Introduction

Digital camera technology is advancing rapidly, just as can be observed with every other aspect of the digital revolution. There have been vast increases in the optical accuracy and detail with soaring megapixel counts and improving zooming functionality, as well as an effort to include an ever widening range of technical efficacy into the camera unit itself, rather than waiting to use PC-based software prior to the photo being taken.

An interface that incorporates all of these increasingly complex tasks is required where existing interfaces are struggling to remain effective and adequate enough to do so.

Camera Hardware

The physical interface of the digital camera has always been considered as a WYSIWYG style one, since the very paradigm of a camera seems to not allow for anything but. The idea of perhaps a command line operated digital camera is unacceptable for many reasons, not least of all that the only controls of almost any digital camera roughly match their analogue counterparts of a film based camera.

However voice activated software running on a digital camera is not such a giant leap, since many already carry the necessary hardware in the form of a microphone designed to record audio for their very basic video recording features. But there have always been inherent problems with such voice controlled solutions, mainly due to the various types of environment the user is expected to be able to use such a feature. A user at a noisy event is hardly going to appreciate having to shout at their camera in order to take a photo. On the other hand it might prove useful where the camera needs to be in a position where it is difficult to operate manually.

Firstly, I would propose a great increase in size to the viewport screen that has become the standard characteristic found on the interface side of any digital camera. Even larger cameras often have a rather small viewport. There are a number of advantages to increasing the screen size both to the user's ability to achieve what they want to with the image down to the number and complexity of tasks the user interface is capable of representing.

Photographers, professional and enthusiasts alike, and particularly those that use digital SLR cameras are often prepared to carry a lot of equipment around with them, including lens that can be well over a foot in length. Therefore I believe it would be reasonable to assume that serious camera users would be prepared to sacrifice a smaller chassis and accept the hardship of carrying a larger camera and screen for the numerous interface benefits that it would provide. Not that it would be any different really to carrying a medium to large sized PDA.

The photo (right*) demonstrates the sheer size of certain DSLR cameras, and possibly the vulnerability of delicate parts as well, that users are prepared to take into a situation like a massive demonstration crowd. Other photos of interest here are of yet more DSLR cameras only this time taking photos in the middle of a confrontation between a protestor and the police officers.

* http://www.flickr.com/photos/emmaandlorenzo/117990863/in/photostream/

http://www.flickr.com/photos/emmaandlorenzo/117994150/in/photostream/

http://www.flickr.com/photos/emmaandlorenzo/117994353/in/photostream/

Alternatives might include using projected images or holographic screen technology in order to increase the physical amount of information that can be displayed clearly to a user. Firstly though, a projected image onto a flat surface is really not appropriate since the camera will still require a very large flat surface (in comparison to itself). This surface will need to be designed specifically for the task otherwise the image will be too distorted for the type of fine detail expected for working with photos. Secondly I think that having an image projected away from the camera (in any direction but forwards of course) breaks the sense of direct manipulation between the view seen through the lens and then displayed and the actual physical direction the camera is pointing, leading to a scenario similar to when a computer user tries to use a mouse and the monitor is upside-down, i.e. they become disorientated as the interface responds in an entirely unnatural and unexpected fashion.

Secondly, as holographic technology stands, it requires hardware of a massive footprint and far too large to consider in any way mobile. Also, interaction with holographic images always requires some form of additional control mechanism, perhaps in the form of a glove with sensors tracked by an optical sensor or more traditional means such as the mouse and keyboard. Even if the technology were reduced to a considerably smaller size, its usefulness as a camera interface is limited, unless of course the actual photographic output of the camera became three dimensional.

There are many existing PDAs, palmtops and even micro sized laptops, small enough to pack away easily but include a screen size large enough someone thought it capable of displaying the full version of a Microsoft Windows operating system and applications. Therefore a screen of such a size would in theory be more than adequate for displaying a much simpler interface.

http://www.engadget.com/2006/09/20/seitz-6x17-digital-shoots-at-160-megapixels/

Finally, taking an actual 160 megapixel camera from today, it is evident that larger mega pixel counts the required camera chassis size increases accordingly. The Seitz camera uses quite a large screen, which only appears small (pictured) due to the comparison in size with the rest of the giant chassis of the camera.

Similarly I have seen normal camera models on sale, such as a Casio brand 7-megapixel camera, with much larger screens between two and a half inches and 3 inches in size.

A recent addition to some new digital cameras is the use of a detached and pivoting screen, similar to those found on digital camcorders. This design feature will allow the

user to preview their image when the actual body of the camera is in a difficult to view location, such as being held right above the user's head in a crowd. While this is entirely possible with my proposed larger screen, and indeed digital camcorder screens are generally larger than digital camera ones, it increases the risk for damage in rough or crowded situations.

A common physical interface feature of the camera is the use of either a joystick/select button or an arrow/select keypad giving the user the ability to navigate the camera's two-dimensional software interface. While both of these solutions only offer directions down to 45 degrees in one direction, the joystick gives the illusion that any direction of movement in the interface is possible, whereas the keypad is limited to simply combining two buttons at once. However, such a method of navigation will become obsolete with the use of a touch-sensitive screen and the cumbersome size will be much better used as additional screen space on the camera's physical interface.

Camera Software

The user's ability to simply take a photo using a camera is paramount, usually to the extent that one of the measured features of today's digital cameras is the speed at which they start up and are able to take a photo. While in part this is a test of the mechanical capability of the camera, it's also imperative that the first thing a user is immediately able to do is take a photo, with any other interface and controls coming later.

This is important for novice users of the camera, but primarily it is important because there will often be situations which require a fast start up time in order to take a photo before the opportunity has passed. Having any form of interface that prevents taking a photo prior to this would be unacceptable.

So once the camera is turned on, and ready to take a photo, the next most common activity is using the viewport to in order to preview the photo's results. For this reason the view from the lens has always been the first part of the interface to be displayed.

It is also an expectation that pressing on the main button lightly will initiate the camera's auto focus feature. It is important to keep this function in such a fast and familiar place.

Next of all, assuming that the user wishes to take a photo rather than change any of the camera settings immediately, the zoom and focus control is usually the most important. Hence on a modern day digital camera you can find two buttons, W and T, or with DSLR a simple turn of the lens and quite often the camera is capable of automatically focusing. The interface will retain its W and T function since this is a well established design feature and is difficult to make any simpler. However in addition to this, the camera's touch screen will come into use.

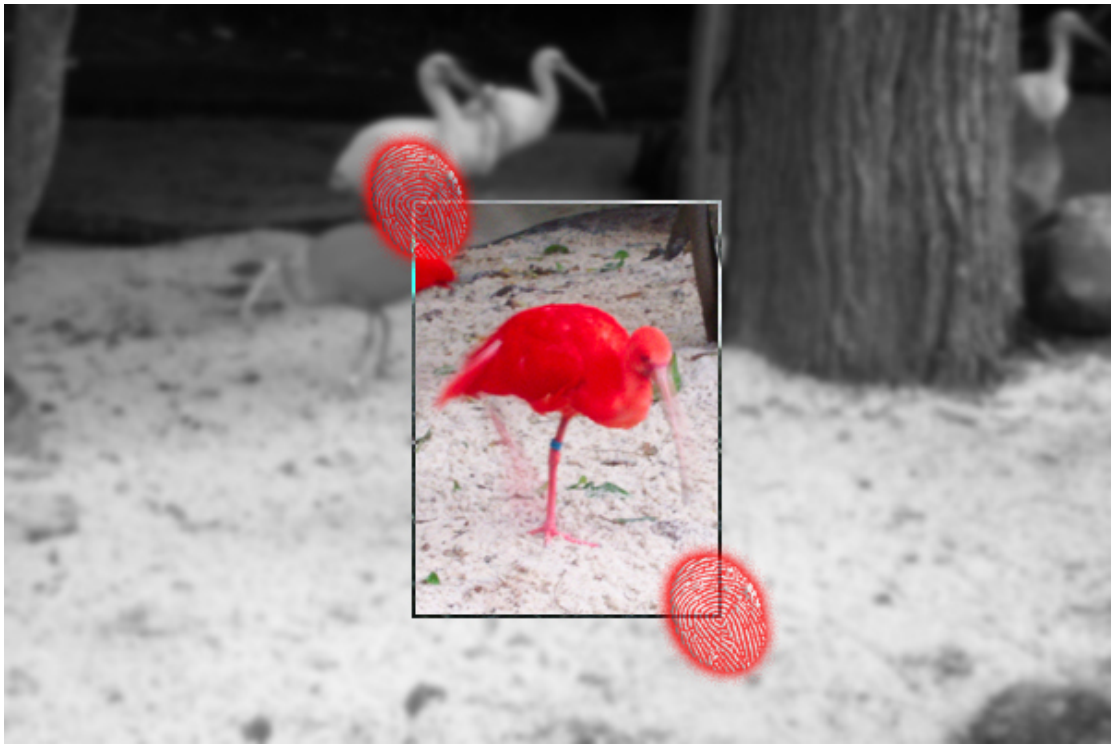
At this point we can assume that the user is not in a hurry to take a photo and actually taking a planned and prepared shot, therefore the zooming feature can become the first of a 'hidden' secondary selection of operations the camera can carry out. If the user is however in a hurry, the W and T buttons will be much more suitable for quickly and roughly framing the shot.

This menu will be hidden at the start, due to the decreasing time criticality of the tasks it will contain. Zooming will be one of a number of options that can be done more comprehensively via this menu, or alternatively traditional buttons that operate in a much faster way. The menu will ultimately be accessed by a Menu button on the physical interface that will display a context menu for the user's current primary task. Importantly, when a setting is altered from the defaults to a specific setting, the camera will remember this until it is changed again. The menu will have a consistent design in

each of the three contexts it can be found (menu for photography, previewing and system settings).

A user can drag out using two corner points a box in which they can frame the subject of the picture. While this box is being created, the surrounding image becomes colourless and slightly blurred in order to allow the selected area of the viewport to be easily distinguished. More specifically, the user has two methods of achieving this. Either they might hit one part of the screen to set the box's initial corner, and then hit another section to set the box's finishing corner, or they can achieve much the same by using two fingers and dragging either finger while the box dynamically resizes underneath them.

While a box is being created, or indeed after it has been created, the zoom icon will display a red X, which should be familiar to any user of modern GUI operating systems, and can be used to cancel the zoom box.



This interface method enables a more direct manipulation between the user and the image than the W and T buttons. Once a box has been created the user is able to change it in several ways. Firstly and most easily it will be possible to clear this box, and return the viewport to its fullest aspect. As well as the previously stated X symbol in the camera's menu, hitting any part of the grey area will immediately clear the selection.

A selection box may be resized after it has been created by hitting and dragging any of the four corners. The ability to move a box is effectively made obsolete in this sense. As well as user created boxes there may also be room for an automatic framing ability that when selected a user can simply hit objects within the viewport and using a form of AI assistance the camera attempts to frame precisely the object that the user selects. However, with regards to using AI as an aid in the visual realms, 'building a computer to recognise, much less perceive, even the simplest objects has turned out to be incredibly difficult' (Seckel 2006: 6) so the effectiveness of such technology is questionable.

Finally, once the user is happy with the frame, it can be accepted. This can be achieved by hitting once within the selected area. This activity effectively removes the need for users to edit their photos later using a personal computer in order to perform fairly mundane Cut and Cropping tasks.

The next most important task on the secondary menu will be given to the flash control. The flash of a digital camera can be made to perform in a number of different ways, from an automatic state of detecting the surrounding light strength in order to give an appropriate flash, forcing the flash either on or off or various other settings perhaps including an automated red eye filter or a fill flash. The flash is traditionally represented by a lightning strike and this is the icon that shall be used in the secondary menu, and also is controlled by its own button. Leaving this button available means that in a speed critical situation the user can quickly cycle through the broad flash options, however from the menu they will presented with an individual control over each. This way options can be combined to make unique settings. In addition the user should be given control over the power percentage of the flash's brightness.

The next tasks on the menu should be the camera's timer feature and the camera's burst feature. Although the tasks are now increasing in complexity, they are still considered standard enough to be provided with their own buttons on the physical interface and therefore they shall stay, with the ability to quickly set the user's last setting without going through the menu.

If accessed from the menu however, the user will be presented with options to tailor the settings to their own needs. For the burst shot the user will be able to set the number and interval of the photos to be taken once it has started. At this stage a warning message will be required for when the number of photos multiplied by their estimated size exceed the remaining memory on the camera. This of course will only be a warning and the user can choose to continue if they wish. On existing compact digital cameras this feature is far more limited and serves very little use as such, taking a fixed number of shots at a fixed interval.

The timer option will be expanded in much the same way, whereby the user can choose to quickly set their most recent settings by use of a physical interface button or they can go through the menu and set the specific length of time the timer will take. Unlike existing cameras both the timer and the burst shot can be stacked along with every other setting that doesn't override another.

For the following menu activities, it can now be assumed that they are not time critical, or such tasks are impossible or simply not practical to emphasise speed as an interface factor, and that the user is taking photographs in a premeditated and planned fashion. Therefore next of all, ISO speed and exposure time settings will have comprehensive menus for their settings. There will of course be default automatic settings.

Expanding on the camera's ability to take simple and not so simple operations from computer based software, a filter gallery that works on a live preview basis will be the next menu feature. By selecting from visible example thumbnails, and hitting them once to enable the filter, the viewport will be altered accordingly. An enabled filter will be represented by a tick beneath its previews, and obviously the fact that its effect will be visible. Filters can be mixed in the sense that more than one could be enabled, such as perhaps a Sepia colouring effect with a simple Invert.

Finally, the menu will allow access to the image file's output, quality and location options. A filename text mask output setting will allow a user to modify the naming scheme for new photos taken, a task which is reserved for some camera software on a PC when photos are uploaded, but generally not catered for.

Having this available solves the problem of ambiguous and unhelpful filenames such as 100_4502 and again takes the onus of such a time-consuming and mundane task that would have to be performed later on using a PC. Text entry will be discussed in more detail later, however a user can select the text that will be placed either side of an auto-number system. Therefore it is possible to give the filenames a more contextual and relevant meaning, for example 'holiday2006_74.jpg'.

Digital cameras have offered varying levels of output quality, perhaps measured by the terms best, average and low. But again it would not be unreasonable to vastly increase the level of control a user has to the same level found on a computer by giving them precise access to the JPEG quality level from 0 through to 100. This will be a serious consideration for a camera user that wishes to upload photos to an online blog or gallery without having to edit their shots beforehand on a computer.

And ultimately, the user can override the camera's settings as to which location it saves files, a fairly typical feature since most cameras have both an internal memory and memory card slot.

Viewing existing photos and media the user has already taken is one of the greatest strengths of the modern digital camera. It part way went to solve the problem of discovering your photos were perhaps inadequate immediately after they were taken rather than long after the opportunity to do anything about it had passed. And yet so often I find myself looking at particularly poor photos on the computer screen because it has been impossible to tell this from the camera itself. This can be greatly improved with the larger screen and its inherently more detailed previews.

Previewing images will be started by pressing a preview button on the physical interface and the first interface will be similar to an operating system folder or semantic dialogue involving actual thumbnails of each image to represent their file.

The first and most likely activity is that the user will want to view their individual photos therefore selecting one will effectively maximise it and hide the folder view. A return symbol will return the user to the folder and a precise replica of the zoom feature for taking photos will be adopted for zooming in to view them.

If the menu button is pressed while in the folder view, a list of the options that don't require a specific photo be selected will be displayed, including a slideshow, publish to online source and copy files to device, send directly to a printer and the delete feature. If the button is pressed while viewing a photo, these options and additional photo-specific settings will be displayed.

Included here will be the ability to change the photo's metadata. As demonstrated by the data that can be found on a photo taken by most digital cameras, it is possible to store an awful lot of additional information as metadata about the photo such as the camera model, aperture speed, etc. However there are other articles of data that it would be impossible for a camera to determine itself, such as the location of a photo, or a description of its contents.

Here we come to the issue of entering text into such a compact and mobile device as a digital camera. The mobile phone deals with this problem by use of associating 3 or 4 letters to each number key of a standard keypad, but of course no such set of controls exist within the camera paradigm. It could be possible to instead associate the letters with the existing controls, but it is highly unlikely that a user is going to ever want to have to learn and use second letter functions for each individual camera control.

A more viable alternative would be to use a laser projected keyboard. Such devices can be found and bought for attachment to PDAs and computers via an infrared Bluetooth connection. They have an incredibly tiny footprint but obviously a certain amount of physical space is required for any keyboard, projected or not. A serious drawback of this method however is the fact that a camera is likely to be in environments which lack any suitable surface whatsoever on which to project such a keyboard. It could be assumed that users would be willing to wait until a suitable location had been found in order to use this keyboard, however this firstly defeats the purpose of being able to add metadata at the very same time as taking the photo and secondly, the user is likely to wait until they are back in situation where a computer is readily available anyway (two examples being on a train where a laptop is just as easy to use or back at home with a desktop machine).

But finally, since the camera's screen size is to be increased greatly and touch sensitive, it would be completely reasonable to display a touch keyboard in the QWERTY format. An even further possibility would be to include some form of text recognition to allow a user to actually write on the touch screen and have the camera convert it to the JPEG metadata.

A system button on the interface will pull up the final menu available to the user that gives access to certain camera settings such as the camera's clock and calendar, formatting memory and language.

Connectivity

A digital camera can send photos directly to a personal computer via numerous methods including the traditional camera-to-computer USB cable, infrared technology such as Bluetooth, or by removing the memory card and reading it from a card reader or perhaps having a docking station into which the camera is placed for USB access and simultaneous battery charging. Another fairly standard method of connecting the camera to another device is the composite video output.

Digital cameras in the past have attempted to streamline the whole act of creating a photo from start to finish by making certain post-photography seamless from taking the actual photo itself. Mobile phones as comparable portable devices again, accomplish this same activity far more effectively given that their inbuilt cameras are supposedly a secondary feature. At a cost it is possible for a user to take a reasonably high quality photograph and immediately publish it to an online blog with descriptive text. However this is really only possible due to the fact that a mobile is inherently connected to a telecommunications infrastructure and a pure camera really cannot justify using the same technology itself.

However there are other means by which digital cameras ease the action of transferring photos to their finished result. Aside of having software installed on the camera owner's computer, it could be possible for the camera itself to be internet ready via a WIFI or Ethernet connection. There are already Wi-Fi-enabled (IEEE802.11b/g) products that 'allow consumers to immediately transmit images wirelessly directly to a computer' (physorg, 2005: 1) via wireless connections to computers or networked printers. There is no reason why this cannot be taken a step further to incorporate online publishing.

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Additional Photos:

http://www.flickr.com/photos/emmaandlorenzo/

Words: 3872