A picture paints 5 000 *(pages of)* words

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Those who have, and many who have not, read the previous article in this series will be familiar with the relationship between files and folders.

While folders are the houses on your computer, files are the software citizens that live in them: they are unique individuals, each has its own function, but few can do anything without the co-operation of others.

Files are essentially of two types – program files and data files. Most of you will not have direct dealings with program files. They will, hopefully, live a peaceful life in your computer, not bothering you and doing their job.

Data files are the ones you deal with – they contain your letters, spreadsheets, digital pictures and so on. Despite being a very heterogeneous bunch on the outside, they all look the same internally: as with anything else on a computer, they consist, at their most basic level, merely of a long string of 0's and 1's. There is potential for confusion here: the same string of 0's and 1's that tells your graphics program to make a particular spot on the screen dark grey might be used by a music program to denote middle C. How does the computer know what to do when it encounters a data file containing this string? The answer is that the data file not only contains data but also contains a little information about itself, telling the computer how to handle it.

Imagine a UN get-together: each attendee's jacket bears a label stating the person's name, occupation and country of origin. Just enough information for you to know how to approach the person and what language to speak, for example:

"Hi, I'm Vladimir and I'm a tractor aesthetist from the Ukraine" – no good talking to him in Polish about guided missile systems. Well, each data file has a similar little label telling the computer how to process its 0's and 1's.

Having acknowledged the existence of the "Hi, I'm ..." part of a data file, let us turn our attention to the 'guts' of this type of file – the data. In particular, let us look at a file type of great importance to radiologists: a graphics file.

These are of two basic types: vector and bitmapped. A vector graphics file contains a series of instructions telling the computer how to draw a picture, similar to the way you would teach a child how to draw a stick man: draw a circle this big for the head, then a line this long for his body, etc.

Bitmap graphics files are more reminiscent of the way Seurat painted: they contain instructions describing a two-dimensional array of pixels (picture elements) and stipulate the colour (or shade of grey) of each element in that array.

Imagine an exceedingly simple bitmap picture: it has only four pixels, two across and two down. The graphics file for this picture would have to have two bits devoted to spatial information. "Why two? What are bits?," you may ask.

A bit is the most basic informational unit of a computer. It is a 'thing' that can be either 0 or 1 – no other choices.

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Philips Medical Systems: successfully starting off the millennium with a completely new MR program

Reporting records orders for its Gyroscan Intera MR scanners introduced at the 1999 RSNA, Philips Medical Systems is using the European Congress of Radiology to announce yet another system introduction, the Gyroscan Panorama, featuring the most patient-friendly of all open magnet designs: a C-arm.

The Gyroscan Intera is Philips' new general-purpose family. This new generation of MR scanners makes truly interactive scanning a reality. Recently installed at a number of hospitals in Europe, the USA and Japan, its users are thrilled by the very significant advances in image acquisition and reconstruction speed, as well as improvements in user interface and patient environment.

In addition, Philips' new Gyroscan Intera CV, dedicated to cardiovascular MR, has been launched alongside the Gyroscan Intera I/T that is especially suited to interventional procedures and assistance in therapy. Intera's flexibility and advanced capabilities replaces traditional imaging exams with faster, less costly and more informative MR studies such as high-resolution contrast-enhanced peripheral angiograms, comprehensive stroke and cardiac exams and whole body screening.

Intera's new RapidView reconstructor is the industry's fastest, with up to 196 images per second reconstruction speed. Acquisition and reconstruction speed combine with the industry's most flexible RF spectrometer to provide truly interactive scanning: the ability to change geometry and contrast parameters in real time. This brings the equivalent of X-ray fluoroscopy to MR.

Furthermore, its magnet is believed to be the shortest, the most open and lightest presently on the market: a great help in eliminating patient anxiety, providing free patient access and facilitating installation.

"We're truly excited about showcasing our new MRI solutions for the first time," explained Jacques Coumans, PhD, Global Marketing Manager for MR at Philips Medical Systems. "We believe that MR continuously changes how the world looks at diagnostic imaging and that our new Gyroscan Intera changes how the world looks at MR." This statement will be even further substantiated by the introduction of SyncraScan and Explorer gradients. Philips' new SyncraScan package (based on the Sensitivity Encoding (SENSE) principle), provides for an immediate doubling of acquisition speed. With Explorer gradients delivering up to 60 mT/m, diffusion imaging becomes an even more sensitive diagnostic tool for stroke than previously.

The dedicated Gyroscan Intera CV helps physicians diagnose cardiovascular disease more quickly, accurately and economically.

Using this new system, scanning most patients can be completed in one hour and diagnosis is possible the same day. This contrasts with the traditional diagnostic pathway of ultrasound, nuclear medicine and X-ray studies that take several days of scheduling and cost far more. Vectorcardiogram (VCG) triggering separates the true ECG from distortion caused by the magnetic field and RF effects, raising triggering accuracy to nearly 100 percent. Furthermore, the system's MotionTrak technology allows patients to breathe freely while being examined – a definite plus for patients who are chronically short of breath.

Assistance in complex interventional and therapeutic procedures is made possible with the new Gyroscan Intera I/T, developed by Philips in partnership with leading medical research institutions. The image quality and high field capabilities of the Intera I/T, such as spectroscopy, functional MRI (fMRI) and diffusion, offer all the tools required for such applications as image-guided neuro surgery, biopsy guidance, molecular therapy imaging, MR-guided ablation therapy and endovascualr interventions.

In the latest addition to this range is the Gyroscan Panorama, a high quality open MR system. With a patient-friendly C-arm design, the 0.23 tesla Panorama provides excellent all-round patient access and easy sideways patient entry.

The attractive features of the Gyroscan Panorama aren't limited to its openness – advanced technology ensures that it provides superb image quality across a wide range of applications. "Fast, strong gradients – combined with an extensive range of imaging techniques – make it an ideal workhorse for the general imaging department" Coumans said. "We are confident," he continued "that the inclusion of phased array coil technology as standard in the system will be seen as an indication of its intrinsic quality." The application bandwidth of the system is enhanced by a wide range of RF coils for head, neck, spine, body and extremities. Departmental efficiency is assured by its easy-to-use interface, the ability to prepare patients on the tabletop outside the examination room and reliable pre-set protocols.

The Gyroscan Panorama complements Philips' existing Gyroscan Intera family thereby offering customers the widest choice of systems and performance.

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TECHNOLOGY UPDATE

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If I have two bits available I can describe a four-pixel picture: pixel 00, pixel 01, pixel 10 and pixel 11. Now, if all those pixels were the same colour it would not be much of a picture. Associated with **each** pixel we need to have more bits describing the colour which that pixel is to be. Let us say, in keeping with the minimalist elegance of the picture, we decide to allow each pixel to have two bits of colour information. "You, Jones, wake up – how many colours can be described by two bits? Yes, four: colour 00, colour 01, colour 10 and colour 11."

In general the number of pixels (or shades) available is 2^n where 'n' is the number of bits available to describe spatial (or colour) information.

A more realistic example: say you want to digitise an X-ray. To achieve adequate quality you want to have a 'resolution' (more about the meaning of this tricky word another time) of more than 2000 pixels in both dimensions. If the breadth and height of the picture are both represented by 2048 pixels, the total number of pixels will be 2048X2048 = 4 194 304 pixels.

If it is further required that the picture is represented by 4096 different shades of grey then **each** of the above pixels will need to be associated with 12 bits (2^{12} = 4096) of colour information.

The total number of bits needed to describe the bitmapped graphic will be 4 194 304 X 12 = 50 331 648 bits. (A few liberties have been taken for ease of calculation and explanation, and because some of the complexities are beyond the intellect of the author.)

If you are to transmit this uncompressed picture to somebody by means of a modem capable of transmitting 50 000 bits per second (for ease of calculation, and unlikely to be regularly achieved on a '56 kbps' modem) the transmission time (ignoring overheads) will be 50 331 648/50 000 seconds = 1007 sec = 17 minutes.

Text requires about 10 000 bits per page. A small calculation shows that a text file as large as the graphics file described above for a single X-ray would hold about 5000 *pages* of words.

COMPANY NEWS

PHILIPS MEDICAL SYSTEMS

New technology offers health care providers access to an electronic patient folder solution

THE ANNOUCEMENT by Philips Medical Systems of The Netherlands of the acquisition of CardioLogica ™, the cardiology information system (CIS) for electronic patient folder (EPF) creation from Milwaukee-based Cardiovascular Computer Systems, Inc (CCS), takes technology another step forward.

CardioLogica™ is a specialised information system designed for the cardiology department, where cardiac images and clinical and administrative data are brought together via a centralised software solution. The system provides modules for patient scheduling, automated report generation and distribution, and other administrative functions that can further improve workflow and efficiency throughout the cardiology department.

Other benefits of the system include the merging of invasive and non-invasive modality data into one electronic patient folder, integrated modules across all diagnostic imaging modalities for flexible customisation and unique anatomical data structure for fast access to clinical information. The system also integrates images with reports, other records and haemodynamic data and can interface with Hospital Information Systems (HIS), allowing access by appropriate health care providers. The modular design of CardioLogica™ allows for easy upgrades which facilitate the rapid transfer of information, ultimately enhancing patient care.

The system will be incorporated into Inturis for Cardiology, Philips' integrated image and information management system for cardiovascular care environments. The addition of CardioLogica™ to its product offerings strengthens the company's HeartCare programme portfolio of cardiovascular imaging modalities, connectivity solutions and consulting services that maximise patient care and workflow efficiency.

Information from Philips Medical Systems.
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