

invent

DCU

**Dublin City University
Innovation and Enterprise Centre**
Transforming knowledge into commercial success



**Portfolio of Research Capabilities and
Technologies in ICT**

Paddy O'Boyle

Business Development



DCU Strategic ICT Research Assets & Capabilities



Emerging Multimedia & Sensor Web

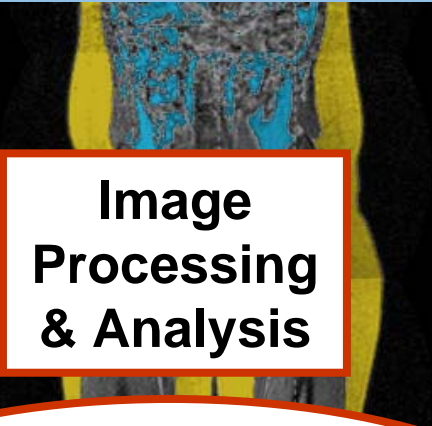


Image Processing & Analysis



Information Systems



ICT Research Areas



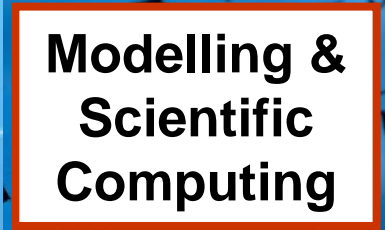
Language Research



Networks & Communications Engineering



Health & Human Performance



Modelling & Scientific Computing

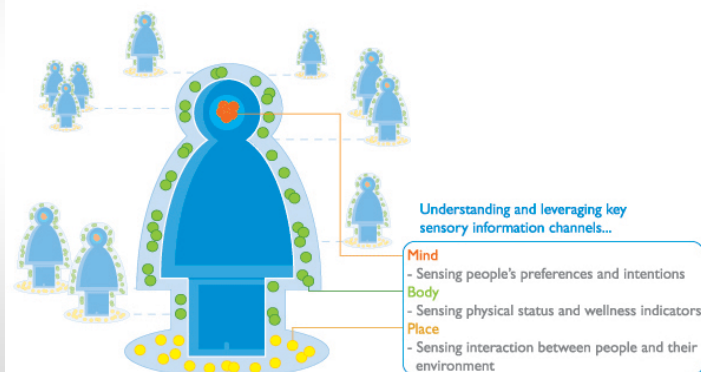


Emerging Multimedia and Sensor Web

- **CLARITY** a new Science Foundation Ireland Centre for Science, Engineering and Technology (CSET)
- Focus on Intersection of **Adaptive Sensing and Information Discovery**
- Large-scale academic-industry collaboration, accommodating more than **100 full-time researchers** in partnership with more than **10 industrial partners**
- <http://www.clarity-centre.org/>



Vision: Sensing Mind - Body - Place



Centre for Digital Video Processing (CDVP)

- Many of the research technologies have come from the **Centre for Digital Video Processing (CDVP)** which is now part of Clarity
- <http://www.cdvp.dcu.ie/>
- **CDVP Mission:** To research and develop techniques and tools to automatically analyse and index digital video information and allow content-based operations such as browsing, searching, alerting, filtering and summarisation.

Emerging Multimedia and Sensor Web (1)



Pedestrian Tracking

- Overview:** Pedestrian detection and tracking using stereo vision (two cameras). Solution robustly handles variability in lighting conditions, occlusions and variation in camera positions. Applications are likely to be security related and also for assessment of foot traffic in public places e.g. airport, public transport and transit points, shopping malls.
- Target Market:** Commercial and Governmental Security Applications. Market research companies involved in assessing foot traffic in specific locations.

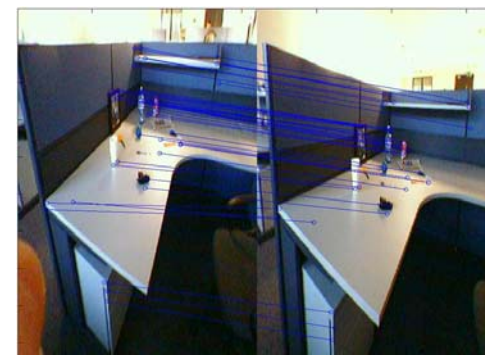


Image Matching

- Overview:** Image matching software that robustly and quickly matches a digital image of an object against a database of images. Example applications include - word matching in scanned hand-written documents, searching CAD & blueprints for specific features. Many others possible.
- Target Market:** Companies engaged in novel web search technologies.

Adaptive Object Detection and Tracking

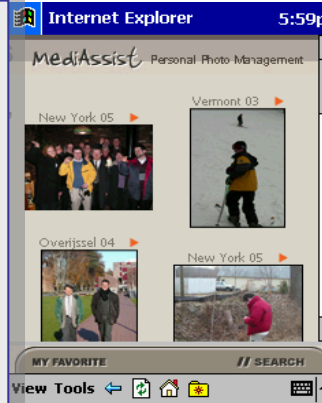
- Overview:** Adaptive object detection and tracking software solution that uses multiple inputs (e.g. visual, thermal, audio) for improved tracking, for security and automated surveillance applications.
- Target Market:** Commercial and Governmental Security Applications.



Emerging Multimedia and Sensor Web (2)

Search Technology for Video Archives Using Pictures and Speech as Queries

- **Overview:** Search technologies enable a picture, speech or free text (or all three) to be used to query a video archive. Content archive is sorted automatically using content analysis algorithms that automatically extract useful information from video that can then be searched against. Avoids manual tagging of multimedia clips.
- **Target Market:** Media organizations; security vendors; software developers providing personalized search services for home users.



Search Engine Optimization

- **Overview:** Algorithms to enable improved search engine performance through usage of document parameters to indicate relevance and quality. These are then used to eliminate large numbers of low quality documents returned in a typical search, and to prioritize most relevant documents, improving overall search performance.
- **Target Market:** Online search engines and enterprise search.

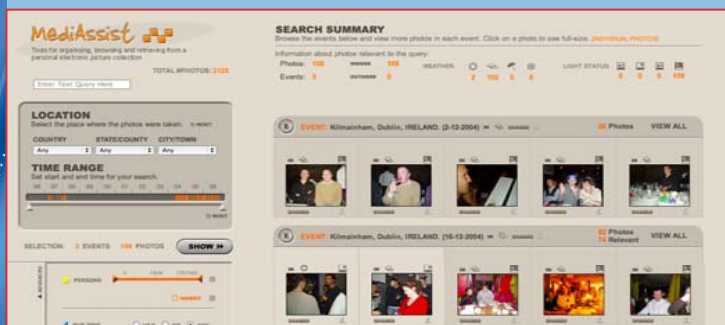
Synchronous Collaborative Web Search

- **Overview:** Collaborative search algorithms to allow multiple users, independent of location, to carry out shared searches more effectively than as individuals.
- **Target Market:** Online search engine vendors.

Technologies for Efficient Access to Multimedia Content from Mobile Phones

- **Overview:** Technologies and know-how, to access archives of photos and video on a mobile, overcoming handset limitations of screen size, processing power and interface. Complete technology solution, leveraging core expertise in search engine design, visual processing tools to better understand multimedia content, user interface design and hardware development.
- **Target Market:** 3rd party software developer supplying leading mobile operators; handset vendors; content management companies who support www companies.

Emerging Multimedia and Sensor Web (3)

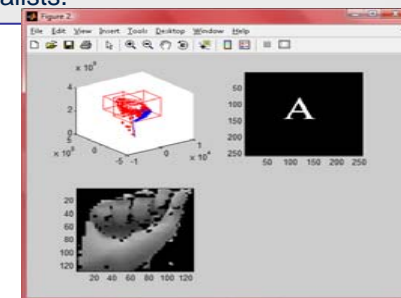


MediAssist

- Overview:** Software tool to enable easy and automatic management of digital photo collections based on content (people, buildings, faces) and context information (location, time, date). Easy-to-use intuitive web-based interface.
- Target Market:** Companies involved in photo processing; Providers of infrastructure to social networking sites; Companies who manage large digital photo collections.

Gesture Recognition

- Overview:** Gesture recognition software as interface to mobile phones, PCs, gaming consoles and other electronic equipment. 3D gesture recognition has advantages over traditional keypad and touch screen inputs. As cameras become more ubiquitous in all kinds of applications – household appliances, TVs, cars etc. gesture control will become more important.
- Target Market:** Mobile handset vendors and their suppliers; Gaming console providers; Vendors of consumer electronics; User interface software specialists.



Life Logging

- Overview:** A software solution that analyses, organizes and summarizes huge amounts of digital photographs (or video clips) into meaningful visual summaries. The best known implementation is using the SenseCam that a user wears all the time and which automatically takes photographs passively approx every 20 secs. More sophisticated approaches can use video, and can integrate other data - GPS, interactions with others via bluetooth, and incorporation of other Internet content, to enable even more compelling applications.
- Target Market:** Providers of infrastructure to social networking sites; Companies who manage large digital photo collections; Market Research companies.

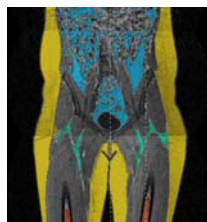
Image Processing and Analysis

Centre for Image Processing & Analysis

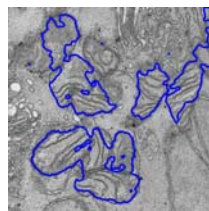
- 27 researchers and staff + 5 adjunct members + Visiting Researchers
- Group has filed 7 patents since 2007 www.cipa.dcu.ie

Focus areas:

1) Medical



2) Industrial



3) Consumer



Develop and design novel computer based solutions that will allow the **automatic extraction of key image features** with a view to a **robust and reliable quantitative analysis** of the key information/data within the scene.

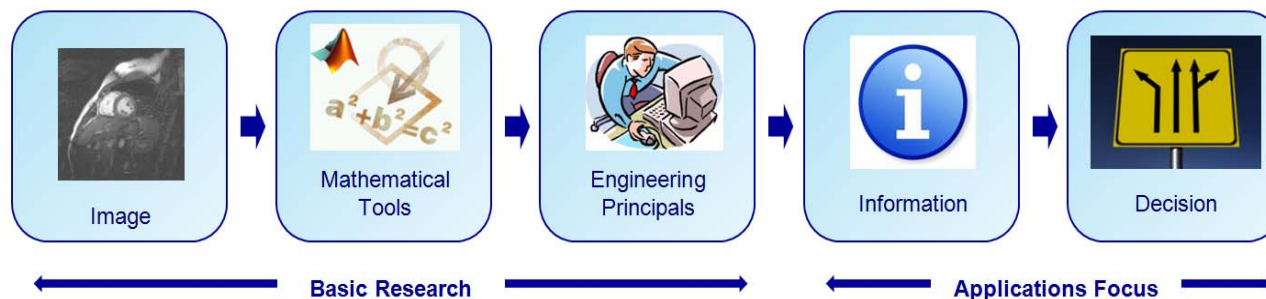
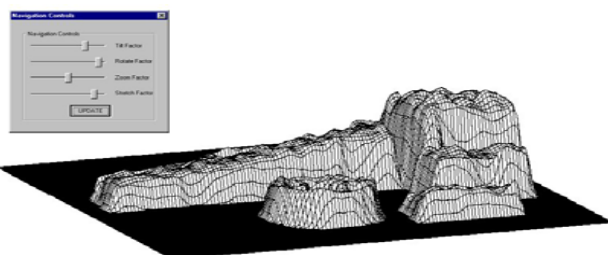
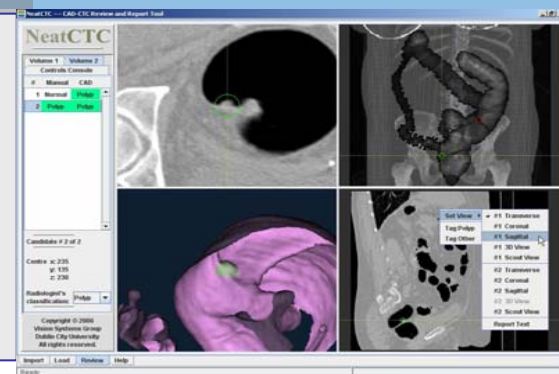


Image Processing and Analysis

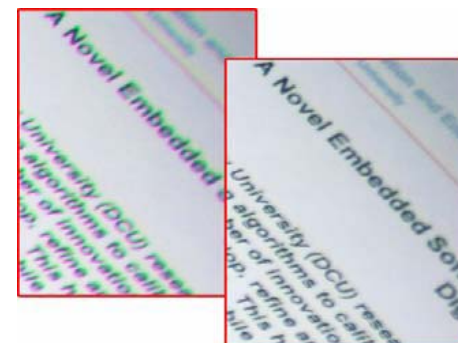
Computer Aided Detection Tool for Virtual Colonoscopy

- Overview:** Computer Aided Detection (CAD) tool for Virtual Colonoscopy. Using this technique, a CT scan is used to generate a 2D or 3D image of the colon, and the CAD tool automatically identifies candidate features based on mathematical analyses. Technology differentiator is detection of flat polyps the most challenging clinical problem.
- Target Market:** Medical Imaging companies; Vendors of virtual colonoscopy solutions; Other CAD vendors for other modalities e.g. chest, lung.



3D Digital Imaging Using Evaluation of Blur

- Overview:** 3D Digital Imaging solution through simple change in aperture. Mathematical algorithms determine depth information from difference in de-focus between two digital images at different aperture settings. "Range Sensor" solution is compact, simple and inexpensive and easily implemented on camera phone or digital camera.
- Target Market:** New capability for camera phones and digital cameras; Medical imaging applications in endoscopes and other dedicated devices; Possible manufacturing and industrial applications.



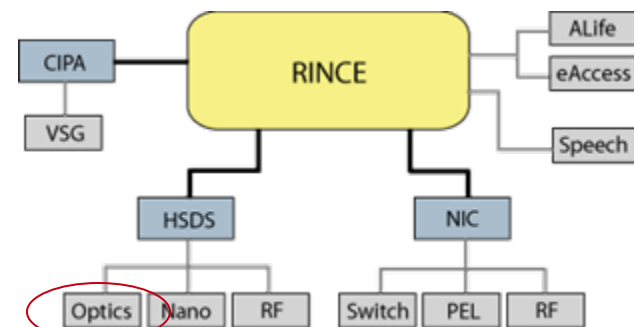
Software Enhanced Optics

- Overview:** Embedded software solution to correct for all the main lens distortions in devices such as digital cameras, mobile phone cameras, and industrial and medical imaging.
- Target Market:** Digital camera manufacturers and suppliers to digital camera manufacturers; Mobile phone handset technology suppliers.

Networks and Communications Engineering



- **RINCE** is a national centre for excellence in Information and Communications Technology (ICT) <http://www.rince.ie>
- 1. **The Centre for Image Processing & Analysis (CIPA)**
- 2. **The Centre for High Speed Devices & Systems (HSDS)**
- 3. **Network Innovations Centre (NIC)**



Radio and Optical Communications Lab

- Optical networking innovations come from Radio and Optical Communications Lab
- <http://elm.eeng.dcu.ie/~opticlab/>
- Core focus on the design, simulation and demonstration of new technologies for future broadband photonic communication systems
- Team of 17 researchers
- Experimental facilities €4m

Networks and Communication Engineering (1)

High Speed Optical Pulse Source

- **Overview:** A high speed pulse source that can be used in next generation 10G, 40G and >100G bps optical communication systems. The solution is smaller, cheaper and more efficient than traditional technologies. It can also be used in medical imaging, chemical analysis, microscopy and others.
- **Target Market:** Vendors of optical networking equipment subsystems.

Optical Signal Characterization

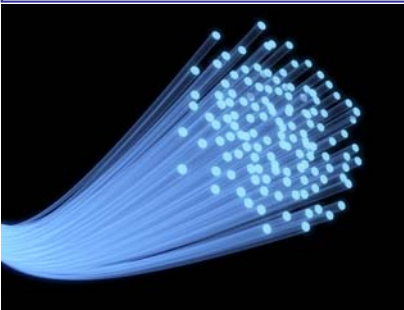
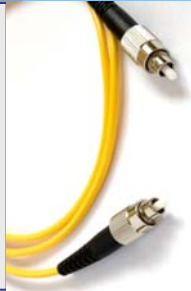
- **Overview:** Optical signal characterization solutions to support next generation high speed optical networks >100Gbps that are currently being deployed.
- **Target Market:** Optical networking equipment vendors and test equipment suppliers.

Differentiated Services over Wireless LAN Networks Solution

- **Overview:** Solution for prioritisation of different multimedia traffic streams over Wireless LAN through content adaptation instead of loss. The technology enables tiered services with differentiated quality of service, and increases the number of simultaneous streams possible.
- **Target Market:** End user applications include residential IPTV and Video on demand distribution; residential and corporate videoconferencing; security monitoring.

Hybrid Radio over Fibre Distribution Systems

- **Overview:** - Next Gen. network solution using microwave radio links (10-100GHz) transmitted directly over the fibre network usually to connect wireless base stations. Has cost benefits or when wireless backhaul not possible.
- **Target Market:** Wireless network equipment vendors.



Networks and Communication Engineering (2)

Optical Comb Source for NG Optical Broadband

- **Overview:** A cheap and simple Optical Wavelength Comb Source (OWCS) takes an optical input signal from one laser and generates a number of coherent optical signals closely spaced. The most obvious application is in bringing DWDM capabilities from the core optical network to the access network, greatly enhancing access network capacity to enable new broadband networks and services.
- **Target Market:** Providers of FTTx (Fibre to the Home / Kerb / Building).



Technologies to Enhance Performance of IP Routers

- **Overview:** Algorithms to enable improved performance (power consumption, speed, scalability and cost effectiveness) of Deep Packet Inspection (DPI) hardware in routers to enable more widespread deployment of the technology for improved security and multimedia traffic management.
- **Target Market:** IP router manufacturers and subsystem suppliers.



Optical Solutions to Enable High Speed In-Home Wireless Networking

- **Overview:** New UltraWideBand (UWB) over Fibre solution leveraging research breakthroughs in cost reduction of key optical components, Solution offers cheaper and more flexible ways to distribute HDTV signals wirelessly in homes and buildings.
- **Target Market:** Home networking market is a huge opportunity.



Information Systems

- The Information Management Group is part of the DCU School of Computing
- It has three major research themes:
 1. Digital Multimedia
 2. **Database Engineering and Interoperable Systems**
 3. Educational Technologies



<http://www.computing.dcu.ie/~isg/>

- The objectives of the **Interoperable Systems Group** are to provide interoperability between information systems, and to facilitate complex transactions across a distributed architecture.
- **Information system engineering** research focuses on models and methodologies for increasing the value of data in information-intensive and networked economies.
- **Educational Technology** research is focused on the development and evaluation of on-line learning materials and supporting architectural infrastructures.

Information Systems

Flexible E-Learning Tool

- **Overview:** Flexible E-Learning software tool that enables quick and easy creation of new E-Learning courses, through discovery and use of existing course structures and content on www or in corporate intranets. Tool allows course creators to modify course for different users through graphical UI and export results to existing delivery systems e.g. Moodle.
- **Target Market:** E-Learning companies, Corporate Training Organizations.



FastX XML Database

- **Overview:** Native XML database technology that has market leading performance. The novel technology has the ability to handle the growing number of web documents in native XML format - while resolving the traditional poor performance that has held the technology back to date.
- **Target Market:** Huge untapped opportunity for storage as XML documents versus relational database. XML allows sophisticated data mining for web based businesses, Government records and sensor data, as potential target markets.



Data Quality Management Model and Tool

- **Overview:** A modelling approach and software tool to diagnose errors in corporate databases. Tool maps businesses processes to the data storage architecture in a business. "Dynamic" business rules address root causes of bad data rather than the conventional "data cleansing" tools that only correct errors.
- **Target Market:** Any corporation with complex processes and large databases of information e.g. hospitals; ISVs; technology consultants; ERP providers.

Improved Customer Relationship Management (CRM) Using Network Analytics

- **Overview:** Software tool that analyzes communication connections (phone call records, email, financial transactions) between customers in a database to develop a model for identifying most connected and influential customers. This enables more effective management of churn and marketing of new services.
- **Target Market:** Service providers (especially telecom) who have large repositories of customer data; Companies who provide CRM tools and services.



Language Research



- **The National Centre for Language Technology (NCLT)** is based in the School of Computing in Dublin City University.
 - The Centre carries out basic and applied research in the areas of machine translation, natural language parsing, grammar induction, question answering, sentiment analysis, computer-aided language learning, software localisation, speech recognition and speech synthesis.
 - The Centre is affiliated with the **Centre for Next Generation Localisation (CNGL)**
 - <http://www.nclt.dcu.ie/>
-
- **The Centre for Next Generation Localisation (CNGL)** is a dynamic Academia-Industry partnership with over 100 researchers developing novel technologies addressing the key localisation challenges of volume, access and personalisation.
 - <http://www.cngl.ie/>



Language Research

Text Analytics Engine

- Overview:** Natural Language Analysis Toolkit that enables automatic discovery of the relations between words in text, to accurately understand meaning in unstructured data e.g. www or corporate intranets. Much more sophisticated than current state of art e.g. key word count. Typical implementation for multiple apps. 1) Crawl web for key data sources 2) Interpret meaning 3) Present findings.
- Target Market:** Huge market opportunity for this platform technology. Examples: Enterprise Search; Next Generation Q&A Search; Sentiment Analysis; Trend Analysis; Voice of Customer. New and existing search companies, market research companies etc.



Assistive Translation Technology Using Animated Sign Language

- Overview:** Automatic translation between natural language and sign language bi-directionally, using Example Based Machine Translation (EBMT) techniques. The solution incorporates translation modules, speech recognition, and avatar technology to produce animated sign language.
- Target Market:** Many applications for deaf community. Information kiosks in banks, hospitals, public transit points; Animated announcement systems.



MovieTrans: Automatic Subtitle Translation

- Overview:** MovieTrans is subtitle translation engine for automatic translation of subtitle content from a video source to another language. Based on state-of-the-art example based machine translation (EBMT) technology it can be used for new release movies, to include the growing amount of bonus material, or to automatically improve poor quality subtitles that prevail today.
- Target Market:** Companies involved in international movie distribution.

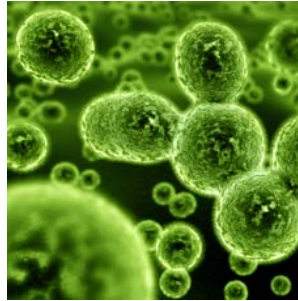
Modelling and Scientific Computing



- Centre for Scientific Computing & Complex Systems Modelling (SCI-SYM)
- <http://sci-sym.dcu.ie>

- Computational Science explores models of the natural and artificial world, through computer solutions of problems, which, due to their complexity, are intractable by conventional methods. Complex systems arise in a variety of fields, e.g. physics, biology, chemistry, eco-and other hybrid sciences, finance, socio-economic phenomena, and many others.

Modelling and Scientific Computing



Modelling Tool for Bacteria Antibiotic Interactions

- **Overview:** Software tool that simulates the growth and interactions of bacterial cells with antibiotics, to predict the Minimum Inhibitory Concentration (MIC) value of antibiotic required to combat a particular bacterium. MIC is the key measure of antibiotic efficacy used in clinical assessment.
- **Target Market:** Drug development companies and vendors who supply ancillary support services.



Financial Tool and Novel Trading Strategies for Hedge Fund Managers

- **Overview:** Application of novel analytical methods to standard asset classes such as stock index and market sector data to predict response time to crashes.
- **Target Market:** Financial institutions and hedge fund managers.



Drug Dissolution Simulation Tool

- **Overview:** Multiple computer models and extensive know how in drug dissolution including complex state-of-the-art drug delivery systems. Computational models provide an effective way to simulate hypothetical compacts and environments to reduce expensive in vitro testing.
- **Target Market:** Drug development companies and vendors who supply ancillary support services.

Health and Human Performance

Health and Human Performance at DCU

- The study of Health and Human Performance has its foundations primarily in the following subjects: Anatomy, Biomechanics, Physiology, Psychology and Sociology
 1. Sport and Exercise Psychology
 2. Sport and Exercise Physiology
 3. Sport and Exercise Biomechanics
 4. Sociology of Sport

Facilities

- The School of Health and Human Performance laboratories extend over an area of 1,100 m². These laboratories cater for teaching, research and consultancy in the fields of both
 - a) sport science and
 - b) physical activity for health.

<http://www.dcu.ie/shhp/>

Health and Human Performance

XML for Mining Sensor Data

- **Overview:** A solution to manage health and athletic performance by aggregation and data-mining of sensor data from low cost, commercially available sensors (blood pressure monitors, accelerometers, GPS location devices, heart and respiration rate sensors etc.). Solution leverages XML database technology to query both stored and streaming data, enabling much more sophisticated analyses than is available today.
- **Target Market:** Health sensor companies. Health club chains. Professional sports teams and organizations.



Energy Expenditure Analysis for Interactive Gaming

- **Overview:** Expertise in Human Physiology to make current interactive games on mainstream consoles more effective and scientific in providing exercise and work-out routines.
- **Target Market:** Game developers and console manufacturers.



E-Diary for Managing Athletes

- **Overview:** Online diary for effective management of athletic teams.
- **Target Market:** Sporting organizations and sporting equipment suppliers. Technology consulting companies.



The logo for 'invent' is displayed in white lowercase letters on a red rectangular background.The logo for DCU (Dublin City University) is displayed in white lowercase letters on a light blue rectangular background.

For more information please contact:

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The DCU logo is located in the bottom left corner, featuring a stylized yellow and orange swoosh above the letters 'DCU' in a bold, sans-serif font.