AcehCamera – Collaborative Visual Mobile Application

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ABSTRACT
AcehCamera is an application designed for use by the children of Aceh. It encourages expression of feeling through photo sharing and collaborative manipulation and is designed to be simple to use to suit the illiterate. It employs a unique navigation system and freedom of subject choice.

Categories and Subject Descriptors
J.4 [**Computer Applications**]: Social and Behavioral Sciences – *sociology, psychology;* H.3.3 [**Information Storage and Retrieval**]: Information Search and Retrieval – *Information filtering, Search process.*

General Terms
Design, Human Factors, Management.

Keywords
Database, photo sharing, mobile application, image manipulation, virtual collaboration, visual interaction.

1. INTRODUCTION
The mobile phone has developed over the years from the simple purpose of a mobile telephone to becoming a conglomeration of computer-based products, such as an mp3 player, camera or calendar, and the social hub of our lives. There have been increased efforts to create programs that are tailored to the mobile's unique characteristics, such as its computational power relative to its size, its mobility and the fact that there are now more than 2.5 billion mobiles in the world[1]. As with all computers mobile phones are steadily gaining in processing power and capabilities. Consumers are eager to follow trends and get the latest mobile models. As the cycle flows older models are in many cases passed down to developing regions of the world, where they have often been used in an attempt to help improve the quality of life. One such example is the Grameen Phone[2].

2. DESIGN AND THEME
As part of Design Computing 3200 we ask "how could computing improve the quality of life for people in developing regions of the world?" To explore this question we have undertaken a project that is aimed at a specific developing region.

AcehCamera is a project that has been designed for the children of Aceh, which is a 'special territory' in Indonesia, located on the northern tip of the island of Sumatra. It is a patriarchal society that has been well known for its political independence and has fought Indonesian authorities in efforts to achieve this. Aceh's western coastal cities were among the areas hardest-hit by the December 26, 2004 tsunami that resulted from an Indian Ocean earthquake.

Many of the children of Aceh lost their family, homes and friends in the tsunami disaster. There has been ongoing reconstruction of homes, schools and facilities as well as the placing of orphaned children with families or relatives. However there have been lingering psychological effects on the children. Many have had fears of the ocean or were too traumatised to speak. Many children have been unable to go to school because they have to work to help support their family.

AcehCamera is designed for these children to have fun, be creative and share their thoughts with others like them. The Aceh culture is very visual and traditionally uses a lot of story telling. By giving children the tool to create visual stories I hope they can work together to create interesting pieces of art that have a deeper meaning.

There have been many projects that have given children the opportunity to use cameras to convey their feelings. In Aceh a UNICEF-sponsored program called 'Hello Video'[3] gave children the opportunity to tell their stories via video camera. The success of this program inspired me to develop a simpler visual application that could be used without guidance and serve also as a game for children.

AcehCamera uses the mobile phone's camera to allow children to take a photo of their subject choice. Their photo will be sent to the database and stored. As a reward for offering to share something with other children the application allows them to start a new evolving art piece with their image at the forefront. Two other images submitted by children to the database are sent to the phone, which displays these three images as layers stacked on top of one another. The child is then able to scratch away square-shaped chunks from the top layers to reveal parts of the images underneath. Each child can do a limited amount of 'editing' before the creation must be passed on to another child.

Children also have the option of adding to an existing art piece without needing to take their own photo. The evolution of these art pieces will be portrayed on a web site for the whole world to see.

3. TECHNICAL

AcehCamera is written in J2ME and was specifically designed for the Nokia N80 mobile phone. It also uses server side PHP and a mySQL database. The application uses a HTTP connection to transmit data such as images to the server. The PHP processes this information and stores it in the mySQL database. It also retrieves information and sends data back to the phone.

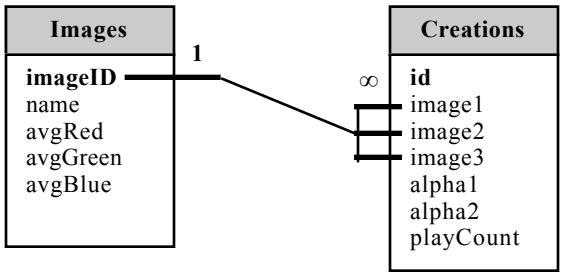

Figure 1. Schema for AcehCamera database.

3.1 Navigation – Average Colour

In order to make use of the processing power of the mobile phone, and to provide an interesting and educational aspect about the game, a unique navigation system was employed. Because AcehCamera is heavily visual and relies on the visual interaction of images as well as the eye of the camera it made justifiable sense to incorporate both these aspects in the new navigation system.

Whenever a user takes a photo and transmits it to the server, not only is the photo stored in the database but also the average colour of the image (see Figure 1). The average colour is determined by adding the red, green and blue values of each pixel in the image and then averaging the three results (i.e. dividing by the total number of pixels). When the user is in "Play" mode, whereby they are able to download an existing image set and add to it, they are directed to take a "photo" with the camera.

The phone will average the pixel data of the image taken and draw on screen the average colour represented by this image instead of the photo taken. This in itself provides an interesting and fun way for children to learn about colour. The average colour values are then sent to the server, where PHP uses the data to sort the "Creation" entries so it finds one in which the Image linked by the "image1" key is closest in average colour to the average colour sent by the phone.

This is the algorithm that is used to perform that sort and retrieve information about the "Creation" to return to the phone:

```
$result = mysql_query("SELECT Creations.id, Creations.image1,
Creations.image2, Creations.image3, Creations.alpha1, Creations.alpha2,
(ABS(Images.avgRed - $red) + ABS(Images.avgGreen - $green) +
ABS(Images.avgBlue - $blue) + RAND()) AS 'index' FROM Images INNER
JOIN Creations ON Images.imageID = Creations.image1 WHERE
Creations.playCount < $playLimit ORDER BY 'index' ASC");
```

3.2 Alpha Channels

In order to display the three layers of images on the phone alpha channels are used. These set whether a portion of the image is opaque or transparent. The alpha values are stored in an integer array (one for both images that can be edited) and their values are adjusted whenever a user scratches at an image layer by calculating the position of the cursor relative to the corresponding image data in the array. The alpha integer arrays are then combined with both the images' ARGB pixel data by bit-shifting values. The end result displayed on screen is an image with a chunk "missing".

4. EVALUATIONS

User testing of AcehCamera was carried out in order to evaluate the ease of learning the user interface with regard to the fact that users will have varying degrees of literacy. Tests were carried out where users were told which of the mobile phone buttons could be used for the application but not what the functions of these buttons were. The number of errors made and the key presses used to reach the conclusion of the application (or its paths) was recorded and the data averaged to get results.

Table 1. Conclusions achieved

Conclusion Type	Total	Percentage of all conclusions
Completed	14	67%
Not Completed	4	19%
Phone Error	3	14%

Users were also given a survey to obtain qualitative information on their feelings towards the user interface and the AcehCamera application as a whole.

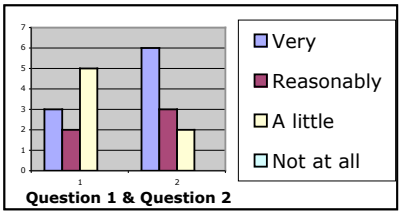

Figure 2. Understanding of menu before (Q1) and after (Q2)

5. ACKNOWLEDGMENTS

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6. REFERENCES

[1] Wireless Intelligence report *http://www.wirelessintelligence.com/*

[2] Grameen Phone *http://www.grameenphone.com/*

[3] UNICEF, Hello Video *www.unicef.org/videoaudio/indonesia_34939.html*