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H8S/H8SX Families

Using the Graphics API to Implement Indexed Bitmap Animation

Introduction

Renesas provides a standard set of functions for creating and manipulating graphics and text on a TFT-LCD panel. These functions are referred to as the Graphics Application Programming Interface or GAPI.

This Application Note is one in a series of application examples which show how to implement interactive graphics on an LCD panel.

This Application Note can be used with any available Direct Drive LCD Demo PCB from Renesas.

Design manuals, software and schematics are also available from www.america.renesas.com/h8lcd.

This application note must be used in conjunction with the REU05b0112_H8SAP application note and code. Please download and install REU05b0112_H8SAP application note first and use the below instructions to add this source code to the project.

Target Device

H8S2378, H8S2456, H8SX1668R

and Direct Drive LCD Demo Board

Contents

1. Indexing a BMP

This sample code uses GAPI calls which will access the bitmap in memory and place its first icon at specific coordinates on the screen.

This code also maps the coordinates to a touchable area based on the size of the icon, and specifies which function will be called in the event that the icon is touched.

This code animates the icon by drawing each image from the bitmap on a periodic basis.

Figure 1 shows the bitmap for the drop of water that we will use in the sample code:

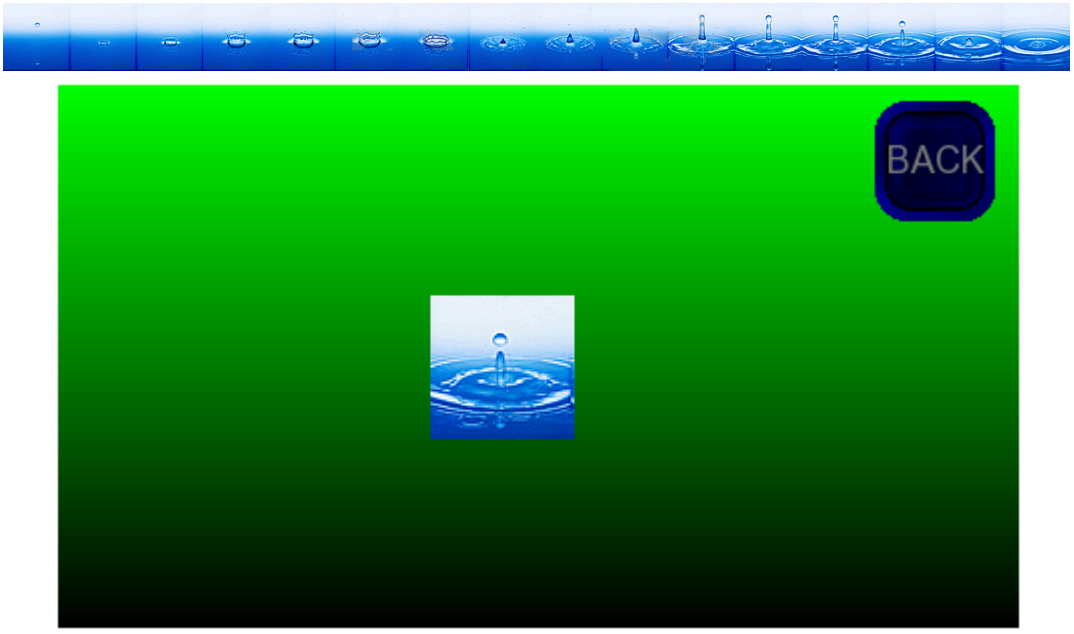


Figure 1 Drop.BMP and ScreenIndex

2. Code

2.1 Setting Up the Icon

The Icons table describes which objects will be placed on the screen. The first pBMP_Drop image will be placed at screen coordinates x = 0.388, y = 0.350 (relative screen coordinates) when the “BasicConstructor” processes the “AnimateStart” callback function.

Any number of icons can be placed on the screen; the final entry in the table must be a NULL to terminate the list.

```
static const ICON_type Icons[]=
{
//*****************************************************************************
//BITMAP ADDR                              FUNCTION CALL             Y POSITION
//                        COLOR SCHEME                  X POSITION
//*****************************************************************************

  { &pBMP_ButtonS, T_SchemeBlue,   ButtonBack,     SX(0.850), SY(0.750) },
  { &pBMP_Drop,   T_SchemeNoColor, AnimateStart,   SX(0.388), SY(0.350) },
  { NULL,               NULL,           NULL,           0,       0      },};

SCREEN_type ScreenHomeData=
{
  Constructor, Destructor, Icons
};
```

2.2 Screen Constructor/Destructor

Every screen is started by the framework calling the screen Constructor. In this sample code, the constructor first locates the “drop” (BMP) file in the pResources structure and assigns this location to the “pBMP_Drop” handle. When the “BasicConstructor” is called, it will execute each Icon table callback function (these functions are responsible for placing their own graphic images).

The “Destructor” function is called on exit from the screen by the framework. The “BasicDestructor” will release the screen task that we will be using.

```
static void Constructor(SCREEN_type const *pS)
{
  /* locate the indexed BMP within the resource file */
  if(pBMP_Drop == NULL)
    pBMP_Drop = FileFind(pResources, "drop");

  /* Clear the background (fill with a gradient) */
  (void)LCDBMPFillGradient(backFrameBuf,0,0,H_DOT_DISPLAY, V_LINES_DISPLAY,  SCHEME[1].ct , 90);

  /* Run default behavior */
  BasicConstructor(pS);
}

static void Destructor(SCREEN_type const *pS)
{
  /* Run default behavior (stops screen tasks) */
  BasicDestructor(pS);
}
```

2.3 Callback function

The “AnimateStart” function will be called on every event that the system receives while this sample screen is active. It is the responsibility of this function to decide if it needs to process the event.

When “AnimateStart” is called by the “BasicConstructor”, it will be passed a message ID of “MSG_DRAW”. When this message is received we will paint the first icon image to the background frame buffer (the constructor will later initialize the display frame with the contents of the background frame.

When “AnimateStart” is called because of touch events, it will process “MSG_RELEASE” ID’s and check if the release was within the boundaries of the icon. If so, we will either start or stop the “AnimateDemo” screen task responsible for periodically sequencing the image.

```
static void AnimateStart(ICON_type const *pS, EVENT_MSG const *pMsg)
{
  static uI08 AnimateRunning;

  /* check if draw request */
  if (MSG_DRAW == pMsg->id)
  {
    AnimateRunning = 0;
    pIndexIcon = pS;
    /* paint the image from index 0 */
    (void) LCDBMPIndex(*pS->ppBmp,backFrameBuf,pS->PosX,pS->PosY, 0);
  }

  /* check if release within BMP boundary */
  if (MSG_RELEASE == pMsg->id)
  {
    sI16 Height = BMP_Height(*pS->ppBmp);
    if (((pS->PosX <= pMsg->param.coord[0]) && (pMsg->param.coord[0] < (pS->PosX + Height))) &&
        ((pS->PosY <= pMsg->param.coord[1]) && (pMsg->param.coord[1] < (pS->PosY + Height))))
    {
      if(0 == AnimateRunning)
      {
        // start timer Scrolling Demo
        (void)ScreenTaskStart(AnimateDemo);
        AnimateRunning=1;
      }
      else
      {
        // start timer Scrolling Demo
        (void)ScreenTaskStop(AnimateDemo);
        AnimateRunning=0;
      }
    }
  }
}
```

2.4 Indexing through the Bitmap

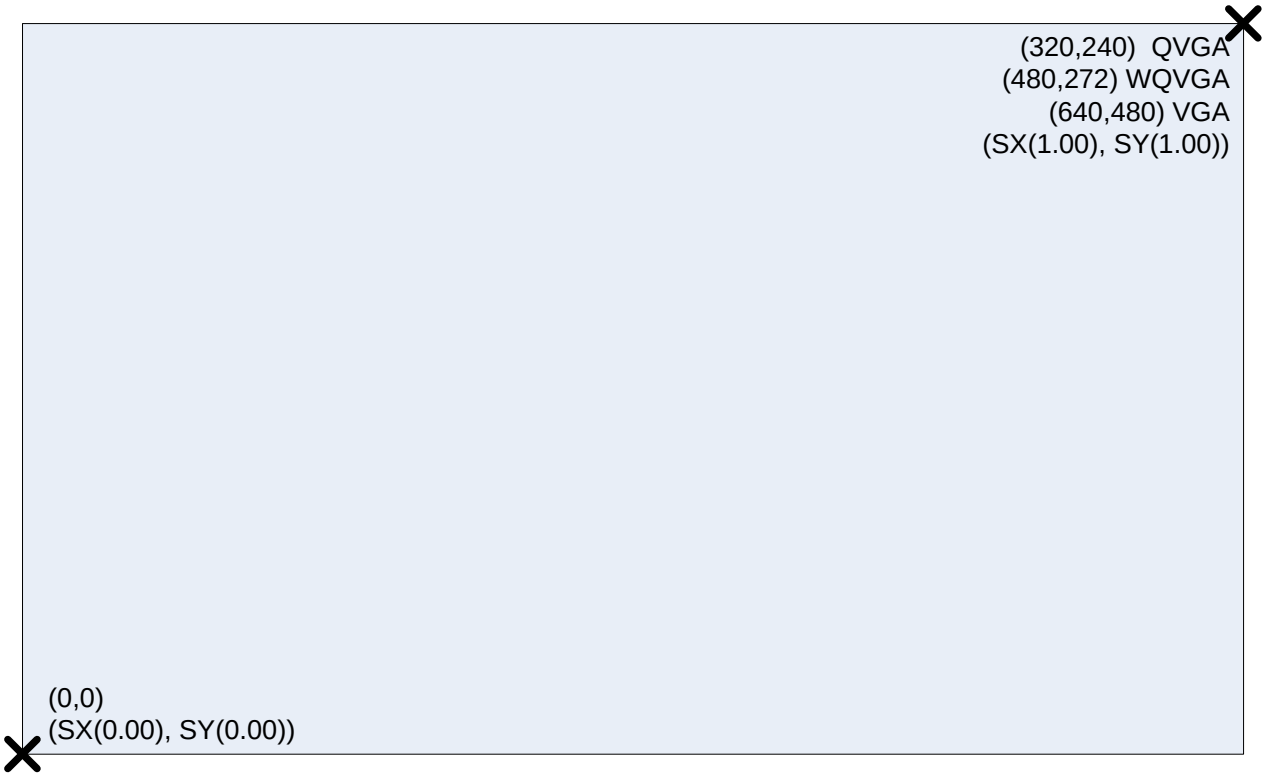
The “AnimateDemo” function is called on a period basis (determined by the xDelay return value…100mS here). Because code in this thread will be accessing the external bus, we must “window” the usage with “ExMemoryAcquire” and “ExMemoryRelease” to prevent conflict with the direct driver. The LCDBMPIndex GAPI call will step through the various images contained within the BMP (one step per execution of AnimateDemo).

```
static TickType AnimateDemo(void)
{
  static sI16 index = 0;
  TickType xDelay = (TickType)(100/TICK_RATE_MS);

  /* Let system know we're accessing External Memory */
  ExMemoryAcquire(RLCD_GetTaskHandle());
  {
    if (++index > (BMP_Width(*pIndexIcon->ppBmp)/BMP_Height(*pIndexIcon->ppBmp)))
      index = 0;                          // wrap around to start

    // put the next icon in the frame buffer
    (void) LCDBMPIndex(*pIndexIcon->ppBmp,displayFrameBuf,
                          pIndexIcon->PosX,pIndexIcon->PosY, index);
  }
  ExMemoryRelease(RLCD_GetTaskHandle());

  return (xDelay);
}
```

3. Touchscreen and Panel Coordinates

By convention, the sample code uses relative screen coordinates. This is accomplished by use of the “SX” and “SY” macro expansions. These expansions convert normalized coordinates (0.00 to 1.00) to absolute screen coordinates. If desired, the SX/SY macros can not be used and absolute screen coordinates used.

For example SX(0.5), SY(0.5) on a QVGA (320x240) panel would expand to (160,120)



4. Installation and Source Code Structure

The code is contained within one source file called “ScreenIndex.c,” and the bitmap images used are contained in a bitmap file “drop.bmp”. To install the sample code, double click on the installation executable “REUE05B0110.exe” to bring up the installer. (figure 2) Make sure you click on the browse button in the “Destination Folder” Panel and select your LCD Direct Drive demo project (REU05b0112_H8SAP installation) directory. Then click the next button to copy the new files into your project directory.

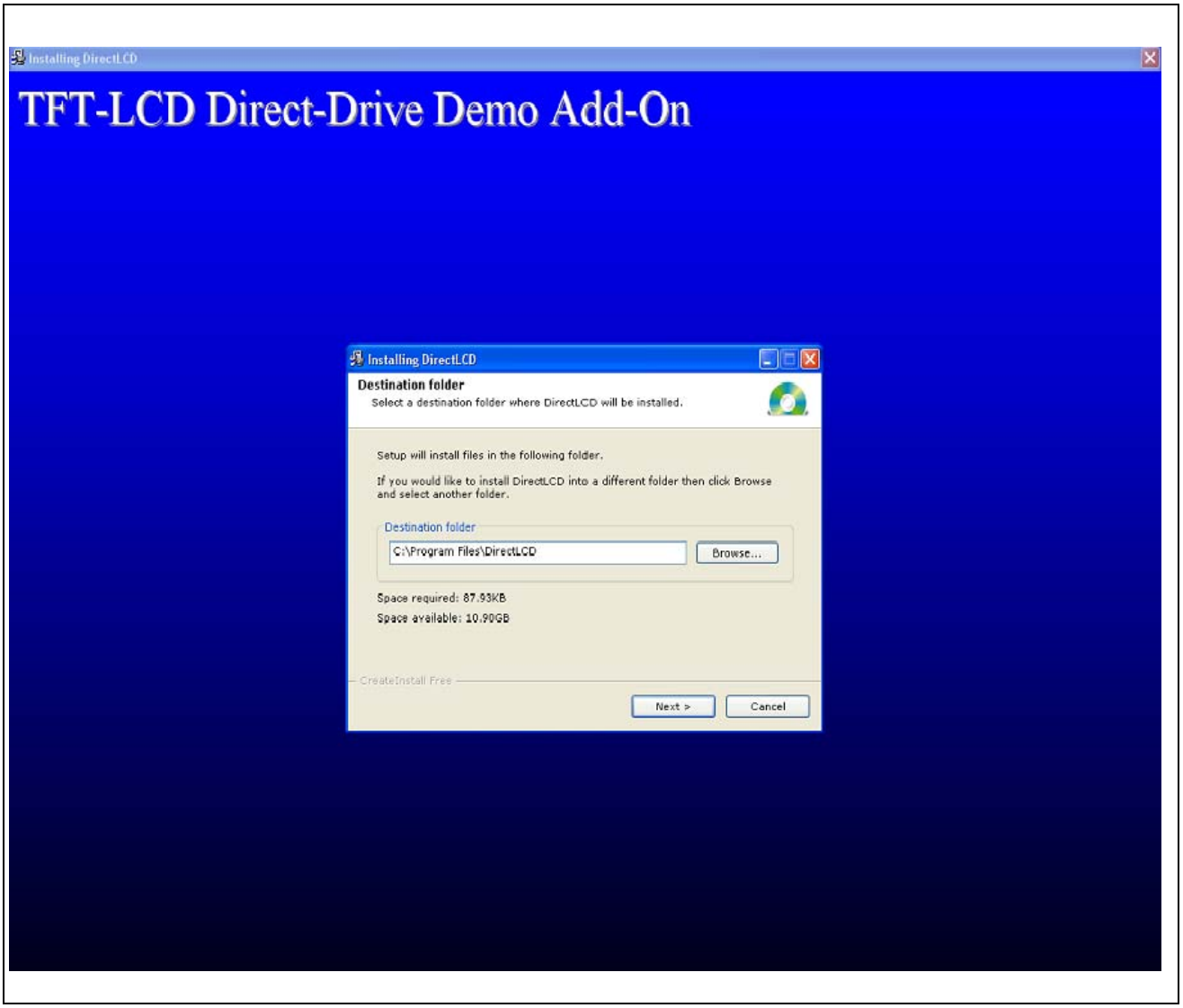


Figure 2: Installation

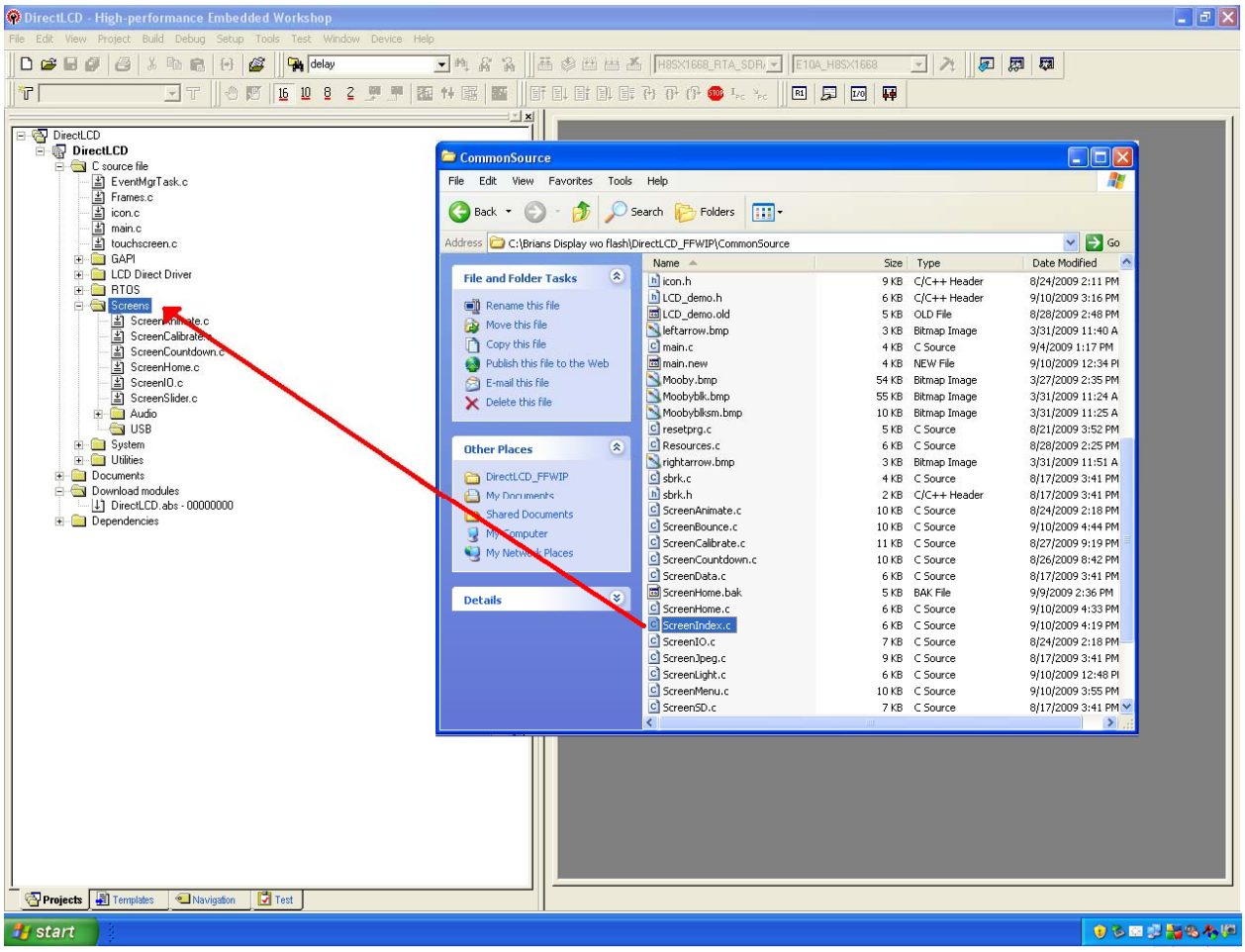


Figure 3: Adding "ScreenIndex.c" to the Direct LCD demo project in HEW

Then, open your LCD Direct Drive demo project in HEW. The ScreenIndex.c file will be located in your CommonSource directory. Add the ScreenIndex.c source file to your project in HEW by dragging the file into the Screens folder of your project. (Figure 3)

The installer places Bitmap Images that are sized for a WQVGA display panel into your resource directory by default. If you are using QVGA or VGA you will need to replace the bitmaps in your resource directory with ones of the appropriate resolution for your display panel. You will find several subdirectories in your resource folder that contain bitmaps of different resolutions. Simply copy all the files from the subdirectories corresponding to your panel resolution and paste them over the files in your resource directory.

Refer to the REU05b0112_H8SAP application note on instructions on how to build and update code resources in the target.

File Name	***File Description***
CommonSource\ScreenIndex.c	Demo screen code
Resources\drop.bmp	Bitmap image

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http://www.renesas.com/

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Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	March.20.09	—	First edition issued
1.10	January.01.10	—	Converted format to add-in code to REU05b0112

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