, synchronized by annual conferences and interacting through meetings, documents, and intensive use of ICT. One of the work packages – dealing with the overarching theme of global systems - will ask questions to the other six at the beginning of each year and help to integrate the responses. The other work packages tackle three more methodological issues – systems thinking, complex networks, domain specific languages – and three more substantive ones – risk and resilience, economy and sustainability, environment and society.

Consortium

- European Climate Forum (DE) – coordinating institution
- Université Paris 1 Panthéon-Sorbonne (FR)
- The Initiative for Science, Society, and Policy, University of Southern Denmark (DK)
- Institute for Science, Innovation and Society, University of Oxford (UK)
- Potsdam Institut für Klimafolgenforschung (DE)
- Institute of Environmental Sciences and Technology, Universitat Autònoma de Barcelona (ES)
- Beijing Normal University (CN)
- ETH Zürich ETH Zurich (CH)
- Institute for Scientific Interchange (IT)
- Università Ca' Foscari Venezia, ECLT (IT)
- Chalmers University of Technology Chalmers (SE)
- Open University (UK)
- University College London (UK)
- Eötvös Loránd University (HU)

MATCHIT PROJECT

Project Title: MATCHIT Matrix for Chemical IT
Start Date-End Date: 01/02/2010-31/01/2013
ECLT project leader: prof. Norman Packard and prof. Irene Poli
Funding scheme: Collaborative project – FET Proactive ICT-2009.8.3

Abstract

MATCH-IT (MATrix for CHemical IT) will develop programmable information chemistry by introducing an addressable chemical container (chemtainer) production system and interfacing it with electronic computers via MEMS technology with regulatory feedback loops. As in the biological subcellular matrix, the chemical containers at the micro- and nanoscales will be self-assembling, replicable and self-repairing. At the nanoscale, DNA containers will provide a programmable and replicable chemistry in which positional information can be harnessed for a range of nanoscale utilities. At the microscale, containers based on DNA-labeled heterophase droplets and vesicles, will form microscopic labeled reaction vessels that can themselves determine their next processing steps. Their DNA-based addresses will be computable, enabling parallel chemical programming in a new multilevel architecture through autonomous address modification and resolution at the container-container, container-surface, and container-molecule levels, providing a concrete embedded application for DNA computing. This generic programmable information chemistry will not only be an enabling technology for "immersed systems" IT applications in the life sciences, chemistry, and nanotechnology, but also promote a deeper understanding of the computational power of coupled production and information processes, as in biology, and provide a platform for building the more organic computers of the future. MATCHIT will investigate the general use of self-assembling chemtainers for information-intensive Chem-IT. The project will develop and apply multiscale physical simulation tools and novel embedded IT architectures to process and integrate modular chemical and digital information. It will integrate and disseminate multidisciplinary European activities in Chem-IT, supported by the European Center for Living Technology and provide an assessment of the likely long-term socio-technical impact of this powerful technology.

Consortium

- The Center for Fundamental Living Technology (FLinT), University of Southern Denmark (DK) – coordinating institution
- Biomolecular Information Processing, Ruhr-Universität Bochum (DE)
- Bioorganic Chemistry I, Ruhr-Universität Bochum (DE)
- The Department of Molecular Genetics, Weizmann Institute of Science (IL)
- The Department of Biological Chemistry, Weizmann Institute of Science (IL)
- The European Center for Living Technology (ECLT), Universita Ca´Foscari Venezia (IT)

ProTuMa PROJECT

Project Title: ProTuMa Novel protein markers for tumor diagnosis and therapy
Start Date-End Date: 01/10/2009-30/09/2011
ECLT project leader: prof. Irene Poli
Funding scheme: Eurotrans Bio (EU - Ministero per lo Sviluppo Economico)

Abstract

Cancer represents a major cause of death worldwide. Key for an effective treatment of this devastating disease is the identification of cancer-specific components which, being selectively expressed in cancer tissues and not in normal tissues, can be exploited for the early diagnosis of cancer, the prediction of life expectancy of patients and the effectiveness of cancer therapies, the design of new therapeutic molecules. Despite the large efforts in the field, the identification of novel tumor markers is one major area of unmet medical need. The project deals with the characterization of four major tumor proteins. The first protein is TUCAP-1, is a membrane protein recently described as marker for malignancy in melanomas. By using Tissue Microarray Technology (TMA), its association with different tumor classes, other than skin tumors, will be evaluated. The other three proteins are membrane-predicted proteins which partners 1 has recently identified in different cancer types through the screening of TMAs with a large library of polyclonal antibodies raised against recombinant human proteins. Although uncharacterized, they show homology to hypoxia-regulated proteins, G-coupled receptors and calcium transporters, respectively, suggesting a role in important cellular processes. By using bioinformatics and several molecular and cellular biology techniques these tumor-associated proteins will be thoroughly characterized to understand their role in tumorigenesis and to confirm their clinical value. Furthermore, monoclonal antibodies will be generated and tested for their capacity to interfere with cellular processes and tumor growth and progression, by using tumor cell lines expressing each of the three proteins. The project has a high degree of innovation and is of great industrial interest since it is expected to lead to the exploitation of a set of completely novel tumor markers for a successful diagnosis, prognosis and treatment of cancer.

Consortium

- Externautics SpA (IT)
- University Medical Center Groningen (NL)
- Synvolux Therapeutics (NL)
- Università Ca' Foscari Venezia, ECLT (IT)

ASSYST PROJECT

Project Title: ASSYST: Action for the Science of complex SYstems and Socially intelligent icT
Start Date-End Date: 01/01/2009-31/03/2012
ECLT project leader: prof. Irene Poli
Funding scheme: Coordination and Support Action - FP7-ICT-2007-3

Abstract

ASSYST will coordinate research around the call Science of complex systems for socially intelligent ICT (COSI-ICT) in the context of the wider science of complex systems (CS). ASSYST will make Complex Systems science and the potential of COSI-ICT better understood by scientific policy makers and funders at national and international levels in Europe. It will showcase successful applications of the science. It will inform European policy makers on the global context of European CS and COSI-ICT and funding polices. It will advise policy makers and scientists on the state of the art, and provide high-quality input and advice for funding policies at national level and for the funding agencies of the European Commission including FP7. ASSYST will promote applications of complex systems and COSI-ICT in the public and private sectors, and publicise successful applications. It will build bridges between complex systems scientists and industry and commerce in Europe, and actively promote civil and commercial applications of the new ICT-driven science. ASSYST will achieve its mission through organising many meetings across Europe and around the world with targeted outcomes related to its objectives, through proactive engagement with policymakers, the business community, and the public sector. It will provide open educational resources to promote complex systems science and COSI-ICT. It will provide conference support for rapid dissemination of complex systems and COSI-ICT research. It will collect information and publish it in easily accessible forms available through an excellent 'one stop' CS and COSI-ICT web site. To make the impact of ASSYST sustainable in the long term, it will work closely with the Complex Systems Society which will take over its assets and continue its mission when the project ends.

Consortium

- The Open University (UK) - coordinating institution
- Fundacao da Faculdade de Ciencias da Universidade de Lisboa (PT)
- Università Ca' Foscari Venezia, ECLT (IT)
- Università degli Studi di Firenze (IT)
- Fondazione Istituto per l'interscambio scientifico (IT)
- Uniwersytet Warszawski (PL)
- Université de Fribourg (CH)
- Universitaet Hambourg (DE)
- Universidad Carlos III de Madrid (ES)
- Bogazici Universitesi (TR)
- The University of Warwick (UK)
- Bar Ilan University (IL)
- Stichting Institute Pare Limes (NL)
- Centre Nationale de la Recherche Scientifique (FR)
- Istituto di Ricerche Economiche Sociali del Piemonte (IT)

Project website

cordis.europa.eu/project/rcn/87946_it.html

ECCell PROJECT

Project Title: ECCell Electronic Chemical Cell
Start Date-End Date: 01/09/2008-31/08/2011
ECLT project leader: prof. Kristian Lindgren
Funding scheme: STREP FET Open ICT-2007.8.0

Abstract

The aim of the project is to establish a novel basis for future embedded information technology by constructing the first electronically programmable chemical cell. This is naturally a high-risk, embryonic research project, but aimed at a breakthrough which will lay the foundation for immersed micro- and nanoscale molecular information processing with 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. Their microscopic multiphase self-assembly under electric field control is the primary information processing mode of this technology. Realtime digital electric field control sequences, regulating the semi-autonomous self-assembly and reactive molecular processing, will both provide an online programming methodology for these complex systems and potentially serve as electronic genomes for the chemical cells. Programming methodologies (beyond optimal control theory) will be explored and evaluated which deal effectively with the remote real time distributed regulation of these novel semi-autonomous combinatorially complex chemical systems. 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.

Consortium

- RUHR-UNIVERSITAET BOCHUM (DE) – coordinating Institution
- RIJKSUNIVERSITEIT GRONINGEN (NL)
- SYDDANSK UNIVERSITET (DK)
- THE HEBREW UNIVERSITY OF JERUSALEM (IL)
- UNIVERSITA' CA' FOSCARI VENEZIA, ECLT (IT)

Project website

www.ruhr-uni-bochum.de/ECCell/index.html

TARPOL PROJECT

Project Title: TARPOL Targeting environmental pollution with engineered microbial systems á la carte
Start Date-End Date: 01/09/2008-31/08/2011
ECLT project leader: prof. Irene Poli
Funding scheme: Coordination and Support Action – FP7 Cooperation Enviroment

Abstract

Synthetic Biology deals with the rational combination of biological properties with central elements of engineering design. We argue that by merging the genetic tool box already available with disciplines such as electrical, mechanical, or chemical engineering and computer sciences, there is an extraordinary opportunity to take a fresh approach to longstanding environmental pollution problems through a vigorous application of modelling techniques and organizing the development of novel biological (e.g. catalytic) systems along a hierarchical architecture with defined and standardized interfaces. However, this endeavour faces 3 major bottlenecks that this Coordination Action attempts to overcome: [i] The scientific and technical communities of European contributors to the application of SB to environmental issues (i.e., Environmental Biotechnologists, Bioinformaticians and experts on the Origin-of-Life subject) have so far failed to recognise their latent capacity to shape a fresh discipline at their very interface, [ii] The new field still misses a comprehensive language and a shared conceptual frame for description of minimally functional biological parts (specifically dealing with catalytic properties and regulatory circuits) and [iii] The development of the SB field touches upon social sensitivities related to recreating life-in-the-test-tube, which threats with a re-enactment of the controversy on GMOs and thus it worries off the needed industrial ease in the field. To tackle all these challenges, TARPOL proposes a dynamic 2-year programme of activities, run by a large collection of stakeholders in the field and aimed at coordinating the so far fragmented efforts to direct this emerging discipline into the most industrially beneficial and socially viable directions. The trademark of this Project will thus be the energization and mobilization of large portion of European scientific, technical and social professionals to empower a new capacity to exploit properties present in Biological systems for prevention, monitoring and remediation of environmental pollution. In this context, TARPOL will recruit the required environmental competences from neighboring disciplines and will develop a number of material and computational resources for advanced refactoring of biological systems. Furthermore, we will establish a consensus frame to standardizations of procedures and parts and will proactively pursue the awareness and eventual insertion of SB into the Environmental Biotechnology context by exploring its industrial interface. Finally, we will pursue and justify the establishment of a solid European Research Agenda on SB-for-the-Environment at the service of implementing the KBBE (Knowledge-based Bio-Economy) vision in our Continent.

Consortium

- Universidad de Valencia. Estudi General (ES) – coordinating institution
- Helmholtz-Zentrum fuer Infektionsforschung GmbH (DE)
- Consejo Superior de Investigaciones Cientificas (ES)
- Institut Pasteur (FR)

- Universidad Politécnica de Valencia (ES)
- Université de Lausanne (CH)
- Università degli Studi di Milano (IT)
- GENEART AG (DE)
- Centre Nationale de la Recherche Scientifique (FR)
- UNIVERSITà Ca' Foscari, ECLT (IT)
- The Biological Research Centre (HU)
- The Spanish National Cancer Centre (ES)
- Genoscope – CEA (FR)
- Organisation for International Dialogue and Conflict Management (AT)
- Centre Cavaillès, Ecole normale supérieure (FR)
- ETH Zurich (CH)
- The Imperial College London (UK)
- BAUER Environment (DE)

Project Website
cordis.europa.eu/project/rcn/87946_it.html

DICE PROJECT

Project Title: DICE Design Informative Combinatorial Experiments
Start Date-End Date: 2007-2010
ECLT project leader: prof. Irene Poli
Funding Scheme: Fondazione di Venezia

Abstract
A great challenge in designing experiments for Living Technology is the complexity and the high dimensionality of the search space. The main purpose of the project is to develop a new methodological approach to design in an efficient and effective way the experimental space. The approach is evolutionary and adaptive, moving from small and random populations of experiments to informative populations according to the results of statistical modelling. The experiments are conducted at the LivingTech Laboratory, created with the support of this project. The specific and prime aim of this project is to develop and build a prototype of minimal synthetic cell that can be exploited as a technological platform for the development of advanced technologies. In order to achieve such goal the following steps will be undertaken:

- creation of the LivingTech Laboratory
- development of a local team of researchers dedicated to modelling and experiments
- designing and modelling experiments in high dimensional space
- prototyping of a "synthetic cell model"
- characterising of the prototypes
- providing technological transfer.

The project stands in a cutting-edge scientific and technological fields and will benefit by the interdisciplinary and internationality of the European Centre for Living Technology. The highly

scientifically prestigious results obtained by some researchers belonging to the Centre will provide the basis for the development of this current research.

PACE PROJECT

Project Title: PACE Programmable Artificial Cell Evolution
Start Date-End Date: 01/04/2004-31/06/2008
ECLT project leader: prof. Irene Poli
Funding scheme: Integrated Project FP6 – IST – FET Proactive

Abstract

The integrated project PACE will explore the utilization of the simplest technically feasible elementary living units (artificial cells much simpler than current cells) to build evolvable complex information systems. We will create, analyse and investigate the applications of such systems that process information by self-organization starting at molecular scales. We will also determine whether life-like properties are necessary for computational systems to be fully robust and adaptive and investigate the tension between evolvable living autonomy and programmable utilization. We will explore the collective properties of artificial cells and demonstrate that they are the right material for building nanoscale robot ecologies. The particular molecular systems we will consider will have genetically controlled catalytic reactions, self-assembly of complex supra-molecular structures, and energy transduction. We will investigate the stepwise evolution of such complex systems by machine complementation and combinatorial search using a programmable microfluidic interface. We will provide theoretical and simulation frameworks for understanding emergent computational properties of such systems, and experimental frameworks for programming them by evolutionary exploration of chemical reactions. We will integrate and disseminate multidisciplinary European activities to give it a decisive international competitive advantage in this FET.

Consortium

- Ruhr-Universität Bochum (DE) – coordinating institution
- Università Ca' Foscari, ECLT (IT)
- Chalmers University of Technology (SE)
- Universitat Pompeu Fabra (ES)
- University of Zürich (CH)
- Vilnius University (LT)
- Protolife S.R.L (USA)
- University of Southern Denmark (DK)
- Dublin University (IE)
- Los Alamos National Laboratory (USA)

Project Website

istpace.org