


password

Philips Research technology magazine - issue 22 - February 2005



“The ultimate goal is to enable consumers to experience audiovisual material anywhere, anytime, with the best perceived quality possible.”

Human-perception research for understanding the user

User-focused research

“We want to make sure we are adapting technology to people, not the other way round.”

The user in the driver's seat

Andrea Ragnetti, the man behind Philips' new brand positioning

“Wireless connectivity makes communication so much simpler.”

Wireless connectivity spurs Sense and Simplicity

PHILIPS



Cover story

Human-perception research

Philips' brand promise Sense and Simplicity underlines our aim of creating advanced products that people find meaningful and easy-to-use. Fundamental and practical research on how people experience technology provides the means to develop products that are really designed around the user.

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Technology for people

Each year, Philips' innovations, designs and people are awarded prizes all over the globe. Many of these prize winners started off in our laboratories and are living proof of our quest to create advanced technologies that are meaningful to people. One which I particularly liked was the selection of the MiraVision Mirror TV as one of the '25 Best Products of 2004' by Fortune magazine and its nomination as one of the 'Coolest Inventions of 2004' by Time magazine.

“Simplifying technology is a complex, challenging task”

Only two years ago, the technology was still an experimental gadget in the bathroom of our HomeLab, where we had installed a couple of LCD screens that doubled as conventional mirrors. The idea was to give people a more natural interface to a health coach program than through the traditional PC, so we integrated the display interface in people's home environment and merged the application with their daily routine. Volunteers who tested it responded very enthusiastically, and this fueled the idea of designing a TV based on the same principle. A business was formed that first addressed the hotel market and now sells the product to consumers as well.

I am particularly keen on it as it constitutes the delivery of our new brand promise Sense and Simplicity and the way we intend to live up to it. The success of MiraVision is not a lucky shot, but a result of our conviction that understanding customers' needs is a key prerequisite for success, even for us at the very end of the innovation chain.

That is why, in addition to our research into what consumers want, we are working closely with many of Philips' B2B accounts, from telecom companies to radiologists using our medical equipment, to discuss our ideas for new technologies and match them to their wishes. It is also the reason why we are such strong advocates of doing research in a spirit of Open Innovation. Because by joining forces with partners and peers we can accelerate the momentum of innovation and build a common platform of technology that really matters and gets adopted. This issue of Password will feature more examples of our commitment to our new brand positioning. Although it may sound like a paradox, simplifying technology is really a very complex, sophisticated task and I will be proud to see more of our Research work end up in acclaimed Philips products in the years ahead.

Rick Harwig, CEO Philips Research

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Philips Research, part of Royal Philips Electronics, has five main laboratories in three continents where 2100 researchers investigate promising options for innovation.

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Technology news

Emmy Award for UHP lamp

Philips has won an Emmy Award for its UHP lamp technology. The National Television Academy recognized Philips' Ultra High Performance (UHP) lamp for its contribution to large-screen TVs by providing lighting solutions that have long life, high brightness, stable picture quality and guaranteed system reliability. Developed by Philips Research, the UHP technology is applied in front projection as well as micro-display projection TV, a segment where the unique and unmatched lamp system is making Philips the market leader with a very large market share.

Handshake Solutions partners with ARM

Handshake Solutions, a line of business of the Philips Technology Incubator, and ARM have announced the joint development and marketing of an ARM processor using Handshake Solutions' unique low-power, self-timed technology. The partnership provides Handshake Solutions with a license to develop the breakthrough implementation using their unique design flow and methodology. "With ARM on board, clockless chips are now set to enter mainstream semiconductor markets," said Wouter Van Roost, CEO of Handshake Solutions, in an interview with Reuters.

For more information
www.handshakesolutions.com

Chinese Premier visits Philips

On December 7, Chinese Premier Wen Jia Bao and his delegation visited the global headquarters of Royal Philips Electronics in Amsterdam. Mr. Gerard Kleisterlee, President & CEO of Philips, introduced Premier Wen to a range of advanced technologies that can contribute to China's sustainable development goals. These included medical diagnostic applications and smart electronic systems and services that can help China further improve the quality and expand the reach of its healthcare. Philips also showed research into an eco-friendly water treatment technology based on an advanced process of disinfection through irradiation with ultraviolet light. In the area of telecommunications the delegation saw a distance learning experiment and learned about the results of Philips' research in support of the Chinese 3G standard TD-SDCMA.

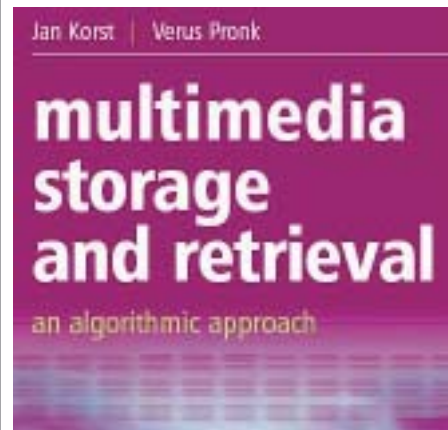


Premier Wen tries 'iCat', a prototype user-interface that provides natural human-like interaction with daily activities. On the left, Mr. Gerard Kleisterlee.

For more information
www.research.philips.com/newscenter/misc/visit.html

Published books

Jan Korst and Verus Pronk of Philips Research are the authors of a new book 'Multimedia storage and retrieval: an algorithmic approach', published by Wiley. The book covers disk scheduling algorithms for the support of multimedia streaming in professional servers as well as personal video recorders, from simple to sophisticated: from single user to multiple users, from constant-bit-rate to variable-bit-rate streams, and from single



disk to multiple disks. In addition, it covers multiple-disk storage strategies, such as striping and random redundant storage, as well as bit-rate smoothing and near video-on-demand strategies.

For more information
www.eu.wiley.com/WileyCDA/WileyTitle/productCd-0470091037.html

Scientists Stein Kuiper and Benno Hendriks of Philips Research published a comprehensive article in IEEE Spectrum on Philips' FluidFocus technology, a revolutionary lens that mimics the human eye.

For more information
www.spectrum.ieee.org/WEBONLY/publicfeature/dec04/1204foc.html

MEXTRAM transistor model elected as world standard

The Compact Model Council has recently elected MEXTRAM (Most EXquisite TRANsistor Model) as a world standard transistor model. IC designers use circuit simulation software to verify the electrical behavior of their circuit designs before the time consuming and costly fabrication process is started. Compact models, which describe the behavior of transistors in an analytic way, form the key elements in circuit simulators. The MEXTRAM model, which has been developed by Philips Research, has been proven to provide the best accuracy for bipolar transistors. This enables design optimization and shorter design cycles, and means that even designs with large system-on-chip ICs are right first time. Since 2001 MEXTRAM has been hosted and supported by DIMES, the Institute of Microelectronics and Submicron technology of Delft University of Technology.

For more information
www.dimes.tudelft.nl/research/press/2004/MEXTRAM_en.pdf

Awards

Kees Schep of Philips Research was one of the scientists on MIT Technology Review's Annual TR100 list of the world's top-100 young innovators. He was elected for his contribution to the development of the Blu-ray Disc format for next-generation optical-storage systems.



Philips has been selected as runner-up in the 'Semiconductor and Electronics' category of the Wall Street Journal's prestigious Innovation Awards 2004 for its work on RF MEMS – a new method of creating radio-frequency components that will help to minimize the size and enhance the performance of mobile phones. The Philips RF MEMS device is essentially an adjustable capacitor constructed from two metallic plates – one on the surface of a silicon chip and the other suspended a matter of micrometers above it. The suspended plate is created by etching underneath specially designed metallic layers on the chip. The capacitance between the two plates is adjusted by altering the separation between them, using the attraction force of an applied electrostatic field to move the suspended plate up and down.

For more information
www.research.philips.com/newscenter/archive/2004/mems.html

Domine Leenaerts of Philips Research has been appointed IEEE Fellow for his contribution to non-linear circuit theory and design. To receive this highest grade of membership of the IEEE, one has to be nominated by at least six other IEEE Fellows who recognize the candidate's contribution to one of the IEEE societies as being very important.



Diego Olego, Managing Director of Philips Research USA, has been elected Chairman of the US Display Consortium (USDC) governing board. USDC is a public/private partnership commissioned to develop the flat panel display (FPD) industry supply chain.

For more information on USDC
www.usdc.org/

“Technology is good when it adds something to people’s lives”

Andrea Ragnetti about Philips’ new brand positioning

The man behind Philips’ new brand promise Sense and Simplicity is Andrea Ragnetti, Chief Marketing Officer of Philips. He spoke to Password about the rationale behind this positioning, and how he expects it to help increase the success of innovations from Philips Research and speed up their time to market.

By Koen Joosse and Cees Jan Mol



1 How unique is Philips’ focus on simplicity?

In the world of technology, everybody understands the relevance of it. If you listen to the CEOs of major technology companies, or world leaders in technology all they talk about is ‘simplification’. So I have no doubt that this is a relevant, and potentially very competitive theme. We are the first company in the world that has decided to commit one hundred per cent to simplicity. And we are the only one. Why is that? Because the fabric of technology companies is made up of very bright, smart people, who have built their careers, their ambitions, and their lives, on complexity. Simplification is a very sophisticated task, very complex. We are making this company the only one in the world of its size that implements it consistently.

2 Sense and Simplicity seems really consumer focused. How do our business-to-business customers respond to it?

The business-to-business community is actually where we get the most positive

feed-back. Radiologists and other specialists ask us to come up with equipment that suits their needs. Equipment that can be operated easily and intuitively. Software that helps them more easily understand the results on the scans and draw the right conclusion from them. I talked to Peggy Fritzsche, president of the Radiological Society of North America who recently joined our Simplicity Advisory Board of external advisers. She said: “You can’t imagine the number of Radiologists, who could have had another 20 years of career, very smart people who quit their job, because they cannot cope with the rapid development and complexity of technology.” Isn’t that a very powerful insight? Technology per se doesn’t mean anything. Technology is good when it adds something to people’s lives.

3 So will customers experience a different Philips?

Yes, because the value of this positioning is really in focusing our efforts. In applying it as a filter in everything we do. In essence the brand positioning talks about three things. One is ‘designed around you’. That means focusing the whole organization around end-

user insights. This goes way beyond simple category benefits, which are too superficial. For example, display developers often say that what consumers want is picture quality. Of course when you buy a \$ 3,000 TV set, it has to have some quality! The really successful companies are able to go 1, 2, 3 levels down and understand the real insights, the drivers, the motivators.

“We can have the best possible technology, but if we are not able to put together eighty per cent of the market around it, then it is useless.”

Think about Google as an example. The category benefit, something all search engines give you, is: “I want to find something on the web.” One level down is: “When I am using a search engine, most of the suggestions I am given are wrong. I wish there was a way to only get things I know others regard to be a useful link.” Our brand position helps the entire marketing community focus on winning end-user insights. Living up to them will be a tremendous asset, also in binding our business customers, because we know the needs of their client base. B2B2C, business-to-business-to-consumer, that’s the game we play in our Semiconductors business for instance.

4 What about the other elements of the brand positioning?


The second element is ‘easy to experience’. Here, the big challenge for the marketing community is to sharpen the definition. My perception of what is easy to experience may be different from yours. This is a complex in-depth issue that involves using focus groups, among other things. The third point is ‘advanced’. Here it is important to point out that we have deliberately used the expression ‘advanced’ and not ‘innovative’. Innovative is generic and conveys the sense that we want to use the best, latest technology. Advanced is more sophisticated and reflects what consumers feed back to us. Fifteen years ago, it was sufficient for technology companies to demonstrate that they were the first with a new technology or achieved the best technical performance. In the meantime, consumers and customers have seen the

failures of technologies. All of us have seen technical standards come and go, different formats and models for the same application and so on. Consumers have become much smarter when it comes to adopting technology. Now they are looking for technology that solves their need in the best possible way. We can have the best possible technology, but if we are not able to put together eighty per cent of the market around it, then it is useless.

5 How will the brand positioning help increase the success of Research innovations?

If we do it well, it will shorten the time to market of new technologies and increase their success. The challenge will be to achieve an ongoing dialogue between marketing people, people in the field, and researchers. Researchers have to become more knowledgeable about marketing and the other way around. In the end, the customer insight we develop should resonate in Research, making sure that we develop technologies that really address and solve relevant needs.

6 Can you capture all this in formal procedures?

I sometimes struggle with the tendency of a technology company to put everything in a box. How do you make sure that the human side is still alive? This world is becoming increasingly dominated by return-on-investment, processes, numbers, figures, facts, data, which is fantastic. But we also have intuitions, passions; we are human beings. Take the example of our Ambilight TV. Formal procedures could have killed that project very early on because there were enough arguments to do so. But we kept it alive, because intuitively everybody thought it was a great idea! All the big stories you hear about successful technologies have, at their core, somebody who was very passionate about it. We have to make sure our processes incorporate that. 

 For more information about Sense and Simplicity www.philips.com/about/brand/index.html

'Designed around your brain'

Human-perception research for understanding the user



Philips' brand promise Sense and Simplicity underlines its aim of delivering advanced products and applications that are meaningful and easy-to-use. Designing products around people is a vital prerequisite for making this ambition come true: we need to fully understand how people experience technology, and provide solutions that exceed their expectations. As all experiences in a person's life are made up of a combination of seeing, hearing, feeling, tasting and smelling, studying these basic modalities leads to fundamental insights that can be applied in human-centric design. At Philips Research, human perception is an important research field that has already led to many innovative products and applications.

By Peter van den Hurk

Visual-perception experiments are used to optimize the performance of displays.

How close can we get?

As a result of many investigations in the field of human aural perception, we know that a loud sound affects the audibility of a weaker sound so that the weaker sound even can become inaudible. This effect is strongest between sounds that are close to each other in time and tone. Masking occurs because the amplitude resolution of our hearing is limited and adjusts to suit the prevailing levels of sound in the environment. This phenomenon is effectively used in the popular MP3 audio codec. By leaving out 'masked' audio information, which is inaudible anyway, this very efficient 'perceptual' audio codec yields relatively small audio files while preserving good sound quality.

The success of MP3 shows that fundamental knowledge of human perception can lead to groundbreaking, highly appreciated new applications, which are not solely restricted to the audio domain. All of the sensations in a person's life are made up of a combination of the five senses: seeing, hearing, feeling, tasting and smelling. At the center of these modalities is the human brain, perceiving and transforming these signals into a huge variety of personal experiences. Consequently, studying human perception is fundamental to gaining insight into the users of our products and applications. Given that we design around people, we could not get much closer.

Compression without compromise

Historically, most of the basic research into human perception at Philips has been devoted to aural and visual perception. Sounds and images are recorded, stored, transmitted and played back, with

digital processing taking place in all of these stages. Trade-offs have to be made at every step in this chain, due to limitations in bandwidth, storage capacity, processing power, etc. Each of these decisions may affect the perceived quality of the user experience. Research on human perception generates the insight required to design solutions that fit people's perceptive and cognitive abilities optimally. Much of the work in this field uses a pragmatic approach with user tests, in combination with a solid theoretical foundation, which leads to new applications.

"The ultimate goal is to enable consumers to experience audiovisual material anywhere, anytime, with the best perceived quality possible. It all starts and ends with the appreciation of the user."

Ronald Aarts, Philips Research

'UltraBass' is an example of an audio feature that exploits a psycho-acoustic effect called 'virtual pitch' or 'missing fundamental'. It extends the perceptual bass response of a loudspeaker by reconstructing a virtual, full-sounding bass from an audio signal that only contains the upper harmonics of the original bass frequencies. With 'BaryBass', another concept, astonishing bass signals can be produced from small-sized loudspeakers by mapping a low-frequency region (20-150 Hz) on a single tone, challenging the existing physical laws of loudspeaker design. ➔

Psycho-physiological measurements of a user's 3D gaming experience



3D Displays

With Philips Research's new multi-view 3D LCD flat-panel displays, users see a remarkably life-like three-dimensional image that remains stable over a wide viewing angle. Simply by moving their head from side to side, viewers are able to glance down the side of objects as they would in real life. Extensive user tests are currently underway, studying if the 'WOW!-effect', which occurs when people experience these 3D displays for the first time, is sustained over a longer period. In these tests, users play a computer game, both in 2D and in 3D mode. During these sessions, not only game scores are recorded, but facial expressions, skin resistance, and the heartbeat of the player as well. These physiological data are all indicators for the level of involvement of the players. In this way, the attractiveness and appreciation of 3D display technology can be measured in relationship to parameters we can adjust.

Aural-perception experiment in an echo-free laboratory



Optimal coding of stereo (OCS)

In recent years, the focus of low-bit-rate coding has shifted towards parametric description of sound, where the choice for basic elements to represent sound, like sinusoidal components or parameters characterizing spatial sound properties, are based on advanced models of auditory perception. OCS (Optimal Coding of Stereo) is an algorithm to encode a 2-channel (stereo) audio signal using only one channel and a limited set of parameters. With this technique, up to 40% higher compression rates can be achieved compared to conventional stereo coding techniques, whilst no concession is made in quality. The coding algorithm derives parameters related to the spatial location of sound sources, like differences in time and levels between the two stereo channels, and also parameters related to the compactness or diffuseness of the various sound sources. This technique is now part of both the MPEG-4 standard, as well as the new standard for mobile communication (3GPP), something that was achieved in far-reaching cooperation between Philips and the external Swedish partner Coding Technologies (CT). With this partner, the challenging problem of a parametric multi-channel audio coder is now being addressed for inclusion into the upcoming MPEG-4 multi-channel audio standard.

A recent focus of applied aural perception research is automatic audio content analysis, which uses perception models and advanced signal processing to extract meaningful features from audio and music signals. Applications of this technology range from music navigation and classification to automatic play list generation.

A perfect picture

Visual perception research aims at understanding the concept of image quality to improve the picture performance of display technologies in different application areas. It addresses the complex relationship between the technical variables of a display on the one hand, and the perceived image quality on the other, through many user evaluation tests. The award-winning television feature 'PixelPlus' is a striking example of insights gained. This digital signal processing algorithm doubles the horizontal television screen resolution and increases the vertical resolution by one-third, which results in brilliant contrast, ultimate sharpness and great picture depth. Another example is 'LifePix', a video-processing algorithm based on psycho-perceptual models of 'colorfulness', which suggest that people perceive brighter and higher contrast ratio pictures with more saturated colors as being more colorful. It converts colors that lie outside a display's color gamut into corresponding colors that lie within it, while correcting for the display's white-point and hue deviations, the result being that the user perceives an image with more vivid and




Shooting high-quality video content for color perception experiments on displays

realistic colors. In the world of graphics design, where true colors are extremely important, this is a major improvement.

Feel and smell added

As events in nature are mostly not restricted to aural and visual signals alone, Philips Research has started to study the perception of tangible and smell stimuli as well, addressing the interactions between the different senses and investigating to what extent their combination influences people's perception. In this new, challenging field, research is being done on combinations of lighting, video and audio settings with fragrances to create specific ambiances that enhance people's experiences. Given Philips' focus on products and services in lifestyle and healthcare, building up fundamental knowledge in this area is vital.

With a pragmatic approach, combining thorough insights in human perception and sophisticated signal processing algorithms, new experiences are created that are truly designed around the user. Sense and simplicity ultimately is about human perception: in the end, only meaningful and easy-to-use appliances will catch the eye, be remembered, and be talked about positively. 



Prof. Dr Armin Kohlrausch • Research Fellow on auditory and multisensory perception at Philips Research Eindhoven, the Netherlands

Dr Ronald Aarts • Research Fellow on acoustics, sound reproduction and electrophysiological signal processing at Philips Research Eindhoven

Dr Ingrid Heynderickx • Principal Scientist for visual perception at Philips Research Eindhoven

Extra info www.research.philips.com/password • Video processing for better display perception • Parametric coding • 3D displays and applications

Joined forces

Human perception is a complex research area, and multidisciplinary cooperation is needed to fully understand the fundamental aspects. Consequently, there is close collaboration with renowned expert institutes, for example at the universities of Genoa (Italy), Santa Barbara (USA), Lyngby/Copenhagen (Denmark), Oldenburg (Germany) and Eindhoven (the Netherlands). For developing advanced solutions, there are extensive contacts with all audio and display-related businesses within Philips as well as with customers. Within Philips Research, much work is done in collaboration with HomeLab, where users are studied in 'real-life' contexts. As the concept of image quality is expected to be susceptible to regional and cultural differences, a center for subjective testing has been established at the Dong Fei Institute at the South-East University of Nanking (China) to investigate aspects of color and sharpness perception for Asian people.

Published

In the book 'Audio Bandwidth Extension: Application of Psychoacoustics, Signal Processing and Loudspeaker Design', Erik Larsen, a former scientist at Philips and now with the Massachusetts Institute of Technology, and Ronald Aarts, Research Fellow at Philips Research, describe several methods to increase the perceived or real frequency spectrum of audio bandwidth and examples to apply these for improvement of the sound of for example TVs, Internet radio and portable audio devices.



For more information www.eu.wiley.com/WileyCDA/WileyTitle/productCD-0470858648.html



Partners in growth

Philips R&D in China enhances sustainable development and Open Innovation

Years ago, Mao Zedong rallied his fellow communists with the cry, “Serve the people!” Now, private enterprises, led by Philips, are serving the Chinese people in ways Mao could not have imagined. Philips Research plays a big role in the company’s plans in the world’s most populous country. Here’s how:

By Craig Brelsford

Healthcare

With healthcare unevenly distributed throughout China, the need is great for mid- and low-end medical applications, especially for the poorer areas in the hinterlands and northeast. Philips Research has identified the development of such applications as a priority.

To that end, Philips is actively pursuing healthcare partnerships in China. In June, the company created a joint venture with the Chinese company Neusoft to develop and manufacture Computed Tomography (CT), MR, and X-ray and Ultrasound equipment in the northeastern city of Shenyang.

“We are here to be inspired by the environment.”

“With China’s underserved rural areas firmly in mind, Philips Research is also developing telemedical applications,” said Wouter Leibbrandt, head of the optical-

storage and digital-television department at Philips Research East Asia in Shanghai. “The idea is that through the Internet and mobile-phone technology, doctors in rural areas can get access to remote service centres,” he says. In a related activity Philips is contributing to Chinese distance education and training. A low-cost, easy to use and easy to maintain open architecture for distance learning, developed and funded in collaboration with several Chinese partners, is the latest result of this commitment.

In serving such areas, the policies of the Chinese government and of Philips are in harmony. The Chinese government wants to smooth out the country’s regional imbalances, seeing them as a threat to economic growth. Philips, meanwhile, continues its century-old tradition of improving people’s lives while taking part in the broadening and deepening of the Chinese market.

Telecommunications

With more than 300 million mobile phones in China, the Chinese are the No. 1 mobile-phone users in the world. Small wonder, then, that Philips bases so much of its research into the technology in China. As Leibbrandt says, “We are here to be inspired by the environment.”

Cooperation on setting standards for Chinese mobile-phone networks is a top priority for Philips Research, says Yonggang Du, department head at Philips Research East Asia in Shanghai and a specialist in telecommunications standards. “In 2003, Philips set up a joint venture with Samsung and Datang Mobile for delivering cellular TD-SCDMA chipset and reference design,” Du said. “Together, we’re working on new features for the new Chinese 3G standard.”

Optical storage


With around 80 percent of such products made in China, optical storage is another area where China is a world leader. Here, Philips benefits from its front-row research seat in China, supplying sub-producers with world-class optical-storage components. Philips’ research team in Shanghai is currently trying to improve robustness (the ability of disc players to handle a variety of discs).


As with telecommunications networks, optical storage also poses the challenge of standardization, Leibbrandt says. “We are active, along with a large conglomerate of other players, in setting the next standard for video publishing. A lot of the driving force behind that is coming from Shanghai.” The activities of Philips Research in China accord with the broad plans for Philips in the world’s most populous country. Philips, for example, is committed to a strategy of Open Innovation, partnering with universities and research institutes in an effort to create new knowledge and markets. This spirit made a delegation led by

Philips Research CEO Rick Harwig and Eindhoven University of Technology President Amandus Lundqvist travel to China recently for visits to four top universities in an effort to establish cooperative links. And it is this same spirit that has led Philips to establish 20 joint ventures so far in the country.

“We work on telemedical applications for the rural areas.”

Philips is also showing its confidence in intellectual-property-rights (IPR) protection in China by sponsoring intellectual-property academies at the Tsinghua, Renmin and Fudan Universities. Under the arrangement, professors from these universities will visit universities in the Netherlands and other countries, while Philips sends IPR experts to give lectures at Tsinghua, Renmin and Fudan. Through it all, the hope is that by serving the Chinese market closely, with solutions geared to the particularities of the giant, developing nation, Philips can grow along with China. The long-term commitment to China was never intended to bear quick fruit, but to allow Philips to set deep roots in the country. Even so, the relationship is starting to blossom. Not quite two decades after launching its first joint venture in China, the Middle Kingdom is now the fastest-growing market Philips serves and its second-largest, with revenues of \$7.5 billion in 2003. Philips operates 16 R&D centres in China.

It has been said that in all of history, no country has improved itself economically as quickly as China has done in the last 20 years, a two-decade span that has seen 400 million people escape severe poverty. Philips and its Research team have both shaped and been shaped by this positive upheaval. 

 Extra info www.research.philips.com/password • TD-SCDMA • Distance learning project • Philips Research East Asia

Philips’ involvement in China stretches back eight decades. A look at some of the highlights:

1920s	Philips opens first offices in China
1985	Philips sets up first joint venture in China
1996	Philips opens optical-storage factory in China
2000	Philips establishes Philips Research East Asia, R&D centre for Philips in the Asia Pacific Region
2002	Philips becomes largest foreign multinational in China
2002	Philips opens LCD plant in Shanghai
2002	Philips China awarded ‘Extraordinary Contribution Award of 2002’ by China Foreign Invested Enterprises Association
2003	Philips total annual revenue in China surpasses \$7.5 billion
2003	Chinese Premier Wen Jiabao meets with Philips President and CEO Gerard Kleisterlee in Beijing
2004	Philips opens Consumer Business Innovation Center in Shanghai, its third innovation centre in Asia and its 16 th R&D centre in China. Philips China now has about 900 R&D staff
2004	Philips agrees to provide MIFARE contactless chip technology for new e-ticketing system at Great Wall of China
2004	Philips sponsors intellectual-property-rights education at Tsinghua, Renmin and Fudan universities
2004	Philips has generated and patented 200 inventions in China. The total number of patents in China increased from 1,100 in 1997 to 6,500 in 2003.
2004	Philips and Shanghai authorities sign Letter of Intent to establish Philips Innovation Campus in Shanghai
2004	Premier Wen Jia Bao visits Philips headquarters in Amsterdam, the Netherlands, and gets demonstration on range of advanced technologies that can contribute to China’s sustainable development goals
2007	Philips’ annual revenue in China expected to reach \$12 billion, making China the company’s largest market

The user in the driver's seat

Philips involves users in the creation of new technology right from the start

At Philips, one of the core tasks is creating technology that serves people, is a seamless part of their lives, and is as simple to use as possible. But what does that mean in practice? Above all, it means listening to real people almost from the moment a product is conceived.

By Craig Brelsford

"Technological changes are happening, with or without Philips," says Boris de Ruyter, scientist with Philips Research in Eindhoven, the Netherlands. "But we can, to some extent, shape what happens. We feel our job is to make technology as human-centred as possible."

One of the places where human-centred technology is being created is the HomeLab, a unique research centre at the High Tech Campus in Eindhoven.

There, 'residents' experience life in a truly homelike environment—the stuffy, clinical feel of a laboratory is long gone. Products and systems in the prototype stage are tested. But so is something else: new concepts. Beyond looking at the workings of a particular system, Philips scientists pay special attention to more intangible, but no less important, phenomena, such as the way humans and machines interact and the way people respond to a virtual awareness monitoring their lives.

"For a while now, we've been hearing about how users have had to adapt to new technology," said de Ruyter, who devotes much of his work to HomeLab. "At HomeLab, what we want to do is make sure we're also adapting technology to users."

Experience matters

At HomeLab and elsewhere, a key insight that researchers at Philips have gained concerns the user's experience. For example, studies conducted for the development of voice-controlled television found that, although giving verbal commands to a television involves about as much effort as pushing buttons on a remote-control device, a considerable number of the persons tested simply enjoyed the experience of speaking to a machine and telling it what to do.

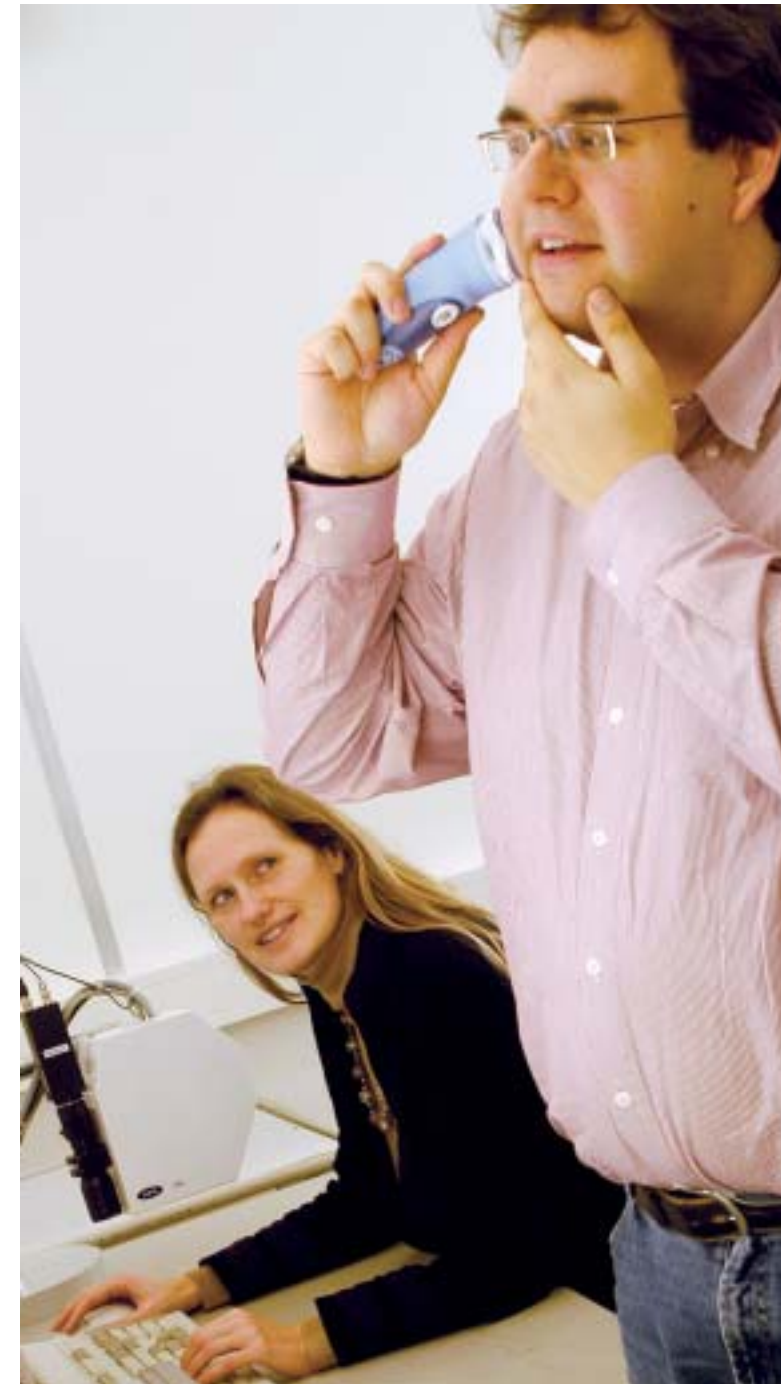
"We want to make sure we are adapting technology to people, not the other way round."

Boris de Ruyter

From that discovery, a developable experience came to light.

"It's all about differentiating yourself from the competition," said Patricia van Kemenade, a scientist at Philips Research in Eindhoven. "On some levels, we and the competition produce a very similar product. Where we can pull ahead is on the level of experience." ➔

Improvement of the shaving experience is one of the topics of research at Philips' Personal Care Institute



Ambilight television

The development of Ambilight is illustrative of how Philips incorporates users' experiences into the creation of new products. It also shows how those experiences can run from the general to the very personal.

With Ambilight, for example, the fundamental user 'experience' applies to humans in general: We are natural-born peripheral viewers.

If, Philips researchers proposed, people naturally take in more than just the screen when they watch television, why not put that

extra space to use?

Guided by that insight, Philips researchers developed prototypes and introduced them to small test groups – real, flesh-and-blood human beings. Some group members didn't think they were going to like Ambilight, says Boris de Ruyter, scientist at Philips Research in Eindhoven, the Netherlands.

"A few said, 'I don't want disco lights in my house,'" de Ruyter remembers.

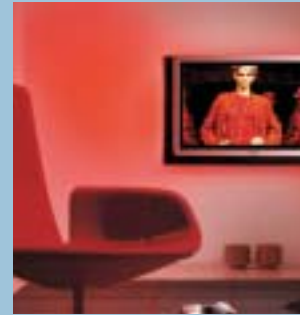
"But once those doubters actually experienced Ambilight, most

changed their opinion," de Ruyter said. "Winning them over showed me the difference between experiencing a system and just imaging it."

Feedback from prototype users also helped researchers at Philips make sure that the lighting projected by an Ambilight television is soft and unobtrusive. Pleasurable enhancement, not unwelcome intrusion, became an even greater priority.

Ambilight designers also remembered that users like to retain control over their gadgets.

Therefore, Philips built into Ambilight six preset colours and white tones as well as custom settings, allowing for complete personalization of one's Ambilight viewing experience.



Ambilight television

An example of that attempt to pull ahead is the new Philips Cool Skin razor, with its unique moisturising shaving system and integrated living-light display. Researchers at the Personal Care Institute, also a part of Philips Research in Eindhoven, tested and talked to men who shave. They learned that some men don't dread shaving at all, but enjoy making it a part of their day.

Shaving is fun

Those men, went the thinking, might respond to a product that lifts the action of shaving from a mechanical one to an experience. From that was born the idea of having cooling cream exude from the shaver even while the person is applying it—the Cool Skin experience.

“Where we can pull ahead of competition is on the level of experience our products give to people.”

Patricia van Kemenade, Philips Research

“We have long been confident that our scientific know-how gave Philips the best electric razors in the world,” says Joyce Westerink, a scientist at Philips Research in Eindhoven. “With Cool Skin, we added to that further research on the effects of friction on the skin, plus our insights into users' experiences.”

Cool Skin identifies a clear need and fills it, creating a new sort of man-machine interaction. But just as Edison tried hundreds of ways to make a light bulb before finding one that worked, so too do Philips researchers often have to pay attention to the negative findings of their research. When it comes to human-machine relationships, that means finding out what users don't want as well as what they want.

“We have to be careful with some anticipatory systems,” de Ruyter said. “We're learning that some people get annoyed if the anticipatory actions take place on levels higher than the small-task level.” Similarly, research into the Ambilight television system (see box) also found that some users want to be able to turn off the effect when desired. Researchers made sure to include a simple on-off function for Ambilight.

Umbrella vision

The centrepiece of HomeLab, and the one thing that wraps up all the new ideas about users' experiences, has to be Ambient Intelligence, which de Ruyter describes as “a vision, an umbrella, a process, and an instrument.”

The very purpose of Ambient Intelligence is to enhance the life experiences of the user—to put people at the centre of a home full of new and high-tech functionalities. Research into Ambient

InnoHub

In October 2004, Philips added to its growing commitment to R&D in Asia with the opening of the InnoHub, part of a \$90 million investment in Singapore to accelerate its Connected Planet strategy.

As in the HomeLab in Eindhoven, the Netherlands, the InnoHub is a homelike environment. As such, it serves not as merely a testing place for machines, but as a place where humans and machines can work together.

And those aren't just single machines, but whole systems.


Users will interact with those systems at the InnoHub, where researchers will monitor their responses. The information collected will be determinative to the final form products in prototype take.

As part of the InnoHub concept, Philips has also installed connected systems in a number of digital homes in Singapore—again, in an attempt to obtain the most accurate feedback possible on technology in development from the very sorts of people who will use it.

The InnoHub project is the latest embodiment of Philips' company-wide commitment to humanizing technology and making it a seamless part of consumers' daily lives.

Intelligence (much of it occurring at HomeLab) not only takes users' experiences into account. It builds new experiences.

Among the Ambient Intelligence prototypes are voice-recognition electronics that not only respond to your commands, but know that it is you who are uttering them; digital displays on a special bathroom mirror that can play cartoons about dental care while your children brush their teeth; and Phenom, technology that uses RF-ID tags and wireless connections to allow persons access to their digital photos from virtually anywhere in the home.

The centrality of the user is an idea suffused throughout Philips Research, from scientists active in areas where Philips has long been dominant (e.g. electric shavers) to their counterparts active in the most cutting-edge activities imaginable, such as Ambient Intelligence. The essence of the idea is that customer satisfaction is, after all, the end and sum of success for Philips, or indeed for any other company; and that no matter how dazzling some advances may seem, they are meaningless, and in a sense not even advances, unless they improve the lives of the people who pay money to use them. 

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Extra info www.research.philips.com/password
HomeLab • Ambient Intelligence • Flat TV with Ambilight • Philishave
Cool Skin • InnoHub

Virtual Fitness Coach

User feedback helped shape Philips' personal Fitness Coach. And user feedback will continue to influence the product – long after the consumer has bought it and is using it.

As with the Ambilight system, Philips researchers began development of the Fitness Coach with 'feedback' about general human experience: we sit around a lot. And many of us need exercise.

And something even more simple: people like to have fun.

Thus, the germ of the idea for the Fitness Coach: to create a product that will motivate users to get active by creating a personal 'coach'—actually, a machine—who provides data and even spurs the user on to greater achievements.

“We found that if you immerse a person, then it's more fun,” says Joyce Westerink, scientist at Philips Research in Eindhoven, the Netherlands.



In scenario studies for next-generation fitness applications, sensors in a body-area network provide live feedback on exercise performance

Westerink said that a tough choice for developers was whether to create a gruff coach who demands more, or a softer, politer coach who mainly provides information. Feedback from users was instrumental in the direction Philips researchers eventually decided to take.

With the Fitness Coach, user feedback is the gift that keeps on giving. Using smart sensors, the Coach monitors physiological signals and calculates training intensity. The Coach turns the physical feedback into data that users interpret, helping them determine the success of their training regimens.

Evaluation of a light source at Philips Extreme UV



A close up of the light beam



Extreme UV

opens the door to next-generation lithography

Rapidly approaching the crunch point beyond which current optical lithography will become incapable of providing further shrinkage of feature size, the semiconductor industry is already evaluating alternative lithography technologies. Extreme ultraviolet lithography (EUVL), universally recognized as the most promising route, is currently the subject of intensive research. Philips and the Fraunhofer Institute of Laser Technology (ILT) have formed the joint venture Philips Extreme UV to develop the advanced sources capable of generating the required UV light and support leading litho-systems manufacturer ASML to push ahead with this new technology.

By Ian Crick

As each generation of semiconductor chips evolves, following the path set by Moore's Law for the exponential growth in transistor density, the importance of lithography as the key technology driver for the semiconductor industry continues to grow.

For now, conventional optical lithography with incremental reductions in wavelength (currently in the deep UV region) increases in numerical aperture of the optical system and the development of new resolution-enhancement techniques continues to support feature-size reductions. This can be expected to continue for several more years but for feature sizes below around 45 nm, lithography needs to make a step change into the world of EUV. Moving to EUV will allow chip geometries of 32 nm and below to be realized, leading to microprocessors that are up to 10 times more powerful than today's chips. But the move presents completely new challenges to lithography-systems and semiconductor manufacturers.

Everything's different

Hans Meiling, product development manager EUV for leading litho-systems manufacturer ASML: "The incremental changes in lithography we've been accustomed to will not take us to EUVL since the extremely short wavelength we're dealing with, settled on by the industry at 13.5 nm, demands completely new approaches to almost all aspects of the lithographic process."

EUV radiation, for example, is readily absorbed by virtually all materials including air, which means the whole lithography process must be performed in a vacuum. It also rules out conventional lens-based optical systems. Instead the system uses aspherical concave and convex mirrors coated with multiple thin films of molybdenum and silicon to produce interference layers that reflect only a narrow band around the 13.5 nm EUV wavelength.

Moreover, a major challenge to EUVL is the development of an efficient, economic and stable EUV source capable of

generating the power levels needed for a production-quality lithography tool operating at 13.5 nm. This is the main focus of the Philips Extreme UV joint venture between Philips Lighting and the Fraunhofer ILT.

"The joint venture, which focuses on EUV generation by gas discharge in plasmas, was created to support ASML's next-generation lithography program," Joseph

"We started off well compared with competitors in the US and Japan."

Joseph Pankert, General Manager of Philips Extreme UV

Pankert, general manager of Philips Extreme UV, says. "I must say we started off very well compared with competitors in the US and Japan with four prototypes already delivered to ASML for evaluation and another due for delivery in 2005. What's more, the major advantage of our concept is that it is the cheapest, simplest and most compact."

One of the main challenges is the fact that plasma radiation is essentially broadband. With the mirrors reflecting only a narrow band around 13.5 nm, much of this radiant energy is wasted. Moreover, the interference coatings reflect only 70% of EUV radiation at a wavelength of 13.5 nm. As much as 30% is absorbed at each mirror surface and since the optical systems usually contain at least 10 mirrors, extremely high-powered sources are needed to be able to deliver sufficient power to the wafer.

Tin vapor

Joseph Pankert: "Initial sources developed by Philips Extreme UV were based on xenon gas discharge. But the very broadband characteristic of xenon-

discharge sources results in too much energy absorption outside the mirrors' narrow reflective band, necessitating a lamp input power of at least 150 kW. Our latest investigations are based on tin-vapor discharge sources which radiate in a narrower bandwidth around 13.5 nm and require only around 30 kW of input power to provide the required exposure power on the wafer." Philips Extreme UV has proven the

concept with the world's first successful demonstration of a tin-vapor EUV source generating 40 W of useable EUV power and is well on course to developing EUV sources with the necessary power and lifetime needed for industrial-scale EUVL. Tin-vapor discharge sources also, however, present challenges. One of the most serious is condensation of tin on the optics. In contrast to xenon, which is a non-condensing gas, tin vapor, if allowed to diffuse downstream, will condense on the optics and severely reduce their efficiency and lifetime. Researchers at Philips Extreme UV are actively working on solutions to mitigate this effect. One proposed solution includes the use of a buffer gas between the EUV source and optics that sweeps the escaping tin vapor onto a foil trap (a series of overlapping foils surrounding the EUV beam) where the tin atoms are captured by adsorption on the surface of the foils.


System optimization

Philips Extreme UV is also working closely with ASML and renowned optical specialists Carl Zeiss SMT on the integration of the ultra-high-quality optics

Philips Extreme UV

The Philips Extreme UV joint venture combines the Fraunhofer Institute of Laser Technology's extensive experience in gas discharge phenomena in high-temperature plasma and Philips' decades of experience in gas-discharge lighting technology. The joint venture was set up in 2001 to develop an EUV light source capable of generating the power levels needed for production-quality lithography in order to support ASML in driving EUVL forward to become the next-generation lithographic process.

with the EUVL light source. In addition, ASML is making solid progress in the integration of the evacuated reticle- and wafer-handling stages, with the EUV sources being developed by Philips Extreme UV to produce a viable EUVL system, and in developing new methodologies for handling masks and wafers under high vacuum.

Hans Meiling: "Provided no insurmountable roadblocks appear on the processing side, EUVL is well on course to become the next generation lithography technology. In the 2005 to 2006 timeframe, we expect to introduce an EUV alpha tool bringing together all individual components currently in development. Intended for evaluation, this tool will have sufficient throughput and imaging capability for the 45-nm node. We will still need several further years however, before a full production tool capable of operating at the 32 nm node becomes available." 

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Wireless connectivity spurs Sense and Simplicity

Communication and interaction are basic human needs built into our genetic code. So too is the inquisitiveness that gives us a seemingly insatiable thirst for information.

Bringing people together so that they can share experiences, and delivering the right information to the right place at the right time, are two of the central themes in Philips' vision of the connected consumer. This Password article highlights a range of user scenarios currently being worked on by Philips Research in which wireless connectivity will help to bring Sense and Simplicity to consumer environments.

By Peter Harold

No place like home

It is a well-known fact that hospital patients recover better in the comfort of their own homes. Ensuring the quality of aftercare at home is something that Philips Research addresses through participation in the Body Area System for Ubiquitous Multimedia Applications (BASUMA) project – an initiative supported by the German Federal Ministry of Economics and Labour (BMWA). In the project, Philips is helping to develop body-area networks for in-home patient monitoring. Containing several inter-communicating sensors, these body-area networks will monitor vital functions such as your heart rate, blood pressure and blood oxygen levels, make intelligent decisions about your state of health and pass on relevant data to you, your doctor or local medical services.

What Philips injects into the system is the development of body-area networks that connect without wires and that automatically re-configure themselves in response to the number and type of sensors attached to your body. Attach a single ECG (Electrocardiogram) sensor and the system will monitor your heart rhythm. Add a blood-flow sensor and the system will automatically recognize that it can combine the data from both sensors to continuously compute your blood pressure as well.

“As an ordinary person, communication is about who I talk to, why I do it and what I say. I don't care how technology makes it possible.”

Tobias Helbig, Philips Research

Wireless connectivity between sensors means they can be built unobtrusively into items of clothing, while advanced low-power radio technology and intelligent power management systems will insure that

they operate for months or years from tiny batteries. As a result you will be able to go about your daily life, free from the stigma of being wired up to a machine or having to plug yourself in every few hours for a re-charge!

Unique recognition

There is, however, another interesting challenge associated with these wireless body-area networks. If there are no physical wires connecting the sensors into the network, then how do you know which sensors are on which patient? It is another area where Philips Research is applying its expertise in connectivity solutions by developing a technology that allows sensors to automatically recognize you the instant they come close to your skin (see New enabling technologies – Active Digital Aura). ➔



New enabling technologies

Self-configuring peer-to-peer networks

Philips Research is helping to develop the self-configuring peer-to-peer networks needed for easy-to-use in-home patient monitoring systems by developing middleware – the layer of software that sits between the network and the application to provide system services such as device identification, authentication, and resource discovery.

For plug-and-play simplicity, body sensors in these systems must be able to operate autonomously or in concert with others. Occasionally they must be able to identify and communicate with external network nodes when they come into radio range – for example, weight scales or urine testing kits. In this ad-hoc heterogeneous networking environment it is vitally important for individual nodes to know the extent of resources available at any point in time so that they can negotiate with each other to optimally distribute and re-distribute the application between them.

Other issues addressed in these middleware layers include making the system robust against the effects of radio interference and node failure, minimizing power consumption through intelligent power management, and ensuring software upgradability.

Active Digital Aura

Connecting without wires does not necessarily mean wireless communication. Philips Research's unique Active Digital Aura technology, for example, utilizes an electric field rather than an electromagnetic field to transmit information. Capacitively coupling the signal from a small body-worn tag into your body, it generates a minute yet detectable electric field that extends outwardly a couple of centimeters from the entire surface of your skin. The tag, which is easily built into something as small and unobtrusive as a wristband, modulates this electric field with a unique digital identification code.

Authorized devices that come close to your skin can pick up this identification code and configure themselves to your specific personal profile, while advanced authentication mechanisms between the tag and the device protect your privacy and security. For in-home patient monitoring systems it could mean body sensors that use your identity information to automatically configure themselves to monitor specific medical conditions, but it could just as easily be mobile phones or MP3 players that automatically configure themselves to your personal tastes and preferences the instant you pick them up.



In the Active Digital Aura concept, sensors automatically recognize people as they are brought close to their skin, allowing intuitive personalized applications.

A love affair with cars

Cars are not merely a way of getting from A to B. They are an extension of our personal space and for many of us a love affair. It's not surprising then that we'd like our cars to become more responsive and welcoming.

Your car should let you know where it is on a crowded parking lot, switch on the interior lights and the music of your choice as you approach, but wait until your hand is within centimeters of the door handle before unlocking itself. This, however, means that your car has to know how far you are away from it.

Scientists at Philips Research have now extended Philips' world-renowned keyless car entry technology by designing circuits that measure with nanosecond accuracy the time-of-flight of radio signals to and from the keyless-entry fob that you carry in your pocket. As a result, they have developed a way of accurately determining the distance between you and your car.

“Wireless connectivity makes communication so much simpler that it opens up a whole new range of applications where communicating simply makes sense.”


Tobias Helbig, Philips Research

Wireless connectivity can also make your car more responsive while you're driving, by providing you with information about traffic conditions and driving hazards that lie much further ahead than you can possibly see. Before too long, cars will be equipped with a wide range of sensors that can automatically detect conditions such as slippery road surfaces, poor weather conditions or collisions. Using short-range radio transmissions from one car to the next, the information picked up from these sensors will be able to hop from car to car down the stream of traffic heading for the hazard, alerting you much earlier to what lies ahead.

Staying on call

Large countries such as China often have a mix of different mobile-phone operators, covering different geographical areas and using different cellular standards. To enjoy 100% coverage this means that users typically have to carry more than one phone around with them.

The issue is so relevant to China that Philips Research has a special research group located in Shanghai to help solve it. This group is using Philips' software-defined radio concept (see 'New enabling technologies – Software-defined radio') to create a multi-mode terminal that can automatically switch between different standards and provide seamless hand-over of your call as you move between coverage areas.

But this is only the start of Philips' vision for mobiles of the future. It is not only working towards a unified terminal architecture that will work with all 2.5G and 3G cellular networks, but one that will also allow mobiles to communicate via alternative channels such as wireless LANs, and receive digital TV and radio broadcasts – a single handset for all applications that will work anywhere in the world. 

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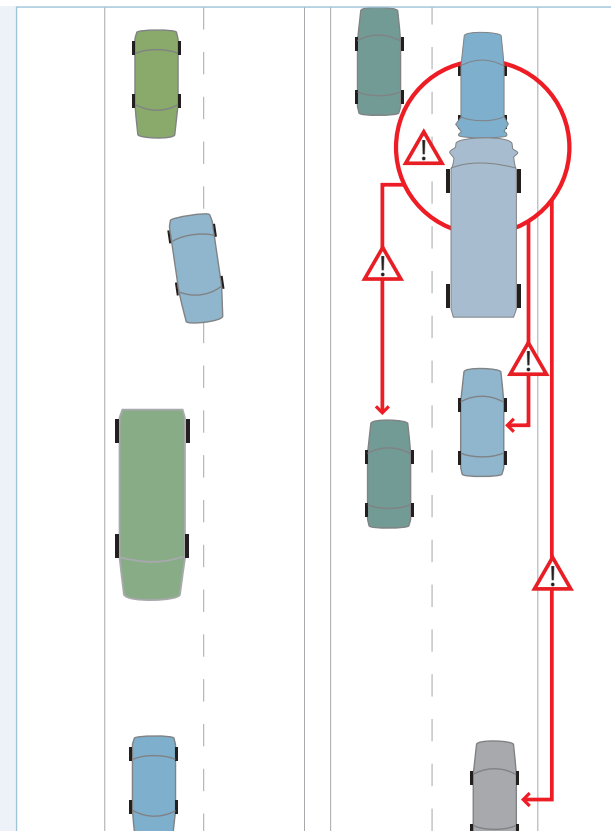
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Extra info www.research.philips.com/password • The BASUMA project • Software Defined Radio • Cognitive Radio

Communication between a car and its environment can greatly improve the driver's anticipation to traffic conditions and hazards.



New enabling technologies

Software-defined radio

In its software-defined radio project, Philips Research is developing new RF transceiver architectures that will allow a single transceiver circuit to receive and transmit using many different digital wireless communications standards. Currently, most RF transceiver circuits are highly tuned to work only with a single standard.

At the digital 'baseband' end of the transceiver chain, it is developing enhanced vector processors that will replace today's dedicated hardware ASICs by a highly flexible software-programmable processor that can execute software codecs, modems and channel filtering functions for a very wide range of wireless transmission standards.

For the RF part of the transceiver, it is developing hardware architectures that can be re-configured under software control to achieve the signal bandwidth and dynamic range needed to tune in to any carrier frequency and modulation scheme. At the antenna end, it is developing ways of allowing multiple antennas to operate in close proximity without interfering with each other.

The objective is to develop a transceiver architecture that can not only switch between standards, but one that can operate on multiple standards simultaneously. All this without paying a penalty in terms of size, cost or power consumption in your mobile phone.

Cognitive radio

If software-configured radio can produce a truly universal transceiver, then why restrict its operation to the relatively small number of frequency bands currently authorized for public use. The unlicensed bands at 2.4 GHz and 5 GHz, for example, are already becoming crowded, yet field testing has shown that overall spectrum usage up to 10 GHz remains well below 10%. Of course, the argument for restricting access to many of the bands is based on the need to prevent interference – for example, on emergency service communications and TV channels.

However, a radically new approach being proposed in the USA would allow public access to these restricted bands in order to make better use of the RF spectrum. The system would prioritize usage in these bands, with transmissions such as emergency service communications having higher priority over unlicensed access. This new approach, often referred to as 'cognitive radio' because it requires a considerable degree of RF environment awareness and intelligence in even the simplest of radios to negotiate usable transmission frequencies, promises access to ten times more RF spectrum than is currently available. In addition, some people see it as the ultimate way of breaking today's close association between specific communication 'pipes' and specific applications, and of providing the highly robust wireless communications systems required for applications such as remote in-home patient monitoring systems (see 'No place like home' on previous page).



TV with peripheral vision. Just like you.

Philips Flat TV with Ambilight. You don't just see what's in front of you. You perceive what's around you – on either side. It's called your peripheral vision. So Philips designed a TV for the way you see. You don't just see what's on the screen, you see beyond the edges of it. It's an experience more like life and not at all like ordinary television. You've never seen anything like it. It just makes sense.

Join us on our journey at www.philips.com/simplicity

PHILIPS
sense and simplicity