

Proposed New Applications for 4K Tablets

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1. Introduction

As 4K technology (which has four times the resolution of Full HD) starts to gain traction in connection with video content such as broadcasting, VOD (video on demand) and Blu-ray disks, work is now under way to establish 4K production environments. For example, there are plans to begin 4K/8K broadcasts in time for the 2020 Tokyo Olympics. In fact, some commercial services such as VOD have already started offering 4K content.

However, the high-definition expressive capabilities of 4K are not limited to video content applications such as broadcasting and VOD, but can also be applied in a wide range of other fields. In particular, when 4K video is shown on an ultra-high definition display, it can produce images with no perceivable graininess that are a world away from what can be achieved with conventional video technology. By concentrating on this new expressive capability, we have developed a 4K tablet as a “paper substitute” to make the expressive capabilities of 4K technology available in new domains outside of TV.

2. Features of the 4K tablet

High-definition display

The biggest feature of our 20-inch 4K tablet (the world's first such device) is the new ultra-high resolution 4K liquid crystal display that we developed for this product. This is a 230 ppi (pixel per inch) high-resolution liquid crystal panel that is capable of displaying pictures in which it is impossible to see the individual dots. The aspect ratio of the display was set to 15:10 (3:2) instead of 16:9 (the aspect ratio of TV) in order to facilitate the display of catalogs, drawings and various forms that are used in many businesses. Specifically, a 20-inch 15:10 4K display (3,840 × 2,560 dots) is able to display about the same area as a printed page of A3 paper. Furthermore, the IPS (In-Plane-Switching)- α method used in this liquid crystal panel delivers a large aperture ratio, high brightness and a wide viewing angle (176°), which means that when laid flat, it can be viewed from any direction with hardly

any hue distortion. This makes it ideal as a replacement for paper when, for example reviewing the context of printed matter or drawings.

High resolution pen

One of the advantages of working with paper is that it can be written on, so to provide this capability we also developed an electronic pen that can be used to write directly on the screen. This pen works by reading invisible address information printed into a film on the surface of the screen. Since this method can be implemented simply by sticking a very thin film to the surface of the display, it does not require the installation of devices to generate electromagnetic fields and receiving circuits next to the display, as would be necessary for electronic pens based on conventional electromagnetic induction technology. This has advantages in terms of the thickness, weight and cost of the device. Also, since the pen tip position can be calculated by directly reading the information representing the position on the screen the pen tip is in contact with, it is possible to judge the position of the pen tip very accurately. As a result, there is little discrepancy between the screen writing position and the position of the pen tip. This method also has the advantage that there is no need for routine calibration of the pen tip position.

Lightweight, thin, tablet configuration

Since this is a new product that can replace paper in business situations where paper has hitherto been used, we selected a tablet form that can be used when surrounded by several people instead of a traditional desktop PC or notebook PC format. By using our own display device that is comparable in size to a sheet of A3 paper, we developed a portable tablet that weighs 2.3 kg and is only 12.5 mm thick. Despite the thin package, we managed to include all the functions of a regular PC, including a high-performance CPU (central processing unit), GPU (graphics processing unit), memory, and SSD (solid state drive). It also uses Windows™, allowing a wide variety of business applications to be installed.

To make it possible for this exceedingly thin tablet to incorporate many devices, we have made use of our extensive technical expertise in the development of products such as mobile phones, portable audio players, and mobile PCs. For example, by using direct hot melt technology to attach the magnesium alloy frame to the liquid crystal display panel with a touch panel glued on by direct bonding, we can make the tablet very strong despite its very thin profile, thereby offering robust performance

■ Photo 1: 4K tablet with pen



in business situations. This result was achieved using Panasonic's mechanical design technology. Specifically, the device is tough enough to withstand a 76 cm drop test in the direction of its rear panel while operating, and 30 cm drop tests in 26 different directions when switched off. We are currently promoting this device for use in new 4K applications by various industries. (Figure 1)

3. New 4K applications where the use of a 4K tablet is proposed

We propose exploiting the advantages of this 4K tablet for diverse industries where value is placed on characteristics such as providing a substitute for paper, improving the portability and ease of installation of high-resolution displays, and substituting real objects. Some examples of our envisaged applications are introduced below (Figure 2).

In the office: A conferencing system for executives

In an electronic conferencing system using a 4K tablet, it is possible to display images of the same quality as the output of an A3 printed paper, and these images can also be used in the same way as ordinary paper. For example, on a conventional device, the text quality is liable to break down when displaying an overview of an entire document, while on the other hand enlarging the displayed image would make it impossible to see the whole document at the same time. However, since a 4K tablet provides a high-resolution display where it is possible to see an overview of a document equivalent to a whole sheet of A3 paper, there is no degradation of text quality. This feature is very popular among executives who often have the opportunity to see detailed numbers containing business figures or the like. Of course, it is also possible to enlarge the displayed image if required. It is also possible to use a pen to write directly onto the screen in order to leave handwritten notes in the same way as when using conventional paper documents. Since the materials are stored in digital form, they can be used in presentations that were not possible with conventional paper documents, and it is also possible for pointers and annotations

Figure 1: Hot melt fabrication process

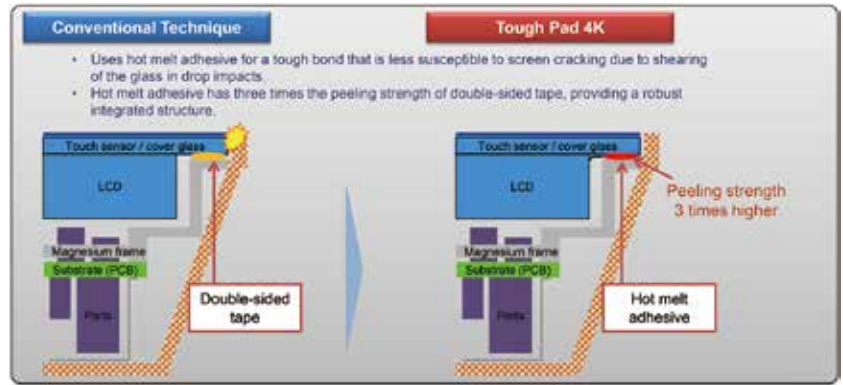


Figure 2: Overview of proposed solutions

Applications of 4K tablets in various industries

| Field | Finance | Architecture/ construction | Transportation/ travel | Medicine | Broadcasting |
|--|--------------------------------|-------------------------------|---|---------------------|------------------------|
| Paper substitute | Executive conferencing systems | | | | Electronic flip charts |
| A high-resolution screen that is easy to carry/install | Counter terminals | Reviewing drawings | Digital catalogs | | |
| | | CAD design | Kiosks | Endoscopy X-rays | Portable 4K monitor |
| Substitute for real objects | | | Cosmetic simulators Virtual museums Car configuration | | |

(notes) to be shared simultaneously between remote locations. Since there is no need to print out paper documents, it is possible to operate business meetings more flexibly by, for example, replacing materials just before or even during the meeting. By going paperless with a 4K tablet in this way, it is possible to retain the advantages of paper while eliminating the cost of buying paper and the labor involved with printing, copying and distribution of paper documents. It is also necessary to manage security concerns in that when documents are printed on paper, there is a risk of information being leaked due to pages being dropped during printing or being left unattended, and the documents have to be shredded before disposal. These are things that do not have to be considered in a paperless environment. Since last year, we have been introducing a conferencing system based on 4K tablets in some of our executive meetings.

Photo 2: Tablets being used at an electronic conference



In manufacturing: Reviewing drawings (PDF/CAD)

Using a 4K tablet, it is possible to see drawings very clearly with a resolution comparable to that of printed A3 hard copies, and to represent these drawings in a variety of different ways. This is achieved by exploiting the advantages of the display in the same way as the conferencing system described above. Detailed circuit diagrams can be displayed in their entirety without losing any lines, so that detailed parts can be checked while viewing the entire circuit. In this way, since it is possible to display images with the same quality as A3 print-outs, there is no need to carry

around large quantities of paper diagrams. Also, since the screen can display curved surfaces without any visible “jaggies” (jagged edges), it produces results that are closer to reality.

■ Photo 3: Reviewing a drawing on the tablet



In particular, the process of reviewing three-dimensional models using technologies such as 3D-PDF (3 Dimension-Portable Document Format) has hitherto entailed printing out many hard copies of the models from various different angles, whereas the 4K tablet can display 3D objects from any viewpoint. Furthermore, 3D-PDF documents can be directly annotated with handwritten comments and shared via network connections to reviewers in remote locations, thereby making the review process more convenient than the conventional paper-based approach, while maintaining the same image quality as documents printed on paper. In addition, by bringing design tools such as CAD (computer-aided design) software into the review process, it is possible to implement a more efficient design workflow by modifying, checking and authorizing the design at the review stage. Here, it is possible to eliminate the cost of paper, printing and delivery, the time and effort involved with printing out the documents, and the work associated with sending design alterations back to the design room, having these alterations reviewed again, and so on.

■ Photo 4: 3D CAD



In broadcast program production: An electronic flip chart

When a 4K tablet is used to display an electronic flip chart, it generates no Moiré effects (striping) when its screen is captured on a FHD (full high definition) broadcast camera or the like. This is because the display resolution of the 4K tablet is at least as large as the camera resolution. It thus produces the same captured picture quality as a paper flip chart, making it a realistic alternative to

paper. With a conventional paper flip chart, it is necessary to perform various steps such as preparing the data that is actually printed, printing the chart out, pasting it to a board, carrying it to where it is needed, and so on. This has made it difficult to keep up with situations where data is being urgently updated. The cost of board preparation, transportation and the like also have to be considered. However, as with the other paperless solutions, these issues can be resolved by making the flip chart digital and capturing images of the same quality as ordinary paper print-outs. By including content such as videos and animations, an electronic flip chart can display things that cannot be depicted by printing onto paper flip charts. It can also save on the costs of materials, printing, transportation and the like, and on the labor costs of printing and binding, and makes it possible to replace the contents of the flip chart just before or even during a program. Since it can also send data over the network, it facilitates a new and unprecedented style of reporting where up-to-date information such as disaster alerts can be prepared by the broadcaster, delivered as data to the relay destination, and then described at the location of the corresponding news story.

■ Photo 5: Electronic flip chart example



In banks: A counter terminal

Since the 4K tablet has a high resolution display, it can display documents such as catalogs and customer agreements clearly and without blurriness, with the same quality as documents printed on paper. Furthermore, these documents can if necessary be enlarged to any size to suit the customer’s viewing preferences. As described above, since this display can be viewed from any angle without hue distortion, it is suitable for being used while laid flat on a desktop. It is also equipped with tools such as the ability to change the display orientation with a single touch. Since it is possible to write directly onto the screen, the tablet can be used to perform the same role as a conventional paper document in various application procedures. This eliminates the need to print out large quantities of catalogs and customer contracts. And since the 4K tablet is also a PC, it can be used not only for simply displaying data but also for retrieving customer details and running simulations of financial products, thereby making it possible to provide counter services that are explained better than by conventional paper pamphlets, such as descriptions that are tailored to each individual customer. We are starting to introduce this technology into counter businesses such as financial institutions.

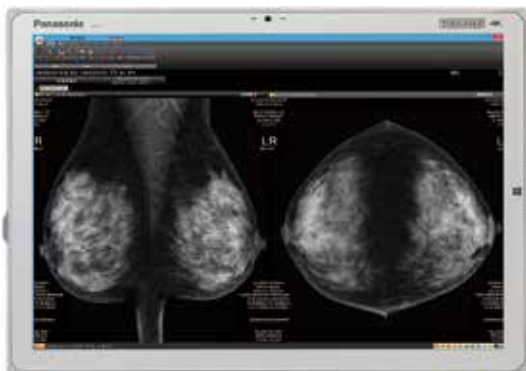
■ **Photo 6: Example of deployment at a financial services counter**



In medicine: Displaying X-rays

The 4K tablet can be of particular use in the medical field, especially when describing a patient's symptoms. For example, mammograms used for breast cancer screening are stored at a resolution of about 5 Megapixels. This 4K tablet allows two mammograms to be displayed side by side on the screen, thereby making it easier to compare multiple images such as a patient's current and previous mammograms. Since this 4K tablet is lightweight and can run on batteries, it can also help to lessen the burden on patients by enabling doctors to explain their diagnosis wherever the patient is. Doctors can also use the screen writing function to write down their observations and other notes in the medical records on the screen, and can even be used in discussions and the like at remote locations. Of course, when taken to a conference or the like, it is possible to connect to a 4K large-screen device to display a clone (copy) of the current high resolution display while the presenter provides a description that is easy to understand while adding annotations and the like by writing on the 4K tablet screen.

■ **Photo 7: Displaying mammograms on the tablet**
Screenshot of Plissimo network system
(Panasonic Healthcare Co., Ltd.)



In the sales room: Digital catalogs

When using the 4K tablet as an electronic catalog, it is not only possible to provide a display of at least the same quality as a conventional paper catalog, but it is also possible to videos and animations and "real reproduction" content that cannot be shown on paper, including simulations of different colors and optional parts. An example would be a car configuration tool in

the showroom of an automobile dealer. Since a large amount of catalog data can be completely stored in the tablet, there is no need to follow wealthy customers around with bulky printed material from foreign traders and the like, allowing the salesperson to provide the client with high-quality presentations. The high-quality screen can also be used for various enhancements of conventional catalogs, such as presenting simulations of cosmetics and the like, which are expected to be increasingly used for sales promotion in the future.

■ **Photo 8: Electronic catalog example**



In the studio: A portable 4K monitor

The 4K tablet also has a 4K video input. Instead of using conventional 4K monitors that can be impossible to carry onto the shooting location, it is expected that the 4K tablet will be used as a thin lightweight 4K field monitor, allowing the captured video to be instantly played back and checked. The 4K tablet could also be used as a space-saving, portable monitor for endoscope equipment in hospitals.

4. Summary

In this article, I have introduced some applications of 4K tablets in a range of different fields. In summary, we have implemented a 4K, 20-inch tablet with an aspect ratio of 15:10 and a high-precision pen. This device offers the clarity of printed material together with functionality that is not available in printed material. In diverse businesses using this 4K tablet, it is possible to eliminate the costs of paper and printing, the labor costs associated with the preparation of these printed articles, and the transportation costs associated with delivering the printed results to where they are needed. Also, the time saved by eliminating the need for printing and transportation means that content can be substituted right up until the moment it is used. Using digital technology makes it possible to display content in combination with movies and interactive systems, which is not possible in printed material. Furthermore, since the frame is not just a substitute for paper, but also a portable tablet with a 4K display, it can be used in places where high-resolution information is preferred but was not hitherto available. This means that it can be used as an "on-the-spot" device for checking CAD data, diagram data, medical X-ray images and the like. In the future, we hope to work towards making this 4K tablet even more useful so that it can be used in a wide range of applications in diverse industries. I will continue to work towards expanding the range of applications for this device in diverse industries.