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At the cutting edge

Mimos is a cornucopia of scientific breakthroughs — from state-of-the-art soil sensor, semantic technology, wireless broadband, grid computing and more ...

MIMOS — Malaysia's centre for applied research on frontier technologies — has broken barriers in the global ICT arena with its cutting edge soil sensor — the agronomist's and farmer's tool.

This pen-sized equipment is packed with sophisticated and state of the art multi-sensing electronics that help develop precision in agriculture — an earth-breaking feat in itself.

Farmers now can use the sensor to check the physical make-up of the soil, and with information from the reading, are able to rectify or enhance the soil for crops.

The sensor chip contains components capable of virtually 'feeling' the humidity, temperature and gases in the soil.

Explained Mimos Micro-Nano Cluster head, Professor Dr Masuri Othman: "The sensor is aimed at improving the quality of life of farmers by improving yields." The sensor was so well accepted that it won the Frost & Sullivan Growth Excellence Award while Mimos was named the industry innovation & advancement (precision agriculture) R&D organisation of the year (2007).

"For the recent Malaysia Agriculture Horticulture and Agrotourism Exhibition (MAHA 2008), we managed to draw 5,000 visitors and encourage interested partners to adopt the sensor technology," Dr Masuri noted.

Concerns over yield to sustain growing demands are propelling researchers to create the wireless and robust sensor, tried and tested in controlled environment for cash crops, vegetables, open plantations (rubber and oil palm), horticulture and livestock.

Besides the sensor chip, Mimos has in hand a number of technology innovations ready to be transferred to the relevant indigenous industries for commercialisation.

The semantic technology platform, led by Knowledge Technology Cluster head, Dr Dickson Lukose, aims to enhance the use of ontology and semantic web technologies to automate the collection, modelling, organisation and retrieval of knowledge.

Semantic technology, according to Dr Dickson, allows the computer to encode meaning, allowing both machine and human to understand, share and reason. In a nutshell, this new system is meaning-orientated.

"The adoption rate of semantic technology is overwhelming and the man in the street will realise its value when the indigenous industries begin to adopt Mimos' semantic technology platform applicable across all verticals," he said.

Unlike other search engines, using word recognition system, the semantic search relies on visual and conceptualisation — in short, a feel of the item searched. When a certain word or sentence is keyed in, the semantic system will search the web using conceptualisation to locate the required information.

"Instead of listing out a long list of associated words, the semantic web constructer will narrow the search and zone in to a few links, narrowing and shortening the search process," Dr Dickson said, adding that the system's base of conceptionalisation allowed the pruning of unnecessary links.

The semantic web constructor is an invaluable aid to the medical profession, especially to interns, as it can be an immediate referral when diagnosing patients. Besides, it comes in a small compact size that can sit comfortably on the wrists of doctors.

"This little but sophisticated piece of equipment will help interns diagnose sicknesses and prescribe the right medication without having to consult seasoned doctors," Dr Dickson explained.

Just key in the symptoms and the computer will come out with a list of sicknesses associated with the symptoms and similarly, the medication. With the acute shortage of doctors, this state-of-the-art technology will undoubtedly assist the medical profession in Malaysia.

Medical students also stand to benefit from this invention as they can study the human anatomy without having to handle cadavers. The programme — infosteology — allows students to cut and dissect any part of the anatomy presented in 3-D formats. The benefits also extend to agriculturists as the unique features of the semantic system allow the farmlands.

Over the years, this technology has generated a significant increase in investments — proof of its value in this modern age. From 2005 to 2007, the total amount invested was USD4008.8 while 2000-2004 saw only USD2,222.4 — a difference of USD1,786.4. From 2008 to 2010, it is expected to jump to USD8,475.6.

Currently collaborating with global research centres —Vivomind Intelligence Inc, USA, DFKI, Germany, LIRMN, Frankest International, Austria, KMRC, Hong Kong, Franz Inc, USA and Knowledge Sc Institute in Canada — Mimos is a member of the International Advisory Board and a full member of Semantic Technology Institute International (Sti-International).

The Internet, now a global culture, is pivotal to development and progress. Recognising this as well as the fact that many areas are not Internet-accessible due rough geographical terrains, lack of power supply and low population density, Mimos has created the wireless broadband solution, WIWI, to bridge the digital divide. Seen as a step forward in cyberspace, WIWI is connecting the unconnected as it erases almost all obstacles to the network.

It provides cheaper accessibility to fixed, portable and mobile wireless broadband — at the same time, deployment is easy. The advantages also include better bandwidth and higher throughput with ease of deployment. Apart from better coverage, it also offers seamless communication and is cheaper. The WIWI not only helps save infrastructure costs but is also the catalyst or local content generation.

Another technological barrier breaker is the grid computing aimed at providing a national infrastructure that maximises high performance computing resources to accelerate industrial development for national wealth and value creation.

"Since the launch in August 2007, KnowledgeGrid Malaysia has been successful in combining networking resources — desktops, servers, storage, database and scientific instruments — to form a massive repository of computing power which can be tapped whenever and wherever it is needed most," Grid Computing senior manager Ng Kwang Ming explained.

Mimos and local

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universities — University Malaysia Terengganu (UTM), University Teknology Malaysia (UMT), International Islamic University (IIUM) and University Sains Malaysia (USM) — had been successfully 'grided' this year, he said.

KnowledgeGrid Malaysian, run by Mimos, has aided animation company, Les Copaque, to produce the country's first full-length three-dimensional (3-D) animation movie called 'The Adventure Begins'.

With grid computing, the Internet is easily accessible — unheard of some 10 years ago.

As such, the operations are made user-friendly to bridge the digital divide among the rural communities.

Jen-ii, another Mimos' creative innovation, is an example of the ingenuity of the research centre's engineers. Simplistic keyboards with symbols instead of letters allow illiterate users to browse the net or maximise the potential of the Internet.

From such simplistic keyboard and programme, the community can use the net for their daily transactions — marketing and comparing prices.

Cloud computing is no longer a vision but a reality. In fact, ICT has evolved from the days of floppy discs to what are currently used — the thumb drives from cable to wireless connection. With KnowledgeGrid, the sky's the limit as technology pushes far into the great beyond.

However, technological advantage is not without its perils. Its borderless nature is open to security problems that invade users' privacy.

"Cloud computing has raised several privacy concerns surrounding data security as well as ownership and control of copyright materials not only at personal but also national level," Information Security Cluster head Prof Dr Mohamed Ridza Aahidin pointed out.

He disclosed that Mimos was researching and developing a comprehensive holistic security approach technology through the "Ultimate Digital Fortress" project, consisting of a defence in-dept (layer-by-layer protection) method to protect information at rest, in motion and in use.

The research and development centre is collaborating with several universities and government organisations in developing a foolproof trusted security platform to combat cyber attacks. Mimos and the International Islamic University Malaya (IIUM) have established the Centre of Excellence in Cyberspace Security at the IIUM campus in Gombak.

From cyber to ground security, Mimos has it covered. Malaysia has a high illegal immigrant population — about one to two million — which has caused the crime rate to shoot up. Given the scenario, surveillance is of paramount importance.

The current video surveillance had its limits, pointed out Advanced Informatics Cluster head Chandran Elamvazuthi, adding that effective surveillance was vital for societal well-being.

The existing programme lacks continuous monitoring of screens to check data overload and environment information.

Deploying security guards has its limitations such as fatigue and negligence.

Whereas Mimos' advanced informatics provide effective software to monitor intrusion and suspicious behaviour. The intrusion and threat detection method used by the system will highlight the area of interest to attract attention of security guards and provide reliable information for further action such as details of the event detected and the location — not forgetting the acquisition of network IP (intellectual property) camera and standard CCTV camera images. The software also includes features that provide image understanding and environment modelling to increase situational awareness and organise video data efficiently by removing the clutter and confusion.

"The uniqueness of this technology is its comprehensive video analytical technologies for wide area video surveillance applications, allowing the viewer to pre-empt the crime or determine the culprit," Chandran said.

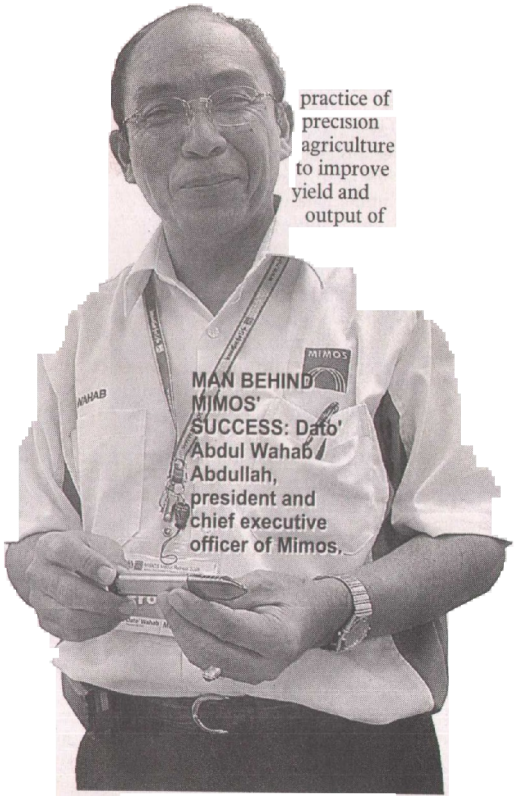
Mimos Advanced Informatics cluster research develops innovative techniques on processing and representation of informatics for practical problems with commercial potential.

He explained the cluster aimed to develop technologies in areas of image processing and pattern recognition as they related to machine learning, statistics for machine intelligence and multi-constraint optimisation.

"Physical security will become a major element in the new economy as concerns for both human lives and assets become more important while conventional surveillance systems prove inadequate," he said.

According to Chandran, Mimos is developing a surveillance system that will ultimately provide behaviour and personal analysis and personal identification via an image processing method.

"The intelligent analysis and imaging system is real-time deployment that will allow for faster danger recognition and enforcement response," he said.



practice of precision agriculture to improve yield and output of

MAN BEHIND MIMOS' SUCCESS: Dato' Abdul Wahab Abdullah, president and chief executive officer of Mimos.

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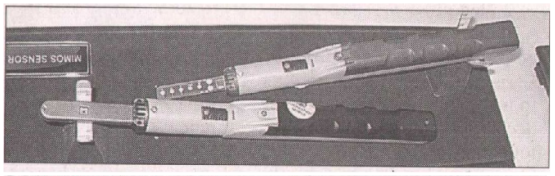
THE FIRST: The first of its kind, Mimos agronomist's and farmer's tool.



SOPHISTICATION: This pen-sized soil sensor is the pride of Mimos.

WIWI CREATOR: Dr Mazlan Abbas, head of wireless communications cluster