Application Note

AN_310

FT_App_Refrigerator

Version 1.1

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This application note demonstrates the smart refrigerator application using inbuilt fonts, stencil operation and scissor commands based on the FT8XX platform.

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1 Introduction

This application demonstrates the smart refrigerator application using inbuilt fonts, stencil operation and scissor commands based on the FT8XX platform.

In this application, the commands such as the screensaver sketch are performed and the audio is synchronised with this.

The application is simplified by using FT8XX Widgets and primitives.

1.1 Overview

The document will give the basic understanding about the FT8XX CPU Stencil operation, Track, Points and Buttons commands.

For information on the Project file and Source code build, please refer to FT App Gradient Application note with respect to PLATFORM.

1.2 Scope

This document will be used by software programmers to develop GUI applications by using FT8XX with any MCU via SPI.

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2 Application Flow

2.1 Flowchart

2.1.1 Main Flow

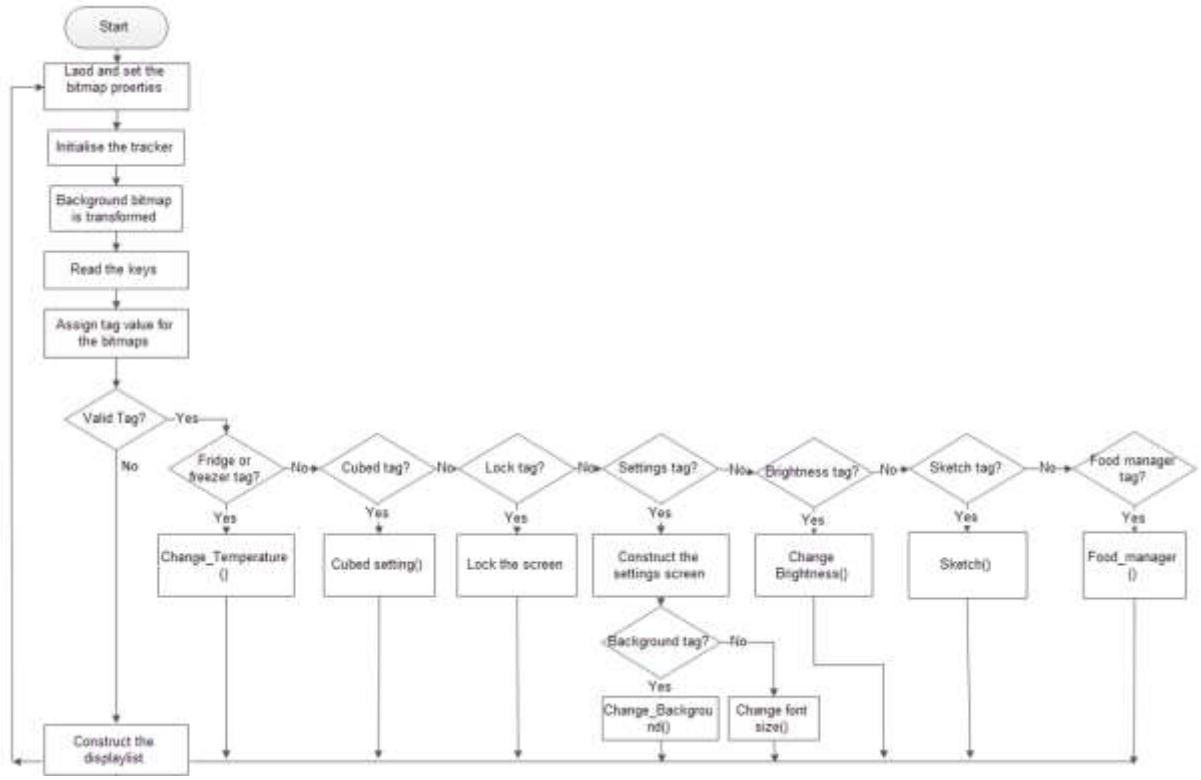

Figure 2-1 Refrigerator Main Flowchart

This is the main flowchart which explains the main control flow of the application.

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2.1.2 Temperature Change Flowchart

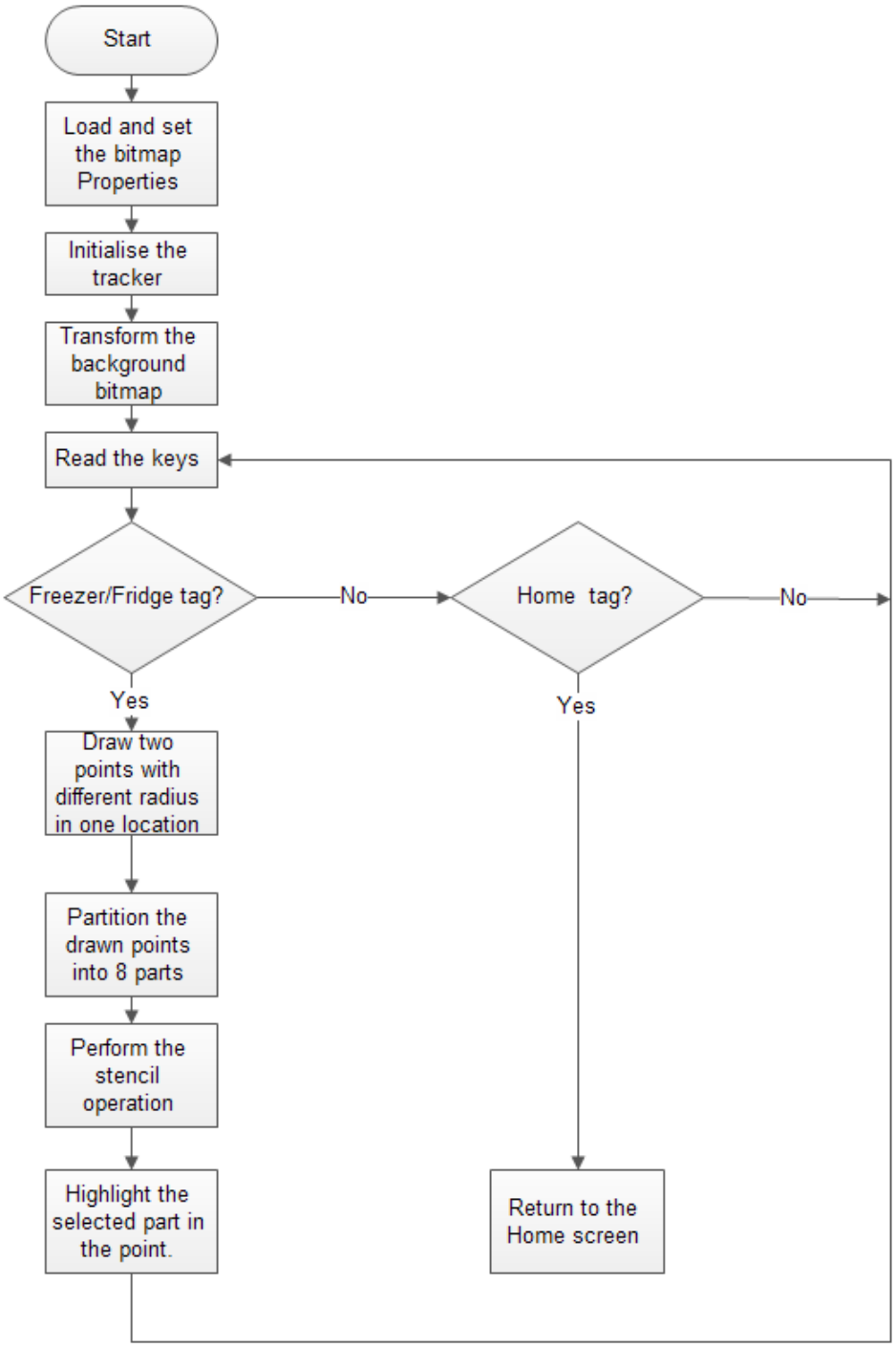

Figure 2-2 Temperature Adjustment Flowchart

The above flowchart explains the control flow of the construction of the screenshot in changing the temperature.

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2.1.3 Ice setting Flowchart

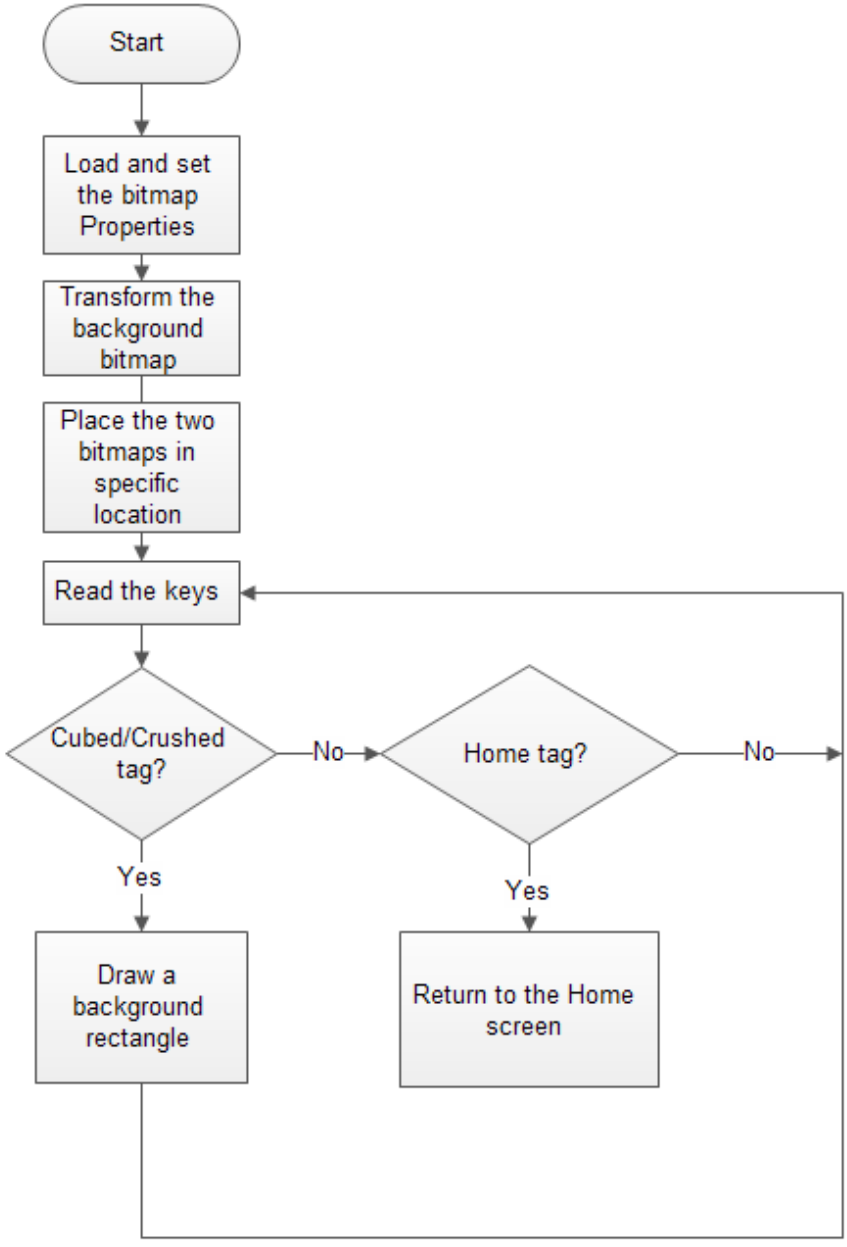

Figure 2-3 Ice Option Flowchart

The above flowchart explains the control flow of the ice option to be selected.

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2.1.4 Settings Flowchart

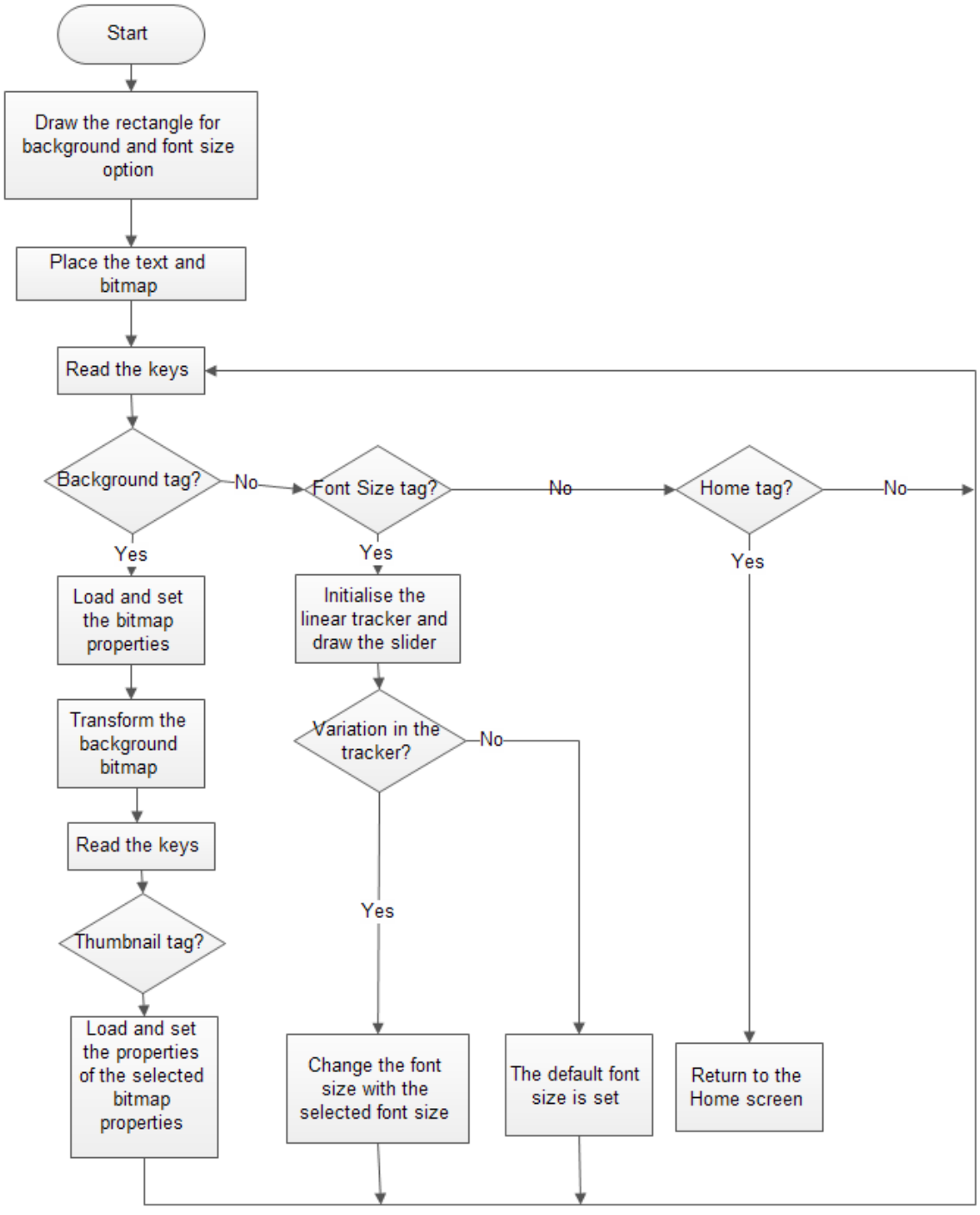

Figure 2-4 Settings Flowchart

The above flowchart explains the control flow of font size change and the background change.

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2.1.5 Brightness Flowchart

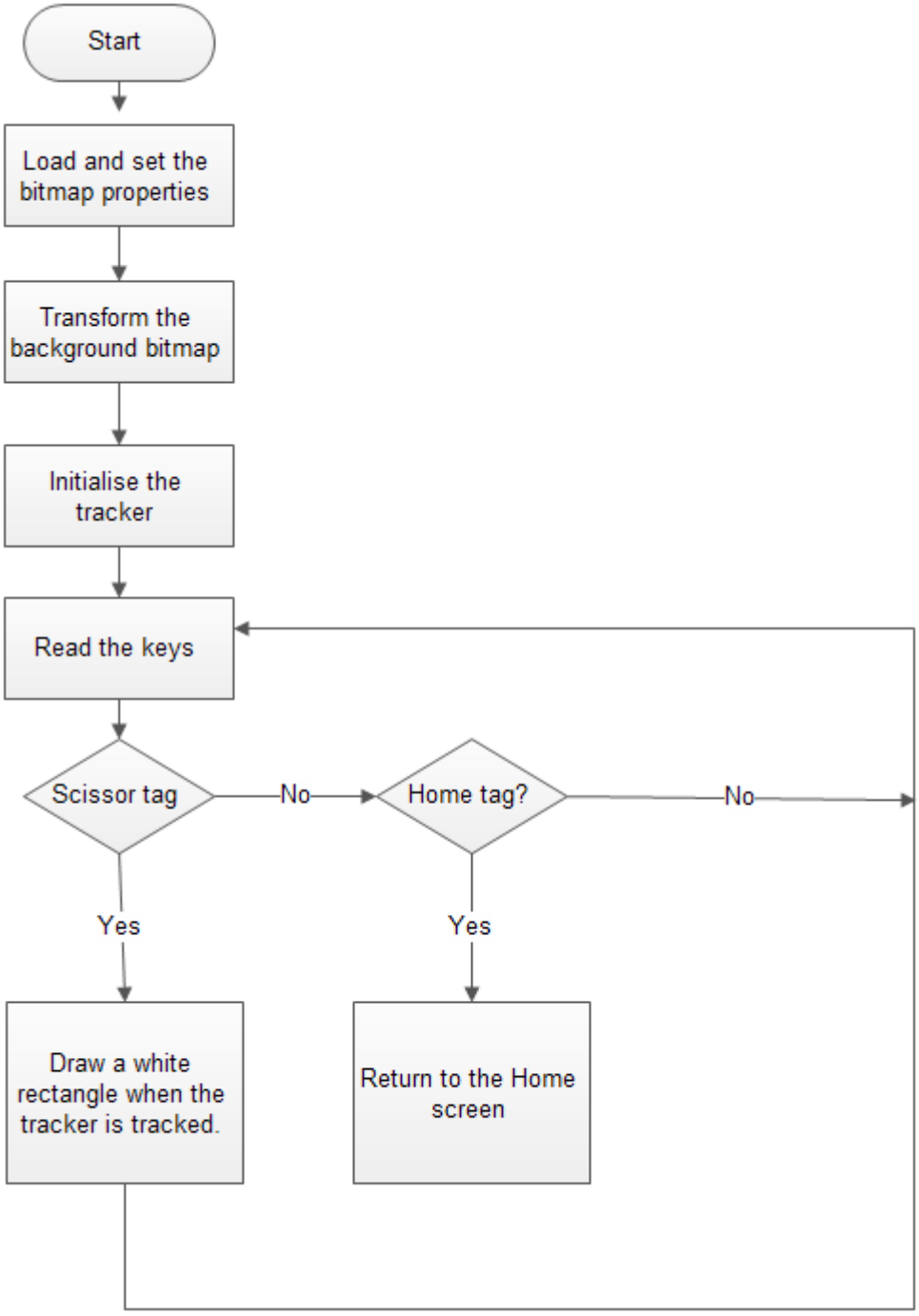

Figure 2-5 Brightness Flowchart

The above flowchart explains the control flow of the adjustment of brightness of the display with the PWM vale.

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2.1.6 Sketch Flowchart

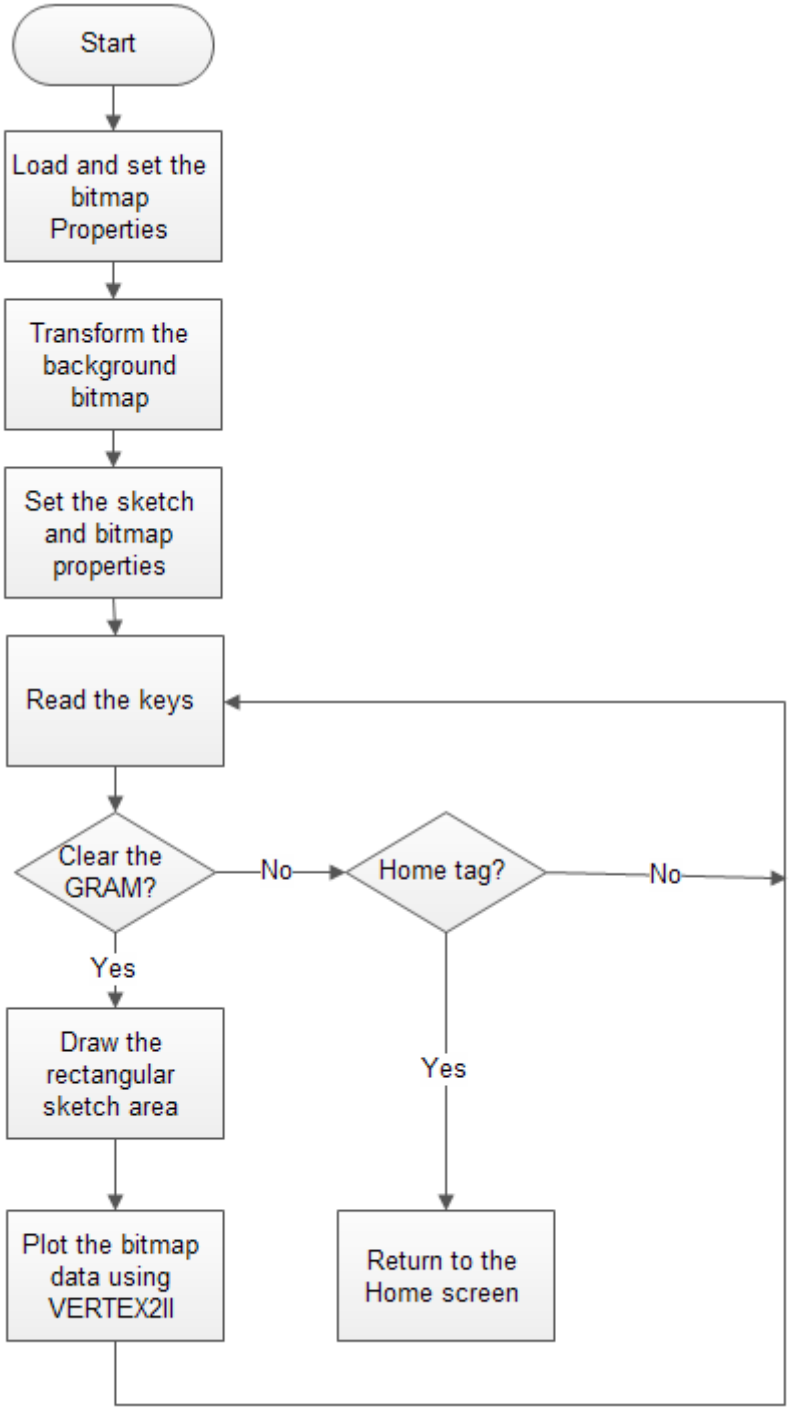

Figure 2-6 Sketch Flowchart

The above flowchart explains the control flow of the sketch command implemented in the application.

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2.1.7 Food Manager Flowchart

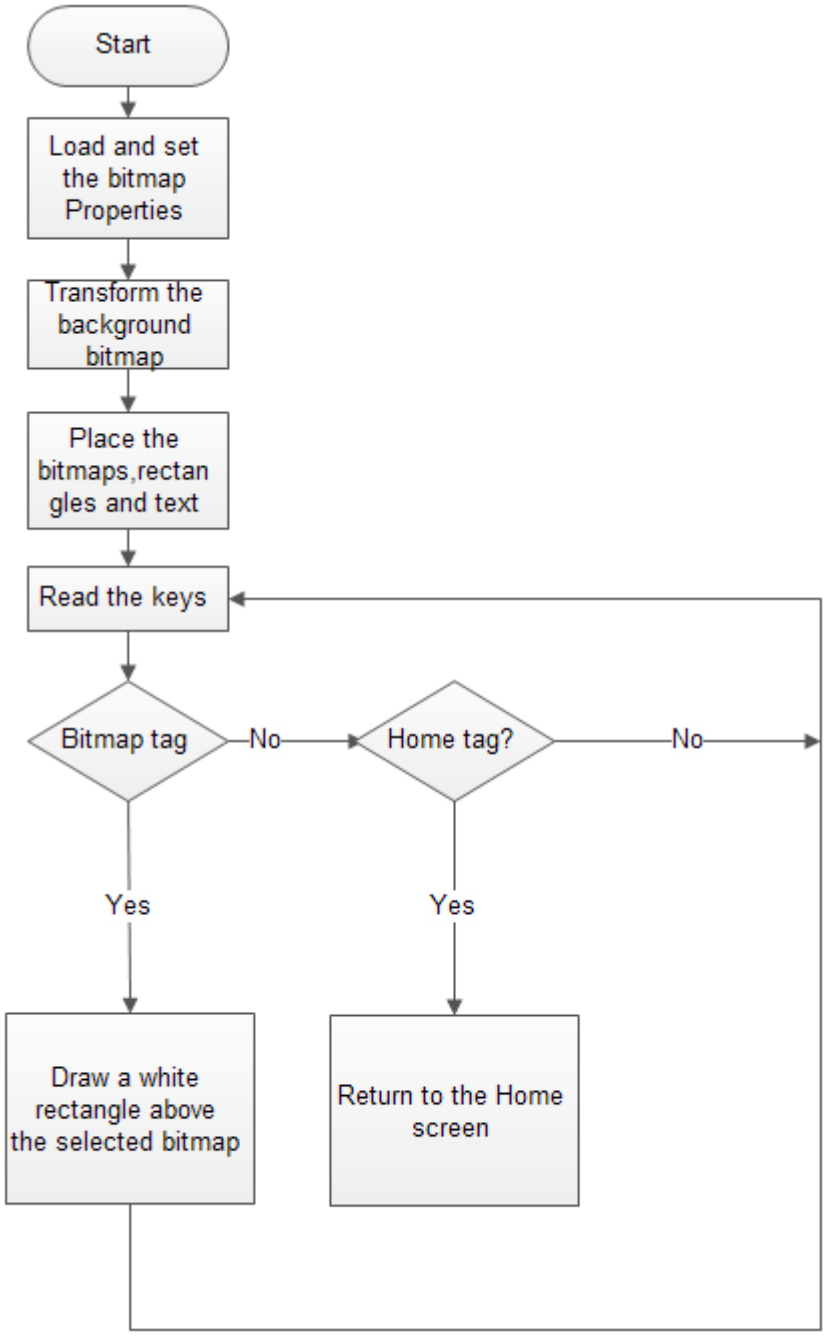

Figure 2-7 Food Manager Flowchart

The above flowchart explains the control flow of arrangement and selection of the bitmaps.

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3 Description

3.1 Functionality

In this application, the smart features such as child lock, screensaver, change of themes, and adjustment of the brightness, sketch and the food manager are implemented. The features are implemented using the primitives and widgets of FT8XX.

3.1.1 Construction of Screenshot

The screenshot is constructed by placing the background bitmap of size 240*136.The bitmap is then transformed using BITMAP_TRANSFORM. The snowflakes bitmap of size 50*50 for animation is made to move randomly from the bottom of the display in the upward direction. The orientation and the movement of the bitmap are shown in the code below:

```
/* compute the random values at the starting*/
pRefrigeratorSnow = S_RefrigeratorSnowArray;
for(j=0;j<(NumSnowRange*NumSnowEach);j++)
{
	//always start from the right and move towards left
	pRefrigeratorSnow->xOffset = random(DispHeight*16);
	pRefrigeratorSnow->yOffset = random(DispWidth*16);
	pRefrigeratorSnow->dx =  random(RandomVal*8) - RandomVal*8;
	pRefrigeratorSnow->dy = -1*random(RandomVal*8
	pRefrigeratorSnow++;
}



/* Draw background snow bitmaps */
for(j=0;j<(NumSnowRange*NumSnowEach);j++)
{
	App_WrCoCmd_Buffer(phost,BITMAP_HANDLE(6));
	if( ( (pRefrigeratorSnow->xOffset > ((DispWidth + 60)*16)) ||
	(pRefrigeratorSnow->yOffset > ((DispHeight + 60) *16)) ) ||
	( (pRefrigeratorSnow->xOffset < (-60*16)) ||
	(pRefrigeratorSnow->yOffset < (-60*16)) ) )
	{
		pRefrigeratorSnow->xOffset = random(DispWidth*16);
		pRefrigeratorSnow->yOffset = DispHeight*16 + random(80*16);
		pRefrigeratorSnow->dx = random(RandomVal*8) - RandomVal*4;
		pRefrigeratorSnow->dy = -1*random(RandomVal*8);
	}
	App_WrCoCmd_Buffer(phost,VERTEX2F(pRefrigeratorSnow->xOffset,
pRefrigeratorSnow->yOffset));
	pRefrigeratorSnow->xOffset += pRefrigeratorSnow->dx;
	pRefrigeratorSnow->yOffset += pRefrigeratorSnow->dy;
	pRefrigeratorSnow++;
}
```


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3.1.2 Home Screen

The home screen is implemented with the display of raw bitmaps, the fonts and the numbers using the text and number command. The tag value is assigned to each of the bitmaps using the register REG_TOUCH_TAG. The bitmap of size 50*50 is randomly made to move in the screen. The background bitmap is of RGB6565 format and is transformed using the bitmap transform. The randomly moving bitmap and menu icons are in L4 format whereas the bitmap of the logo is in ARGB4 format. The icons and the logo are placed in position. Whenever a touch is detected on the icon, the specific functions are called to perform its function. The date and time are displayed at the left side of the display with the inbuilt fonts using the windows function.

Figure 3-1 Home screen

3.1.3 Change of Temperature

The background bitmap and the animation construction are explained in the section 3.1.1 .The change of temperature screen is implemented using points and stencil commands.Two points are drawn and stencil operation is performed on them to shade the area of the points detected using the tracker values. The shaded area is constructed by drawing two rectangles which will hide other portions except the tracker value for 45 degrees.The shaded area is coloured differently to show the touched portion. The inbuilts fonts are used to display the numbers and text in the headings. The home bitmap exits the screen.

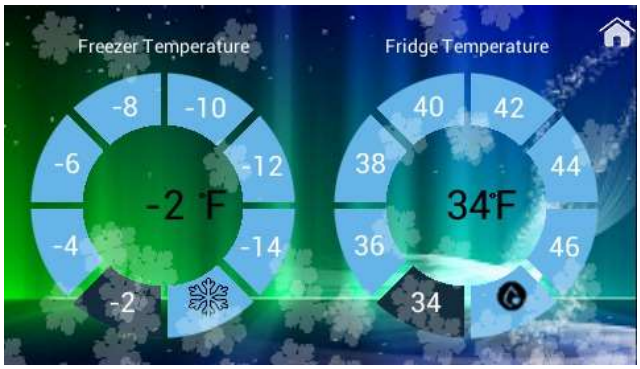

Figure 3-2 Temperature adjustment screen

3.1.4 Ice Option

The background bitmap and the animation construction are explained in the section 3.1.1 .The ice section of the application is implemented by the display of two raw bitmaps, one for cubed and the other for crushed .The rectangle with the alpha value 50 is drawn on the bitmap when the bitmap is selected. The bitmaps are in ARGB4 format.

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Figure 3-3 Ice Option

3.1.5 Settings

The settings section of the application is implemented with the primitives. The settings screen pops up which is constructed using the rectangles and the bitmap at the top. The change background section is implemented by displaying the thumbnails of the bitmaps in two rows. Each bitmap is assigned a tag value and when the tag value is detected, the selected bitmap is transformed using BITMAP_TRANSFORM and is applied to the display list. The bitmaps are in RGB565 format. The font size change section of the settings section is implemented using the slider. The slider is tracked using a linear tracker. The tracker movements are divided into four divisions of different font size varying from 26 to 29 and on the ascending track, the font size is applied to the entire application wherever the fonts are used.

Figure 3-4 Settings screen

Figure 3-5 Background Selection Screen

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3.1.6 Brightness

The background bitmap and the animation construction are explained in the section 3.1.1 .The brightness section of the application is constructed using the raw bitmap, scissor command and linear tracker. The scissor rectangle is drawn at the bottom of the screen and the gradient is applied to it. The linear tracker is applied to the rectangle. With the change in the track value, a decreasing white coloured rectangle is drawn on the gradient showing the change of the PWM value. The PWM value of the screen varies from 10 to 128.

Figure 3-6 Brightness Adjustment screen

3.1.7 Sketch

The background bitmap and the animation construction are explained in the section 3.1.1 .The sketch section of the application is constructed using the bitmap on the background, the sketch command and a button to clear the sketch. The sketch is of L8 format.

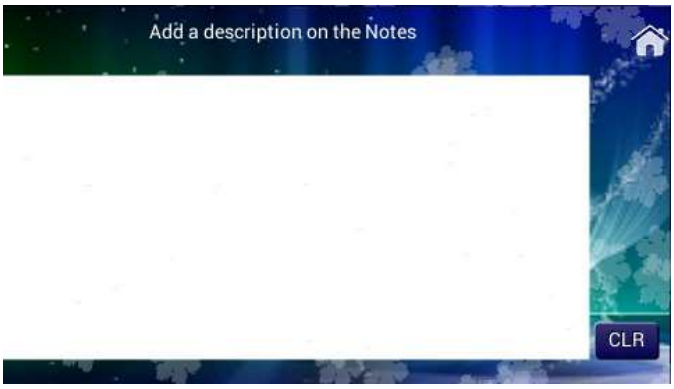

Figure 3-7 Sketch area

3.1.8 Food Manger

The background bitmap and the animation construction are explained in the section 3.1.1 .The food manager section is constructed with the bitmaps, rectangles and inbuilt fonts. The bitmaps placed are in ARGB4 format. The bitmaps are assigned a tag value. When the bitmap's tag value is detected, a rectangle of alpha value 255 is dawn over the bitmap.

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Figure 3-8 Food Manager

3.1.9 Screensaver

When the unlock bitmap's tag value is detected, the bitmap changes to lock bitmap. After a delay of 100ms, the logo raw bitmap is displayed using the command CMD_SCREENSAVER.

Figure 3-9 Screensaver

3.1.10 Synchronisation of Audio

The synthesised sound is played when pen up or pen down or when icon is selected.

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4 Contact Information

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Appendix A– References

Document References

- VM800C Datasheet
- VM800B Datasheet
- AN_391 EVE Platform Guide
- FT8XX Series Programmer Guide
- FT800 Embedded Video Engine Datasheet

Acronyms and Abbreviations

Terms	Description
Arduino Pro	The open source platform variety based on ATMEL's ATMEGA chipset
EVE	Embedded Video Engine
SPI	Serial Peripheral Interface
UI	User Interface
USB	Universal Serial Bus

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Appendix C– Revision History

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Product Page: http://brtchip.com/product/

Document Feedback: Send Feedback

Revision	Changes	Date
1.0	Initial Release	2014-03-05
1.1	Document migrated from FTDI to BRT (Updated company logo; copyright info; contact information; hyperlinks)	2018-01-04

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