Application Note

AN_309

FT800 Washing Machine Application

Version 1.1

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This application note describes the operation of the Washing Machine Demo Application running on the FT900 MCU, Microsoft Visual C, Arduino and EVE Screen Editor platforms. The objective of the Washing Machine Application is to enable users to become familiar with the usage of the FT8xx, the design flow, and display list used to design the desired user interface or visual effect.

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1 Introduction

This application demonstrates an interactive Washing Machine application using Menus and animation, based on the FT8xx platform. The Washing Machine application user interactive function involves the options that can be selected for the washing process.

Figure 1-1 Washing Machine

Further sample code for the EVE family can be found on the EVE examples page: http://brtchip.com/SoftwareExamples-eve/.

1.1 Overview

The document will give the basic understanding about the FT8xx CPU features Menu and animation using bitmaps.

The example code can be run in a variety of platforms as listed below but could be ported over to other platforms:

- PC running Visual Studio (C++) with FTDI USB-SPI interface (C232HM cable, VA800A-SPI adapter, VM800BU basic board with USB interface)
- FT900 MCU platform
- EVE Screen Editor
- Arduino

1.2 Scope

This document will be used by software programmers to develop GUI applications by using an FT8xx with any MCU via SPI.

Please refer to the sample code package that can be found at the following link:
http://brtchip.com/SoftwareExamples-eve/#Example 19 - Washing Machine(+EVE2)

Note: This document is intended to be used along with the source code project provided. This can be found at the above link.

2 Application Flow

2.1 Washing Machine Demo Flowchart

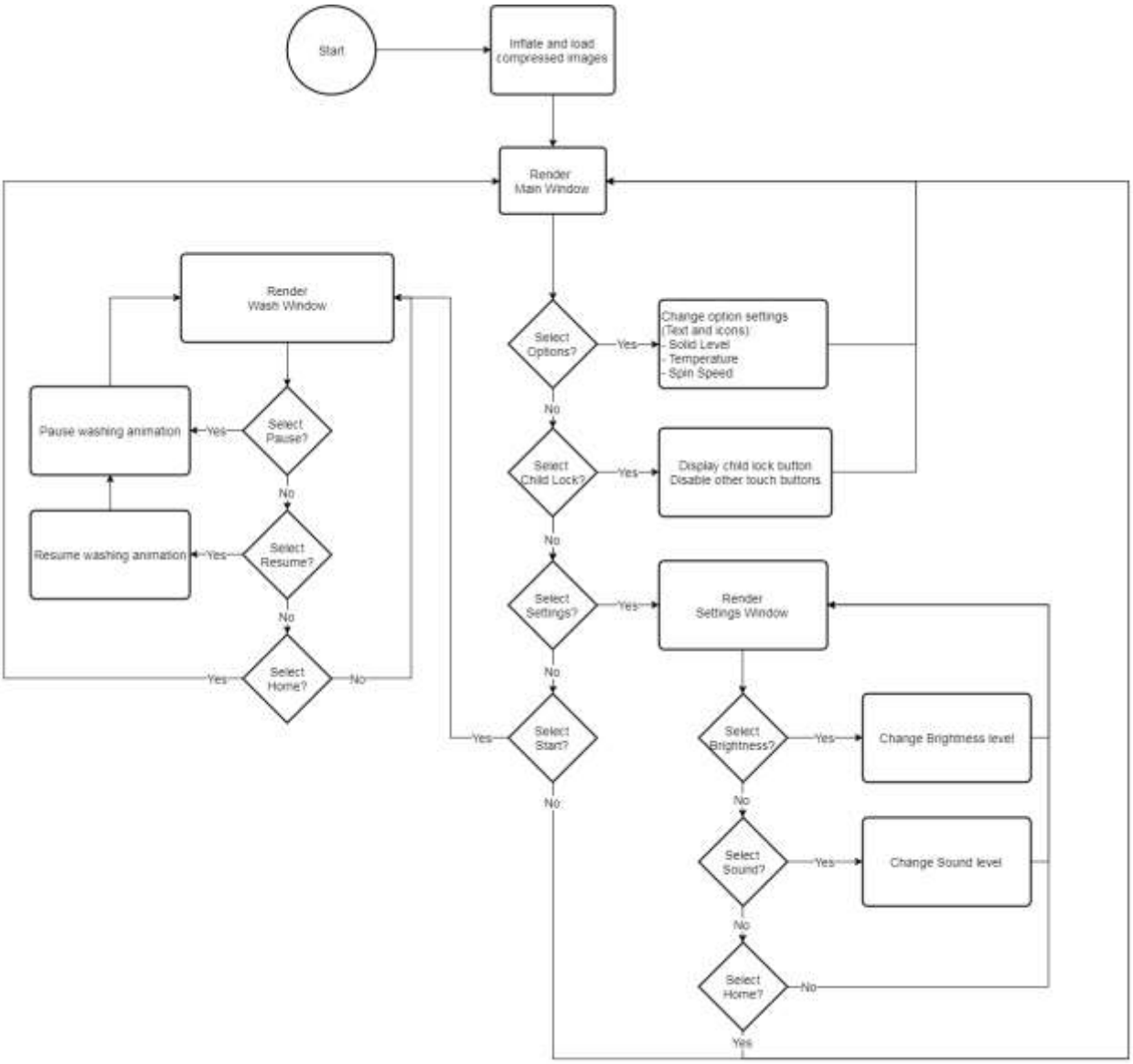

Figure 2-1 Washing Machine Demo Flowchart

3 Description

Refer to AN_391_EVE_Platform_Guide for information pertaining to platform setup and the necessary development environment.

Parameters needed to be initialized are described below for constructing the display list.

3.1 Intialization

3.1.1 Download the Bitmaps

The bitmaps are downloaded into the desired locations. The bitmap handles are also assigned here. The items in the Wash window for different stages are combined into one single image and assigned different cell values. They are then called according to their cell numbers.

Note: After these configurations are set, swap the display list and flush into the Memory.

3.2 Functionality

The Washing Machine Demo is a user interactive demo where the user can select and view items that are available.

3.2.1 Main Window

The Main Menu has options for the Wash type such as Eco Cold, Normal, Heavy Duty, Perm Press, Active Wear, Bedding and Wool. The preferred option can then be selected by clicking on it (touch the screen). Each of the options has its own Soil Level, Temperature and Spin Speed which are shown at the centre of the screen.

There are three options on the right side. Child Lock, Settings and Start button.

Estimated time remaining for the process is also shown.

The Menu Items on the left pane are assigned individual tags. Below the Menu items, a rectangle with only alpha value and a tag is drawn. This rectangle is drawn for the scrolling feature.

The scrolling feature is done by reading the X and Y coordinates at the particular point and by calculating velocity using the previous as shown below.

```
static uint16_t scroller_run(uint8_t touchTag)
{
    signed short sy=-32768;
    if(touchTag==101){
        sy = Gpu_Hal_Rd16(phost,REG_TOUCH_SCREEN_XY);
        if((sy != -32768) && (scroller.dragprev == -32768)){
            scroller.dragprev = sy;
        }
        else if ((sy != -32768) & (scroller.dragprev != -32768)) {
            if(scroller.dragprev > sy)
                scroller.vel = scroller.dragprev - sy;
            else if(scroller.dragprev < sy)
                scroller.vel = scroller.dragprev - sy;
            scroller.dragprev = sy;
            scroller.base += (scroller.vel/2);
            scroller.base = MAX(0, MIN(scroller.base, scroller.limit));
        }
    }
```

```
    else{
        scroller.dragprev = -32768;
    }
    return scroller.base;
}
```

The Options on the middle pane change according to the Menu item selected. The bitmaps used for the "Soil level", "temperature" are changed in color according to the option. The Spin speed bitmap is rotated using the Gpu_CoCmd_Rotate command.

Figure 3-1 Main Window Screen

3.2.2 Child Lock

The Child Lock option will lock the screen thereby disabling all the features of the Machine as shown below.

An edge strip with an alpha value of 180 is drawn and the bitmap is placed in the centre with a tag value to go back to the Main Screen

Figure 3-2 Locked Screen

3.2.3 Settings

The Settings screen has options for Sound and Brightness levels to be adjusted.

The default value for Display is 100 and for Sound is 255 which are the highest. They are shown in Level 5 and Level 4 respectively.

The Level buttons are drawn using rectangle commands and assigned tags. Only the selected buttons are drawn with a bigger than default value.

The Home button is selected to go back to the main screen.

Figure 3-3 Settings Screen

3.2.4 Wash Window

When the Start button is pressed, the washing process begins with stages as Pre Wash, Wash, Rinse and Spin.

The different stages are shown with images being loaded one after the other to create an animation effect.

The Time remaining for the whole process to be completed is shown here and in the Main Window as well.

At any point during the process, the user can jump to the main window and come back to the Wash Window without stopping the process that is happening.

A point is drawn using FTPOINTS with a low alpha value for the washing process to be displayed. This is termed the Process point.

The progress bar is a bitmap. A rectangle of similar colour to the bitmap is drawn over the bitmap as the washing process goes on. This gives an illusion that the bar progresses as the time reduces. The time remaining is shown using the text and number commands. The time shown in seconds is not exactly seconds. The seconds here are calculated faster to finish the process earlier for the purposes of the demonstration.

Figure 3-4 Pre Wash Window

During the Pre wash stages the bitmaps needed are "dropped" from the top of the display to the Process point. The bitmaps used are shown in the images below. They are "dropped" one after the other during the Pre Wash process to the Process Point.

Figure 3.2.4-2 Wash, Rinse and Spin Images

The above displayed bitmaps, used for the Washing process are changed in different angles (as shown below) using external software such as Gimp, or Microsoft Paint.

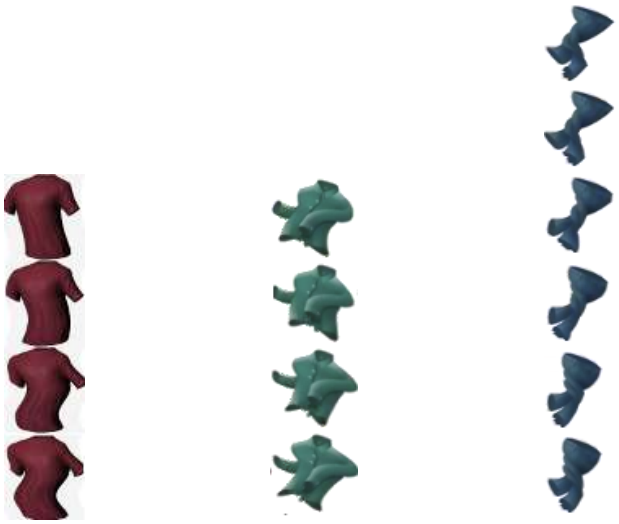

Figure 3.2.4-3 Wash, Rinse and Spin Process Images Altered

These bitmaps are accessed using their respective cell numbers as seen in the image as seen in the code below:

```
// washing and rinsing images

rotate_around(RotX,RotY,th);
App_WrCoCmd_Buffer(phost,BITMAP_HANDLE(ProcessFlag-2));
App_WrCoCmd_Buffer(phost,CELL(BitmapTr));
App_WrCoCmd_Buffer(phost,VERTEX2F(washCycleImgX*16,washSpinImgY*16));


// Spinning images

App_WrCoCmd_Buffer(phost,BITMAP_HANDLE(ProcessFlag-2));
App_WrCoCmd_Buffer(phost,CELL(BitmapTr));
App_WrCoCmd_Buffer(phost,VERTEX2F(washCycleImgX*16,washSpinImgY*16));
```

For the Washing process, bubbles bitmaps are moved in different locations using the random command. The offset of the bubbles are calculated by using the Display Width and Display Height.

The distance the bubbles move is calculated by adding the "xdiff" and "ydiff" values to the offsets.

```
W_Bubble[i].xOffset = random(DispWidth);
W_Bubble[i].yOffset = random(DispHeight);
W_Bubble[i].xDiff = random(16) ;
W_Bubble[i].yDiff = random(8) ;


App_WrCoCmd_Buffer(phost,BITMAP_HANDLE(4));
App_WrCoCmd_Buffer(phost,VERTEX2F(W_Bubble[i].xOffset*16,W_Bubble[i].yOffset*16));
W_Bubble[i].xOffset += W_Bubble[i].xDiff;
W_Bubble[i].yOffset += W_Bubble[i].yDiff;
```

Figure 3-5 Wash Window

For the Rinsing process, the bitmap is rotated at half its path.

Figure 3-6 Rinse Window

For the Spinning process, the bitmaps are displayed one after the other to create an animation effect.

Figure 3-7 Spin Window

The Process point displays the text "DONE" when the process is complete.

Figure 3-8 Process Completed Window

4 Contact Information

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Please visit the Sales Network page of the Bridgetek Web site for the contact details of our distributor(s) and sales representative(s) in your country.

Appendix A– References

Document References

- FT800 Embedded Video Engine Datasheet
- FT800 Series Programming Guide covering EVE command language
- AN_391 EVE Platform Guide
- AN_240 FT800 From the Ground Up
- AN_245 VM800CB_SampleApp_PC_Introduction - Covering detailed design flow with a PC and USB to SPI bridge cable
- AN_246 VM800CB_SampleApp_Arduino_Introduction - Covering detailed design flow in an Arduino platform
- AN_381_ME800A_HV35R_Sample_Application - Covering detailed design flow in an FT900 platform
- AN_325 FT9xx Toolchain Installation Guide
- AN_281_FT800_Emulator_Library_User_Guide - covering APOI interface for FT800 Emulator.
- AN_252 FT800 Audio Primer
- http://brtchip.com/utilities/ - EVE Screen Editor link
- https://www.arduino.cc/ - Arduino IDE

Acronyms and Abbreviations

Terms	Description
GUI	Graphical User Interface
SPI	Serial Peripheral Interface

Appendix B – List of Figures & Tables

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Appendix C– Revision History

Document Title: AN_309 FT800 Washing Machine Application
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Product Page: http://brtchip.com/product/
Document Feedback: Send Feedback

Revision	Changes	Date
1.0	Initial release	2014-03-25
1.1	Document migrated from FTDI to BRT (Updated company logo; copyright info; contact information; hyperlinks)	2018-01-05