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Reports and Surveys

AUTOMATION REPORTS

1. Worldwide diffusion of industrial robots

The statistics provided by the United Nations Economic Commission (ECE) and the International Federation of Robotics (IFR)* supply us with an up-to-date insight into the world robot market. This joint report tells us a great deal about the technological evolution of industrial robots since their introduction at the end of the 1960s. We know that real prices have declined, and the performance of robots is continuously improving. Robots are now in use in a wide range of applications in countries worldwide.

In the publication's Foreware we are informed that:

> "The total accumulated yearly sales of robots since the beginning of the 1970s amounts, at the end of 2002 to some 1.33 million units. Some of these units (770,000) are estimated to be still in operational use."

The statistics given concerning the diffusion of industrial robots indicate that in the 2002 World Robot Market the total world sales was 68,600 units which shows a fall in the market of 12% over 2001. The total world stock of operational industrial robots was given as 770,000 units which was an increase of 2% over 2001. Readers may recall that in 2001 the world market had fallen by 21%.

Falls were also given for individual countries. Japan, for example, experienced a fall between 2001 and 2002 of some 11% to about 25,400 units. The US also showed falls. In 2001 the US market fell nearly 17% to 10,800 units which was followed by another drop of 8% in 2002 to just under 10,000 units.

The statistics given also indicated the fall in sales in the previously booming robot market of the European Union (EU). In 2000 the EU sales of multipurpose industrial robots rose to 29,800 units and, in 2001, continued to grow reaching 30,700 units. By 2002 the market had falled by 16% to some 26,000 units. The UK, for example, fell by 61%!

Figures for 2003 appear to be more encouraging. The UNECE/IFR quarterly survey which had looked at the first half of 2003 stated that 'The first half of 2003 was the best first half ever recorded'. A worldwide order intake increased by 22% compared with the same period in 2002. Individual countries showed, for this period, high order figures: North America (+18%), Europe (+25%), Asia (+18%), and other regions (+19%). The survey also gives a trend forecast for the whole period 2003–6 which projects an increase in the world market for industrial robots from 68,600 units in 2002 to just over 91,000 in 2006.

In presenting data about the diffusion of service robots the survey provides a detailed breakdown of the type of robot in use for professional purposes (18,600 in 2002 with a forecast for 2003–2006 of 29,780 units). Service robots for personal and private use are also listed (606,840 in 2002 with a forecast for 2,163,460 units for 2003–2006).

The objectives of the UNECE Statistical Division are to monitor economic and social trends, developing indicators with a focus on performance and outcomes whilst supporting business and policy decisions with an infrastructure of good quality information analysis. With the assistance of the International Federation of Robotics these joint reports do provide an excellent illustration of what can be achieved.

Examples of the UNECE/IFR analysis is given in Figures 1(a/b) of the book, which show that between 1998 and 2001 investment in industrial robots steadily increased, reaching 1,941 units, 26% over 2000. In 2002, however, investment dropped as much as 61% compared with 2001. At the end of 2002 the estimated stock of robots in use in the UK amounted to 13,650 an increase of 2% over 2001. By the end of 2006, the stock is projected to grow to just below 14,400 units which, the report reminds us, is hardly an impressive increase.

Figure 2 is a graphical representation the UK price index and an index of labour compensation in the UK business sector. This figure shows that between 1990 and 2002 prices of industrial robots fell from index 100 to 44, without taking into account that robots installed in 2002 the report reminds us, had a much higher performance than those installed in 1990. It was also noted that at the same time the index of labour compensation in the UK business sector increased from 100 to 169.

2. Italian machine tools, robotics and automation 2003/4 statistics

The preliminary final figures for 2003 and the forecasts for 2004, for the Italian machine tools, robotics and automation industry were announced earlier this year by Andrea Rirllo, the president of UCIMU–SISTEMI PER PRODURRE.† He believes that "worldwide we are beginning to see hesitant signs of recovery, but the lull on the domestic market continues". The preliminary final figures for 2003 that were presented show negative year-end results for the Italian machine tools, robotics and automation industry. The figures given were:

> "Output was valued at Euro 4,050 million, down 7.5%. The value of exports suffered a considerable decrease, (−7.2%) to Euro 1,810 million. The Italian industry's propensity to export

* *World Robotics 2003* (pp 1–370) is published by UNECE and IFR. (Information Office, CH-1211 Geneva 10 Switzerland, $30). A full review of the book appears to *Robotica* Vol. 22, Part 5 (2004).

† UCIMU–SISTEMI PER PRODURRE
Associazione Construttori Italiani Macchine Utensili, Robot e Automazione, Italian Machine Tools, Robots and Automation, Manufactures' Association. http://www.ucimu.it, e-mail: ucimu@ucimu.it

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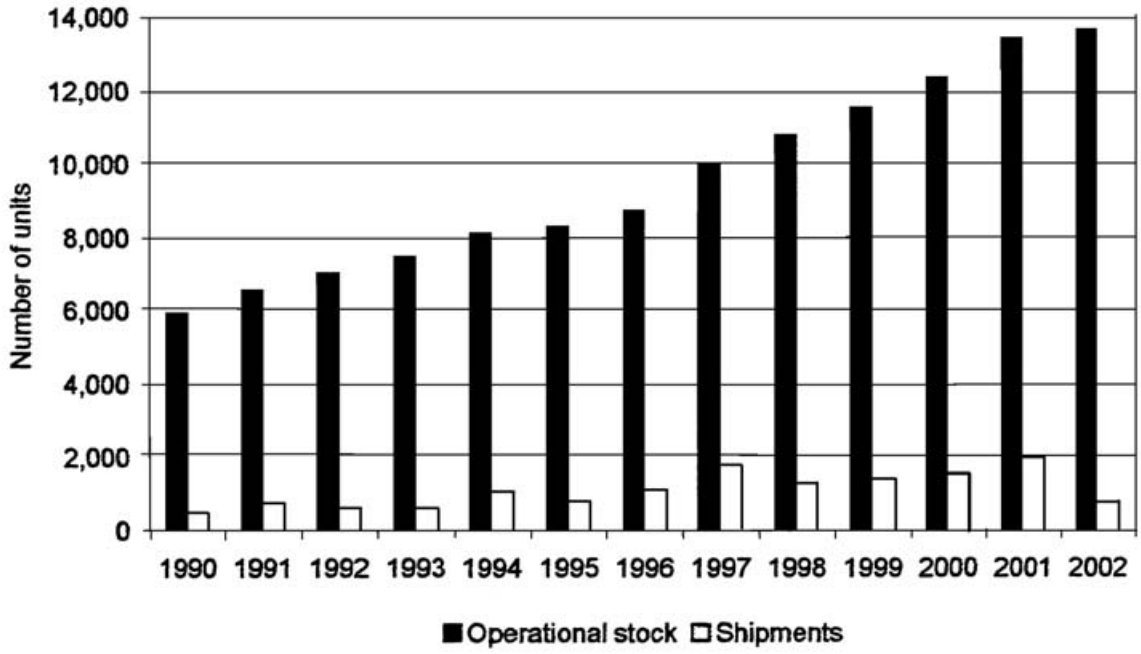


Fig. 1a. Estimated operational stock of robots at year-end and shipments during the year (Published by ECE/STAT in their Press Release).

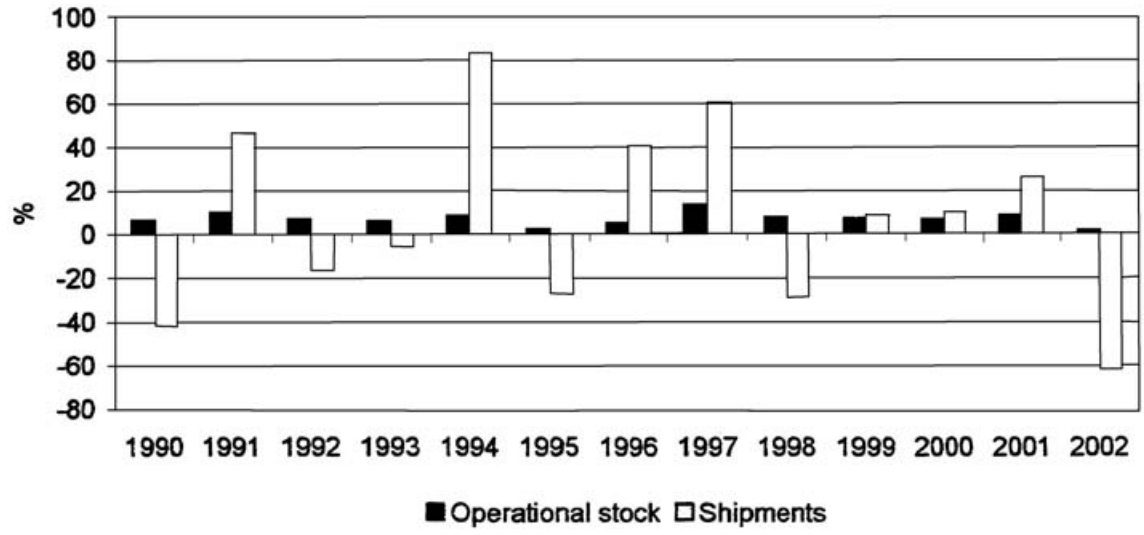


Fig. 1b. Yearly percentage change in estimated operational stock and in shipments (Published by ECE/STAT in their Press Release).

came to 44.7%, remaining substantially unchanged with respect to a year earlier. The balance of trade was positive (up 27.1%), growing to Euro 745 million.

According to the foreign trade data relating to the first eight months of the year, Italian exports of machine tools showed a marked decline in sales on the European Union market (−24.6% on the same period in 2002), due to decreases in exports in some of the main buying markets: Germany (−24.8%), France (−31.3%), and Spain (−30.1%). Exports to non-EU Europe were preceded by a negative sign (−7.2%), while Russia (+32.8%) and Turkey (+31.8%) showed better results. Despite the recovery on the North American market (+32.7%), exports were lower by 6.6% to Latin American countries. Sales to Asia were better, rising by 6.5%, thanks to healthy exports being made to China (+12.5%) and India (+124%).

In 2003, domestic demand slipped by 12.8% to Euro 3,305 million and was met by imports for Euro 1,065 million (−22% with respect to 2002) and Italian producers' sales on the domestic market, falling 7.7% for a value of Euro 2,240 million.

The import/consumption index also dropped from 36% to 32.2%, showing how Italian builders are successfully meeting the needs of their local and national markets, even in times of difficulty.

The preliminary final figures for 2003 in the robotics division show trends comparable to the sector on the whole: production fell by 5.7% to Euro 350 million due to declining exports (−8.7%) and reduced sales on the domestic market (−4.3%). Also down was consumption (−4.2%) and imports (−4%).

According to the estimates made by the Studies Dept. of UCIMU-SISTEMI PER PRODURRE, output in 2004 should

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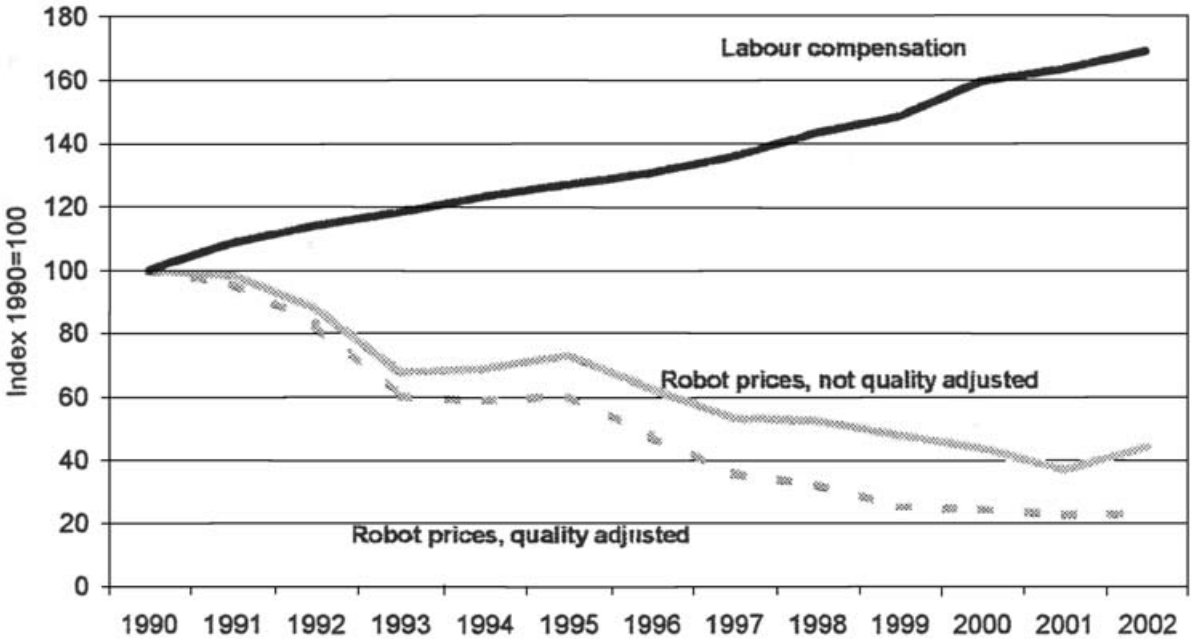


Fig. 2. Price index of industrial robots in the United Kingdom, with and without quality adjustment. Index of labour compensation in the United Kingdom business sector (Published by ECE/STAT in their Press Release).

show gains of 0.5%, due to mainly to recovery in exports (+3%), sustained by healthy sales to emerging countries and the recovery in demand on the traditional buying markets.

The value of domestic demand should fall further to Euro 3,215 million (−2.7%). Bearing the brunt of the fresh reduction of Italian consumption will be domestic sales (−1.6%) and imports (−5.2%). The import/consumption index should show further losses and finish up at 31.4%.

According to the forecasts for the robotics sector, production in 2004 is expected to remain unchanged (Euro 350 million) with 31.4% allocated to foreign sales (Euro 110 million, up by 4.8% on a year earlier) and the remaining 68.6% to domestic sales, dropping 2% with respect to a year earlier."

Concluding his briefing in Milan, the President of UCIMU–SISTEMI PER PRODURRE said (in summary) that:

..."the preliminary final figures for 2003 were influenced by the negative trends in the world economy, which have caused declines in domestic and international demand.

While the climate of uncertainty makes it even more difficult to make forecasts..... we can still assume that the hesitant signs of recovery from the world economies, in particular the United States and Japan, could crystallize during the second part of 2004, driving a recovery on some of Italy's traditional buying markets with the resulting positive effects on our exports. The domestic market is another story, however, here we predict a continuation of the current slump.

What we need is a country system that can foster renewed investments in instrumental assets, an indispensable measure for driving the recovery of domestic industry.

On the foreign front, however,..... Italian builders must be supported in their efforts to penetrate the areas identified as having a higher rate of development. Up until a few years ago, a few business offices were enough to keep business going strong; today you have to decentralize production in order to meet the customers' needs. To encourage the process of internationalisation of our companies, we have to streamline administrative and bureaucratic procedures and work toward more effective promotion of Italian made products abroad, while also protecting our products from imitation."

COMPUTER VIRUSES

Recent reports about the effects of such viruses as SASSER highlight the problem of the 'cyber' criminal. These criminals not only aim to disrupt the working of the Internet, but any computer system or computerised facility. Their motives will undoubtedly vary from the thrill of managing to access a highly secure system to that of simply obtaining financial gain or personal enhancement or pleasure, however warped. Whatever the aim, the 'cyber' criminal needs to be controlled and where possible caught and, if found guilty, punished accordingly. Punishments in recent cases have ranged from long jail sentences to community service, and even in a recent case a court order not to own or use a computer system for a year.

It is in the obvious interests of any organisation that markets computer systems or software to prevent such criminals carrying out their offences. It was encouraging to note that recently Microsoft offered £3 m to track down the authors of computer viruses. The company offered two rewards, each of £300,000 for information leading to the arrest and conviction of the persons responsible for the spread of two particular viruses – the Blaster Worm and the SoBig virus. It was publicized at the time of the announcement that the rewards would be given to the resident of any country The policy of having informers or 'inside' operators' is a well-known ploy used with some success worldwide. In part it would provide a possible answer to the policing of the Internet if an army of dedicated 'hackers' changed sides and worked against other 'cyber' criminals. The trouble is simply that persons responsible for viruses could reside anywhere in the world and tracing

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them, although sometimes successful, is an extremely difficult task.

In the case of the Blaster Worm it has been reported that a US citizen had been charged although it is thought that the originator of this destruptive and destructive computer virus had not been identified. The Blaster Worm did a great deal of damage to the operation of systems in that it triggered an avalanche of traffic. The result was that some machines were forced off-line and many corporate and other networks stifled.

Another virus that has been much in the news, SoBig, has affected hundreds of thousands of PCs worldwide. It will be recalled that it installed a program on some machines that allowed the machine to be used by outsiders who could, for example, spread spam e-mails over the networks.

Last year Interpol's Director of Information Systems and Tec summed up this serious situation when he said:

> "While some might consider certain 'cyber' crime offences to be little more than mischief, they actually threaten the physical security of all those who rely on technology in their lives."

FORMAL TECHNIQUES IN INDUSTRY

Industry has been using formal techniques for some time but it is only now that a new industrial association has been formed to encourage their use. A report published in the *European Research Consortium for Informatics and Mathematics* (ERCIM) (No. 564, 2004) by Stefania Gnesi (ISTI–CNR)* at the International Symposium on Formal Methods that was held in Pisa last year indicated how controversial they have been, with over 200 scientists and academics present at the event he expressed the view that

> "Formal methods have been controversial throughout their history, and the realisation of their full potential remains, in the eyes of many practitioners, merely a promise. Have they been successful in industry? If so, under which conditions? Has any progress been made in dispelling the scepticism that surrounds them? Are they worth the effort? Which aspects of formal methods have become so well established in industrial practice that they have lost the 'formal method' label?"

The event, called FM 2003, had been organised by Formal Methods Europe† which is an independent association whose purpose, we are informed, is to promote and support the industrial use of formal methods for the development of computer systems. Although there were presentations over & wide spectrum of experiences there was no certainty that the discussions would lead to a wider adoption of Formal Methods. Evenso, it was reported that there is a strong commitment within the FME towards increasing the involvement of industry in the formal methods community. Indeed, a new association *FORTIA*, the Formal Techniques Industrial Association, was launched with Anthony Hall from Praxis Critical Systems, as its first chair.

Further information about Formal Method endeavours can be obtained from:

* Stefania Gnesi: e-mail: stefania.gnesi@isti.cnr.it
† FME: http://fmeurope.org
‡ FM 2003: http://fme03.isti.cnr,it/

There has been in the industrial/engineering community a great deal of scepticism about formal methods. Probably this has been the result of the initial much publicised potential of the methods not being achieved rapidly. Perhaps a better understanding of their development would come from a more detailed examination of their use in industry. It was most significant from the reported participation from over 25 countries worldwide that there is a great interest in the development of such methodologies. Indeed, at FM 2003, the 12th International Symposium on Formal Methods,‡ there were so many papers offered for presentation that less than one third of the mainly high quality contributions were accepted.

INNOVATIVE PROJECTS

1. Research project in nanotechnology

Whilst research and development of nanotechnological projects have been reported worldwide there are only a handful that appear to have been viable commercially. A report of a successful venture in this field is therefore particularly welcome.

In the United Kingdom, however, a report from the Engineering and Physical Sciences Research Council EPSRC (*Connect*, Issue No. 19, 2004 under the heading 'Atomic positioning comes out of the cold') provides details of such a success in the UK. It tells us that:

> "THREE-dimensional atomic positioning has become a commercial reality, thanks to Oxford Nanoscience – with a little help from EPSRC and DTI. The Three-Dimensional Atomic Probe (3DAP) offers unprecedented sensitivity and accuracy in atomic microscopy, and is capable of resolving the chemical identity and position of individual atoms in 3D with atomic (ie, Angstom) resolution in the z direction and sub-nanometre lateral resolution.
>
> 3DAP was developed by Professors George Smith and Alfred Cerezo at Oxford University, in part through a series of EPSRC grants going back as far as 1988. Like many scientific developments, the basic idea is quite simple – it has been described as a miniature particle accelerator which reveals structure rather than smashes atoms.
>
> A specimen of material, in the form of a sharp needle, is held at cryogenic temperature (<100 K) in an ultra-high vacuum chamber (approximately 10^{-10} mbar). High DC voltage is applied, plus nano-second long pulses of high voltage. These raise the field at the tip of the specimen such that individual atoms are ionised and removed. The ions travel, via a reflectron energy-compensating lens, to the detector, where the time-of-flight and the spatial location of each ion is recorded – providing the chemical identity of each atom and its three-dimensional position."

It is already clear that alternative systems, such as X-ray diffraction and scanning/tunnelling electron microscopy are unable to determine the precise position of atoms in three dimensions. Advances in studies in nanotechnology and the development of such innovative systems, as Oxford Nanaotechnology's 3-DAP, will mean that more commercialised products will reach the marketplace. Further details about Oxford Nanotechnology can be accessed on: www.oxfordnanoscience.com

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2. Think-Tank Science Centre

In Birmingham (UK) there is a Think-Tank Science Centre that has 'thought-provoking new displays' that demonstrate some of the research in 'new hot-topics'. The aim is to stimulate public interest in science and engineering. The initiative is supported by the UK's research councils. Each display includes a physical exhibit and a touch screen interactivity which allows the Centre's visitors to see interviews with researchers behind the work.

The new displays highlight nanotechnology in particular, but also feature miniature aircraft, and emotional machines. The nanotechnology display shows a Think-Tank logo as small as a human hair and a working micromachine that is only 0.5 mm across. Micro Air Machines (MAVs) are also exhibited; they were shown to be tiny robotic craft which may have a potential in surveillance and rescue work.

In a recent film *Nemo* is an emotional little fish who finds himself in a tank in a dentists surgery. At the Birmingham Centre *eMo* is an emotional little robot; it was created by Professor Noel Sharkey to mimic or recognise human emotions.

After reading media reports we are well aware that nanotechnology, in particular, and science in general, can be a source of great misunderstanding and also worry to the public. Any efforts by the world's researchers to explain with clarity some of these innovations is well worthwhile, not only for the public but also for the scientist who needs the public support and funding.

Further information about the Birmingham Think-Tank which was set up as part of the city's Millennium Point project can be found at: www.thinktank.ac

3. Supercomputer Grid

Supercomputers already play an important part in industry and have an increasing role in research worldwide. A grid of supercomputers, if organised efficiently, could tackle all those problems that arise in science which have had to be put aside until more powerful systems become available.

In this new initiative the most powerful supercomputers in the UK and in the USA were, for what is claimed to be the first time, linked to carry out a scientific experiment. It became a practical experiment and, indeed, a demonstration of how such powerful systems could work together.

4. Experimental Project

This practical scientific experiment took place at the end of 2003 when three of the world's most powerful computers were linked to carry out lattice Boltzmann calculations. These are complex theoretical calculations to model self-assembly and fluid flow. The Teragyroid experiment was based on the Reality/Grid e-Science pilot project and was jointly funded by the UK's Engineering and Physical Sciences Research Council (EPSRC) and the US National Science Foundation (NSF). In the USA it involved the Extensible Terascale Facility (EFT), whilst in the UK both the Computer Services for Academic Research (CSAR) and HPCx.

The USA's TeraGrid and the UK's e-Science Grid provided the link between the facilities. The experimental event was coordinated from the Supercomputing 2003 Conference which was being held at Phoenix, Arizona (18–20 November, 2003). A report of the event outlines what was accomplished, it informs us that:

> "TeraGyroid accessed a substantial fraction of the world's largest supercomputing resources, including the whole of the UK's supercomputing facilities and the USA's supercomputers based in Illinois, Pittsburgh and San Diego. The success of the experiment demonstrates that this linking of multiple high performance computers can allow scientists to expand their knowledge of small systems containing a few molecules to larger, macroscopic, real-world situations containing hundreds of thousands of billions of molecules."

Further linkups will be planned and it is evident that both countries appreciate the need to invest in such high performance computing systems.

ROBOTICS WORLDWIDE

1. Singapore

Recent reports in this section have highlighted the current researches where devices have been developed to mimic creatures found in nature. A wide range of such devices are already at the prototype stage. It was therefore not surprising that scientists would choose an undersea creature to mimic in their design of an underwater robot. Scientists from Singapore have now built an underwater robot that swims by mimicking the motion of the amoeba. It has been named the '*amoebot*' and it has no propeller or rudder, but instead relies on a series of water-filled balloons to move and steer itself along. However, we are told that it is extemely slow and is incapable of moving either up or down. The developers of the robot believe that in the future it could assist divers to build large submerged structures.

Professor I-Ming Chen of Nanyang Technological University is the scientist who has developed the robot. He reports that in experiments at the university the research team has:

> "clocked the *amoebot* moving at a rate of about a centimetre a minute, but a faster version is being prepared. It moves by shifting its weight around. It inflates and deflates its balloons in a specific sequence to redistribute the water between them and so change the overall shape of the robot, which is covered with an elastic skin."

Professor Chen says that "when it changes shape it changes its centre of mass. It is like being on ice skates: If you throw your weight forward, then you move backwards".

The research team say that the *amoebot*' strongest selling points are its quiet running and its ability to swim agains a current to remain in one place in the water. Applications in offshore engineering is suggested as likely but is some 5 years away.

2. Supercomputer for academic research (UK)

The new supercomputer, which has been named *Newton*, was installed at the end of last year at the Manchester-based Computer Services for Academic Research (CSAR). A report

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by the UK's Research Councils says that:

> "*Newton* consists of 256 Itanium-2 processors and 256 GB memory running under Linux. The largest Altix in the world, *Newton* will have a peak performance of 1.3 Tflop/s, each processor peaking at over 5 Gflop/s, delivering more than twice the power of the *Turing* machine and 1.5 times Green. *Turing* will be retired at the end of 2003."

We are told that succesful acceptance tests were carried out on *Newton* in October 2003 and that it achieved a figure of over 1 Tflop/s on the Linpack benchmark. That, it is claimed, is almost 80% of the theoretical peak performance. The Engineering and Physical Research Council (EPSRC, UK) acts as the managing agent for CSAR and was responsible for running the acceptance tests. CSAR has now had its contract extended by EPSRC by 18 months. The computing service offered by CSAR will now be provided to June 2006. Researchers and academics in the UK will welcome this new machine which is claimed to be the largest of its type in the world.

More information about the supercomputer and the service available can be obtained from: www.csar.cfs.ac.uk/newton/

3. 'Newvoice' project

A report in the *Engineer* (11/03) said that throughout the world there are some 30,000 throat cancer victims who have laryn–gectomies each year. This presents an obvious challenge to medical science because victims of this disease need to be able to communicate with sounds that can be made into an artificial voice. There are already researchers in medicine and other fields who have been engaged in researches to provide 'voice boxes'. This report outlines the development of a new artificial voicebox, called the 'Newvoice valve'. It has been produced by scientists in the United Kingdom and the Netherlands. It is unique in its concept in as much as it uses rubber vocal chords to produce sounds. Reports of its initial success are said to be most encouraging.

4. Process Automation

PAL Europe, which is the European arm of the Hong Kong-based Process Automation Ltd. has reported that

> "Stevenage Circuits in the UK and RUWEL of Germany have both ordered Electroless Nickel/Gold lines – the one at Stevenage Circuits is now installed and in production; and the RUWEL line follows the order, and successful installation, of a record breaking plating line (at 5.75 m it is the widest so far made by PAL) that was in production by the first quarter of 2003.
>
> Decorpart, of Nelson in Lancashire (UK) has signed a letter of intent for a fully automatic anodising line, with huge output, for anodising pharmaceutical cans and ferules for the production of nebulisers (their expansion plan takes into consideration the fact that an increasing number of drugs will be administered in this way in coming years); Abrasive Technology, with sites all over the world, has ordered a Nickel plating machine for their Colwyn Bay (UK) facility, for plating dentists' drills and instruments used for varied tasks, such as abrading hard skin build up"

Further details of the MCP–PAL machine, and the story behind its development and of the orders for it from around the world will appear in the PAL News (2004)*. We are told that PAL have installed 1283 machines in 35 countries.

5. United States

In many-previous reports we have discussed projects designed to allow humans and animals to control machines, and gave examples of the successes achieved. Here we report on the experiment of Professor Philip Kennedy of Emory University, Atlanta, Georgia (USA) who, it is claimed, was the first neuroscientist to demonstrate these techniques. The prospect for the creation of cyborgs, that is part human and part machine, is rapidly becoming a reality. Although experiments have previously been performed on animals Dr. Kennedy reports that his team have transplanted miniature transmitters into the brains of terminally ill people suffering from degenerative conditions, such as motor neurone disease where patients become completely incapable of communication. The report of these experiments says that communication has been restored to such patients by:

> "by first identifying the area of the brain in each individual patient responsible for generating specific thoughts related to speech. Then using highly accurate positioning technology the transmitter, a tiny glass cone containing wires, is implanted in the brain.
>
> Special growth factors encourage nerve fibres to grow into the cone, where wires pick up and retransmit their signals. Power is supplied through the skin by a sophisticated rechargeable battery, and brain signals are passed to a computer by radio waves."

The results of the procedure have been that patients who have been operated on have been able to transmit movement to a cursor on a computer and make it point to picture icons or spell whole sentences letter. The researches continue and there are obvious potential uses. The implants have been costed at some £30,000 per patient with the research being funded by the U.S. Government we are told that other scientists believe that linking human brains to computers could be used not only to help the disabled but also to enhance our own capabilities. It should be noted that other scientists are researching this area and experiments have been conducted where brainwaves can be detected through the skin and surgical implants avoided.

Robotica readers will recall the recent research of Professor Jose Millan of the Dalle Molle Institute od Artificial Intelligence. Martigny (Switzerland) and fellow researchers at the Swiss Federal Institute of Technology and the Centre for Biomedical Engineering, Barcelona (Spain). This research gave details of a robot that can be steered by the power of thought and, which it was claimed, would allow certain machines to be controlled by the human mind. Other researches by Professor Warwick of Reading University (UK) described body implants in humans so that specified devices could be controlled by the human host.

There is little doubt that progress is being made in the way that humans will be able to control a variety of machines and devices directly from their brains or from implants. The part human part machine may become a reality and Cyborgs

* *Europe*: E-mail – paleurope@aol.com, *Hong Kong*: E-mail – palmktg@palkh.com

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no longer a figment of our imagination or that of the Sci–fi writer.

TECHNOLOGY AWARD

The automative industry's Nemak named ABB*, the global power and automation technologies group, as the winner of its annual 'Excellence Award' for 2003. ABB has some 270 ABB robots operating in seven Nemak plants worldwide. Nemak say that they instigated the award "to recognise and develop outstanding suppliers" as part of its own policy of ensuring the highest standards in its suppliers. This is a very laudable aspiration and one which both suppliers and the final customers will benefit from in the future.

Nemak is known to produce 40 types of cylinder head and 15 different engine blocks for the world's main automotive manufacturers. These include Daimler–Chrysler, Ford, General Motors, Opel, Renault and Jaguar. We are informed that ABB won this award for its 'excellence in providing robotic solutions and services' for the automotive company. Nemak has a total of 270 ABB robots at work in its plants. The applications in these plants include: Sand core extraction and assembly Palletising; Machine tending: Aluminium pouring; and Material handling.

UK DEVELOPMENTS IN IT

A report from the British Computer Society (BCS) is a good indication of the level of IT development in the United Kingdom. Details of the four technological awards presented by the BCS in 2003 show the very high level of innovation and market potential they have exhibited. It is worth remembering the importance of such endeavours to our own research and developments in robotics and automation.

The BCS Technology Awards are not in the catagory of the many awards that have in recent times claimed the headlines in company newsletters and journals. The BCS awards have honoured the best UK IT developments over the last year. Details of the awards and a summary of the projects that merited the honours are:

1. Monitoring website visitors[†]*: Applications Technology*

This project merited the 'Overall Technology Award' for its speed-trap.com's *Prophet* software that can record, replay and analyse every move that visitors to a website make. In consequence, this apparently simple statement of intent opens up big potential for improving websites, identifying problem areas and testing design changes, and also detecting attempted fraud or hacks. The developers summarise its features as:

> "*Prophet* can provide data, anonymously, on mouse clicks and moves, text keyed in, other keystrokes, item selections, requests for pages, submitted forms and other factors.
>
> Having *Prophet* is like having a video camera positioned behind every visitor to your website, but without the implied privacy intrusion.
>
> Every visitor move is stamped with a time, so the system can for example also highlight potential problems with an internet service, show the impact of network changes and help with capacity planning.
>
> The large majority of visitors dont buy from a site or dont do what *the developer expected*. With *Prophet* you can change a small detail, such as a colour, and see the impact instantly.
>
> Companies can select sequences of events they want to monitor – perhaps their ideal visitor experience – and discover how many people act in this way. Conversely, they can see if there is any pattern in the behaviour of people who gather items in an online basket but end up not buying.
>
> Users the company can name include Toshiba Europe and retail chain WH Smith. It also recently signed an agreement with consultancy KPMG, which will use *Prophet* in its new web monitoring service.
>
> Speed-trap.com was formed in 1999 by people from[†] such companies as Sun Microsystems and Compaq, who have funded the company themselves, with no institutional investors. The company is now profitable and expanding internationally."
>
> *Award sponsor BT Exact Overall Award sponsor Pricewaterhouse Coppers*

2. Automated payments[‡] *Services Technology Award*

This project merited its award for its Automated Payments-BACS contribution. The developer's summarise its features as:

> "The UK's BACS automated payments clearing service for banks and other organisations has come a long way in 35 years – and its latest version, Bacstel-IP, gives much more control to companies that use it.
>
> BACS handles more than 3.5 bn financial transactions a year. Previously organisations sent files of payments to be made or collected, such as salaries and direct debits, and typically got back paper reports and confirmations by post.
>
> With Bacstel-IP and its public key infrastructure security, organisations can now go online to track payments, update records and get payment confirmations and other reports. Problems with payments can be spotted and corrected quickly.
>
> Companies have started installing the software this year – and the reduction in paper reports is already saving BACS £1 m a year in postage alone. The switch to Bacstel-IP is expected to be completed in 2005.
>
> 'The existing Bacstel software is used by more than 40,000 companies to connect to BACS, but until now they have only been able to submit payments,"

Project leaders say that:

> 'Bacstel-IP now provides access to a portal to all BACS services'.
>
> "The Bacstel-IP development is a major part of what the organisation calls its 'technology renewal' programme. This involves a move from old Tandem equipment to Sun Microsystems and its Solaris version of Unix, plus Internet Protocol. Tim provides more flexibility and scope for expansion as demand for BACS services continues to grow. This is a high profile, critical business, we have used the latest technology and taken some risks – and we delivered on time, and 5% under budget."
>
> *Award sponsor Siemens Communications*

* ABB Limited Website: www.abb.w.uk

† See also: www.speed-trap.com

‡ See also: www.bacs.co.uk

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3. Red-eye removal: Systems Technological Award*

This systems project received its award for 'Red-eye removal-Pixology.' The developing company summary for the award includes the following description:

> "Software from UK company Pixology is claimed to be the first technology for correcting the red eyes that come up in photographs taken with flash cameras.
>
> Its Iriss software removes the red-eye, which is caused by the reflection of the flash light from the thin capillaries at the back of the eye, intensified by the lens at the front of the eye."

Pixology's Technical director-informs us that:

> "professional photographers reduce the problem by holding the flash away from the camera – but current trends in digital photography in particular are towards making cameras ever smaller, moving the flash closer to the lens and thus increasing the red-eye problem.
>
> Iriss only corrects the red-eye: all other red items in a photograph remain unchanged. No user intervention is needed.
>
> 'It's a secret how we do it, he says. All I will say is that Iriss does not look for the eyes in a photo.'
>
> At present Iriss is used in the processing of film, and is also supplied by camera manufacturers for people to run on their PCs to correct their own photos – but Pixology is now talking to some camera manufacturers about getting it built into their products so that the problem is resolved as photographs are taken.
>
> Customers include such companies as Konica and Nikon. Using the technology will cut manufacturers' costs because they will no longer need pre-flash, an attempt to cut red-eye which has had mixed results. In addition they will have more design flexibility, because they will not have to take into account the positioning of the flash in the camera.
>
> Pixology has been in image technology since 1995, mainly with a system enabling photo processing companies to provide digital services via the internet or public kiosks. UK customers for this system include Currys and Dixons."
>
> *Award sponsor IBM*

4. London Congestion charging†: Social Contribution Technology Award

This award given in the Social Contribution catogory was to the Capita Group, which is an IT services company. We are told by this Group that it had 11 months to develop a system that could detect vehicles travelling into central London and also to be able to check whether their owners had paid the charge.

The Group Director estimated that the project needed 450 man years of effort. In fact, he says, 'We actually delivered the first phase after only five months and the full systems on time and on budget.' He also said that this high-profile project produced no significant errors on its first day of operation.

In summary project developers report that:

> "Detection relies on a network of 437 cameras at 220 locations. They can identify vehicle registration plates and transmit them to a central database for comparison with payment records."

They also say that the system is further complicated by a:

> "variety of different payment methods, including the first use of the mobile phone short messaging system for a large project: this accounts for 20% of payments.
>
> Drivers have until the end of each working day to pay the charge, including by the internet, post, phone or kiosks in shops."

The aims of the London congestion charging system were given by Grahame Goodwin of Transport London, which was formed to oversee the £200 m project. He says that the two main aims were:

> ..."to reduce traffic and congestion in the central zone – but there are also secondary aims such as increased use of public transport and improved quality of life. You could say it was to take London traffic away from horse and cart speed."

Summing up the success of the project we are told that:

> "The result has been a 16% reduction in traffic and a 32% reduction in congestion – both better than the projected targets of 10% and 25%, Transport for London says. The scheme is also expected to generate £70 m net revenue this year; this will be put towards further improving public transport in London.
>
> One unexpected side effect is a reported increase in sales of environmentally friendly vehicles, which are exemot from the change."

B. H. Rudall
Norbert Wiener Institute and
University of Wales (UK).
Section Editor

* See also: www.pixology.com
† See also: www.capita.co.uk

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