Arm® 926-EJS

32-bit Microcontroller

N9H26 Cooking HMI User Manual

Table of Contents

1 OVERVIEW

Cooking HMI for N9H26 is a GUI reference implementation.

This document utilizes Nuvoton N9H26 series geneal-purpose microprcessor N9H26K6 (64MB DDR) to implement cooking HMI with emWin GUI library. Cooking HMI supports hardware H.264 and AAC decoder.

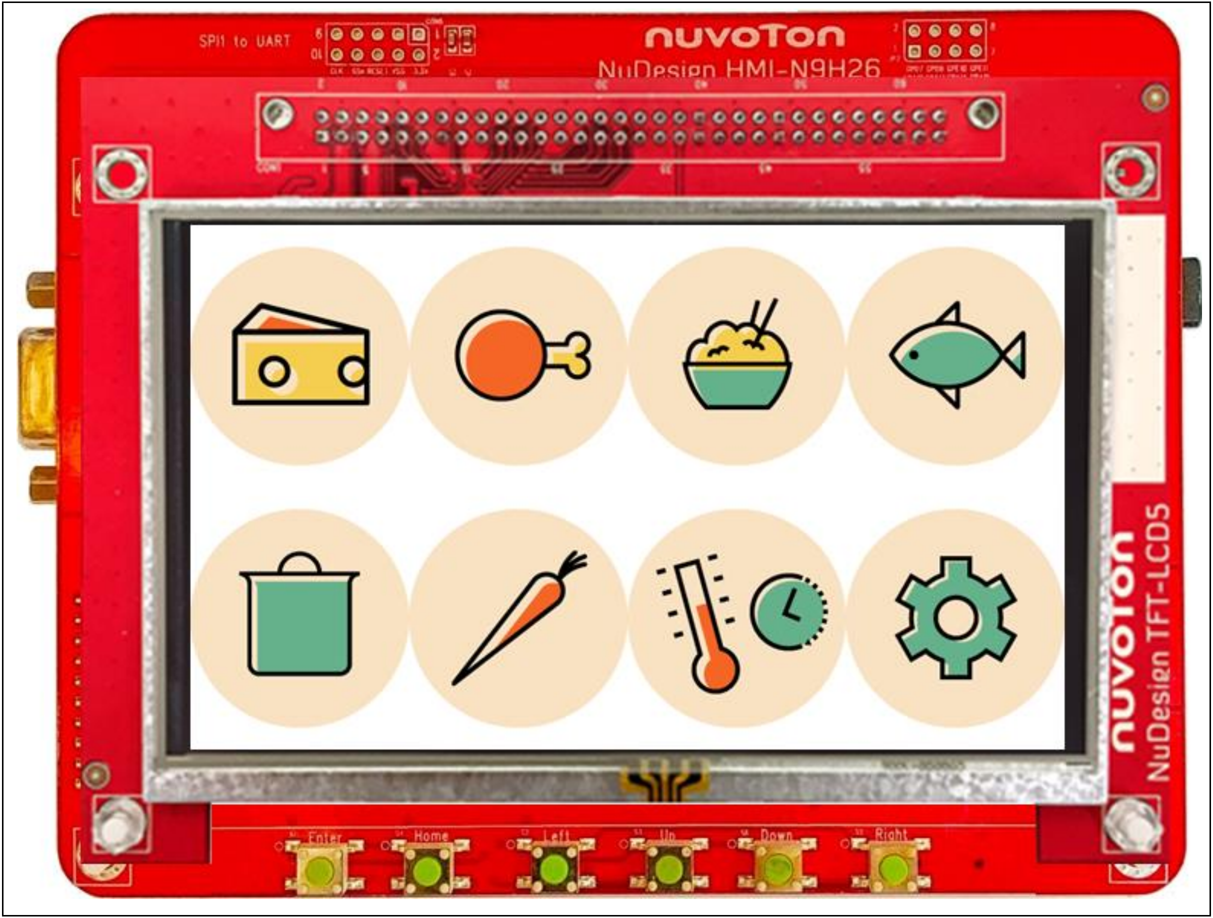

Figure 1-1 Cooking HMI Main Menu

2 FEATURES

2.1 Cooking HMI Features

- Support Nuvoton MPU N9H26K6
- Supports hardware H.264 decoder for baseline decoding
- Supports hardware AAC decoder with built-in audio codec
- Supports high quality and contrast LCD panel with resolution up to 800 x 480
- Supports resistive touch up to 800 x 480 area with built-in touch ADC
- Supports FreeRTOS
- Supports SEGGER licensed emWin GUI library
- Supports many popular image formats, e. g., PNG, GIF, JPG and BMP
- Supports user defined image as icon source

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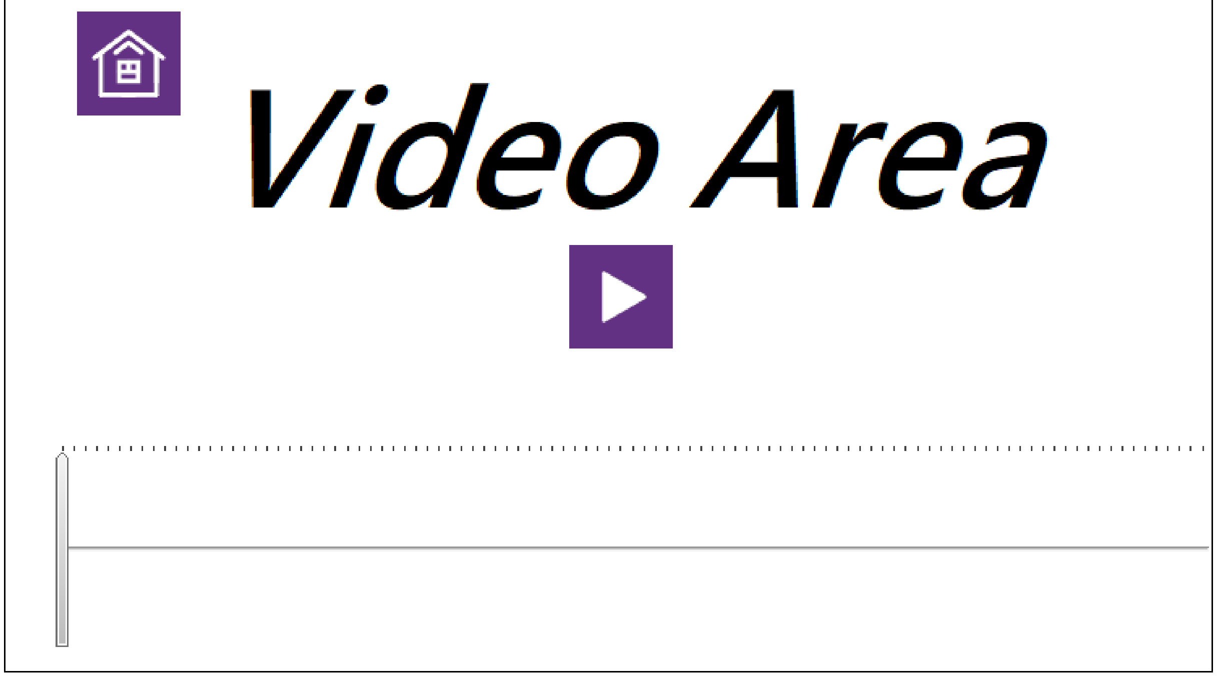
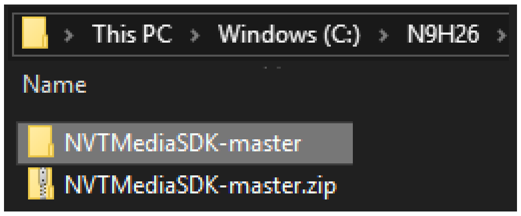


Figure 2-1 Cooking HMI MP4 Video Playback Menu

3 INSTALLATION AND ENVIRONMENT

3.1 Installing NVTMediaSDK

First, download the latest NVTMediaSDK from https://github.com/OpenNuvoton/NVTMediaSDK and unzip "*NVTMediaSDK-master.zip*" to a working folder, e. g., unzip it to the path "*C:\N9H26*", where "N9H26" is the working folder.



This PC › Windows (C:) › N9H26 ›

Name

NVTMediaSDK-master

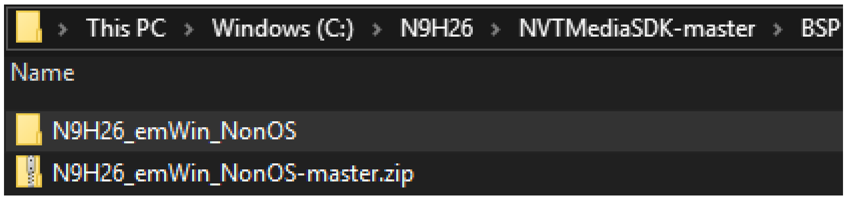
NVTMediaSDK-master.zip

Figure 3-1 NVTMediaSDK Folder

Then goto "*C:\N9H26\NVTMediaSDK-master\BSP*" and start to install N9H26 Non-OS BSP. It will describe in the next chapter. The detailed information of NVTMediaSDK can be found at "*C:\N9H26\NVTMediaSDK-master\Doc\NVTMediaSDK User Guide.pdf*".

3.2 Installing N9H26 Non-OS BSP

First, download the latest N9H26 Non-OS BSP from https://github.com/OpenNuvoton/N9H26_emWin_NonOS, and unzip "*N9H26_emWin_NonOS-master.zip*" to "*C:\N9H26\NVTMediaSDK-master\BSP*". Then rename from "*N9H26_emWin_NonOS-master*" to "*N9H26_emWin_NonOS*".



This PC › Windows (C:) › N9H26 › NVTMediaSDK-master › BSP

Name

N9H26_emWin_NonOS

N9H26_emWin_NonOS-master.zip

Figure 3-2 N9H26 Non-OS BSP Folder

The detailed information of N9H26 Non-OS BSP and emWin library can be found at "*\N9H26_emWin_NonOS-master\N9H26 Readme.pdf*" and "*N9H26 emWin Quick Start Guide.pdf*" respectively.

3.3 Installing Cooking HMI

First, download and unzip the latest "*N9H_emWin_Template-master.zip*" from https://github.com/OpenNuvoton/N9H_emWin_Template and copy "*Cooking_N9H26_FreeRTOS*" to the NVTMediaSDK sample path "*C:\N9H26\NVTMediaSDK-master\SampleCode*".

Then, open KEIL project file at "*C:\N9H26\NVTMediaSDK-master\SampleCode\Cooking_N9H26_FreeRTOS\KEIL\NMPlayer_GUI.uvproj*" and start compiling. The executable binary is in "*C:\N9H26\NVTMediaSDK-master\SampleCode\Cooking_N9H26_FreeRTOS\Bin*", called "*conprog.bin*". Next, connect the USB cable between PC/NB and N9H26 (press up & down key), then power on N9H26. Then copy "*conprog.bin*" to "*SD1-1*" USB disk. Next, copy "*C:\N9H26\NVTMediaSDK-master\SampleCode\Cooking_N9H26_FreeRTOS\Bin\SD1-2\*.**" to "*SD1-2*" USB disk. Finally, remove the USB disk safely and reboot N9H26.

3.4 System Requirements

- KEIL IDE V5.xx and above with professional license
- Nuvoton N9H26K6 800 x 480 demo board (NuDesign HMI-N9H26 + NuDesign TFT-LCD5)

4 FOLDER STRUCTURE

4.1 Code Folder Structure

The content of “*Cooking_N9H26_FreeRTOS*” is described as follows.

Folder	Description
Cooking_N9H26_FreeRTOS	Base folder ● Changelog.pdf is version history ● Cooking_Reference_Implementation.pdf is user manual
src / Application	HMI folder ● TaskGUIDemo.c is for play status control ● TaskTouching.c is for touch operation ● NVT_Config.c is for Nuvoton platform ● PlaybackDLG is for playback menu ● NVT_Playback1.c is for playback menu extension ● Window_CookingDLG.c is for cooking menu ● NVT_Cooking1.c is for cooking menu extension ● Window_TempDLG.c is for temperature menu ● NVT_Temp1.c is for temperature menu extension ● Window_SettingDLG.c is for setting menu ● NVT_Setting1.c is for setting menu extension
src / GUI_Config	emWin folder ● GUI_X.c is for emWin timer under FreeRTOS timer control ● GUIConf.c is for emWin memory pool ● LCDConf.c is for emWin display driver control
Bin	Pre-built binaries folder ● conprog.bin is for cooking execution file
Bin / SD1-1	Resource folder ● conprog.bin is for cooking execution file and identical with Bin’s conprog.bin
Bin / SD1-2	Resource image and dta ● DCIM is for 6 MP4 video files ● 01_dessert.dta ~ 08setting.dta are cooking menu icons ● Home_01.dta is back function to cooking menu for playback, temperature and setting menu ● Pause_01.dta is pause function in playback menu ● Play_01.dta is play function in playback menu

Bin / 9To565	Any image convert to dta file format
Bin / 28ToA565	Any image convert to dta file format with alpha-channel
Bin / AnyToMP4	Any video convert to base-line H.264 + AAC in MP4
Bin / LogGen	Any image convert to logo file format
Res	Image files
KEIL	Arm Keil MDK project folder
src / tslib	Touch folder ● Resistive touch panel ● Touch area is 480x272

Table 4-1 Cooking HMI Folder Structure

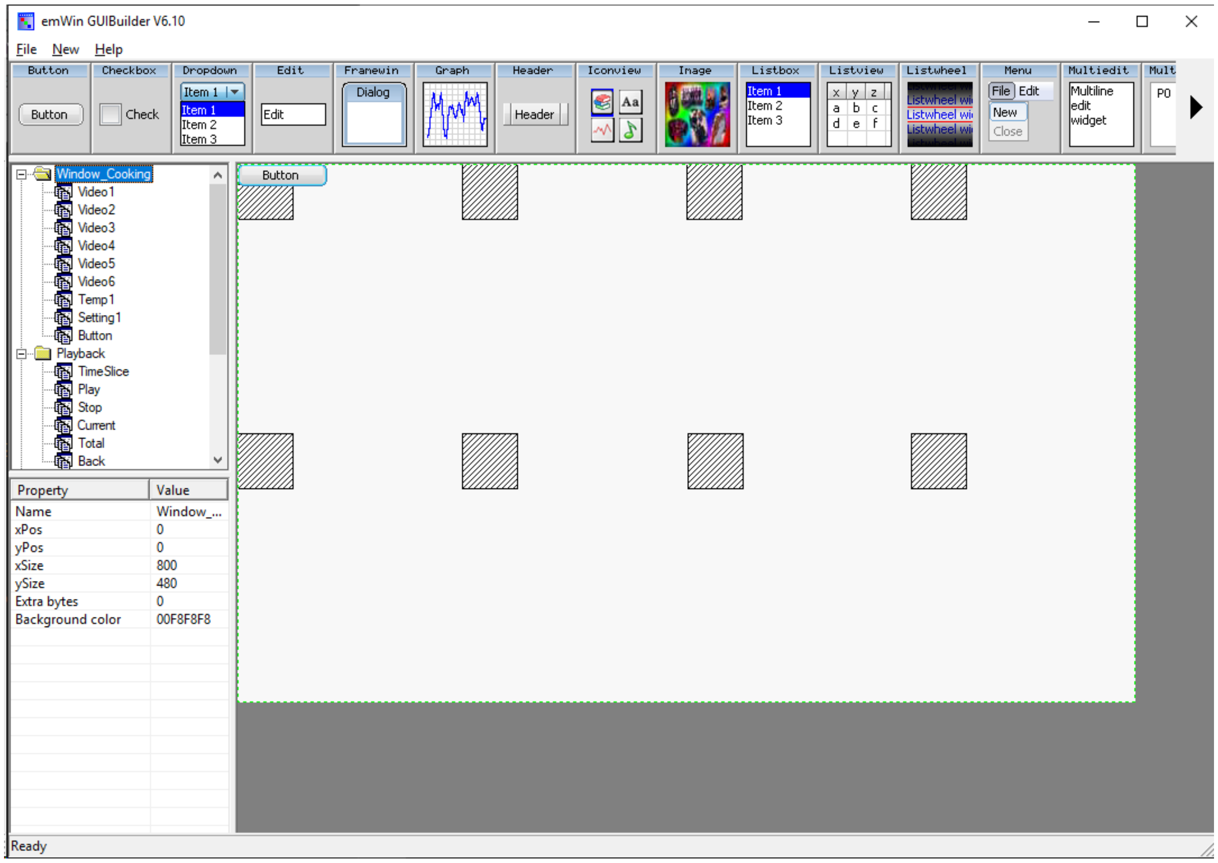
5 DESIGN GUIDE

Cooking reference implementation guide assumes that you already have a mature knowledge of the following:

- IDE operation for editing and compiling
- The C programming language, how to use linker and C compiler
- The N9H26 Non-OS BSP & FreeRTOS programming knowledge
- The basic emWin programming knowledge

Note: cooking template is based on NVTMediaSDK - a Nuvoton Media SDK, more details can be found at "*NVTMediaSDK\Doc\NVTMediaSDK User Guide.pdf*".

5.1 Cooking Menu Control



Property	Value
Name	Window_...
xPos	0
yPos	0
xSize	800
ySize	480
Extra bytes	0
Background color	00F8F8F8

Figure 5-1 Cooking Menu

Cooking menu is generated from GUIBuilder, called "*Window_CookingDLG.c*". You can open this file by GUIBuilder and re-arrange widget postion, size and property. It contains 1 dummy BUTTON and 8 IMAGEs.

By "*NVT_Cooking1.c*", you can assign user define dta file to replace the original.

```
// USER START (Optionally insert additional code for further widget
initialization)

hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_0);

NVT_Cooking1Video1(hItem);
```

```
hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_1);

NVT_Cooking1Video2(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_2);

NVT_Cooking1Video3(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_3);

NVT_Cooking1Video4(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_4);

NVT_Cooking1Video5(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_5);

NVT_Cooking1Video6(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_6);

NVT_Cooking1Temp1(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_7);

NVT_Cooking1Setting1(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_BUTTON_0);

NVT_Cooking1SetButton(hItem, 1);


// USER END
```

Click IMAGE will invoke related function, e. g., ID_IMAGE_0 is to play video and ID_IMAGE_7 is to go setting menu:

```
// USER START (Optionally insert additional code for further Ids)

case ID_IMAGE_0:
```

```
case ID_IMAGE_1:

case ID_IMAGE_2:

case ID_IMAGE_3:

case ID_IMAGE_4:

case ID_IMAGE_5:

case ID_IMAGE_6:

case ID_IMAGE_7:

    invoke_cooking_command(NCode, Id);

    break;


// USER END;
```

The implementation of invoke_cooking_command:

```
// USER START (Optionally insert additional static code)

static void invoke_cooking_command(int NCode, int Id)

{

    printf("[%s] id=%d, NCode=%d, \n", __func__, Id, NCode);

    if (NCode == WM_NOTIFICATION_CLICKED)

    {

        switch (Id)

        {

        case ID_IMAGE_0://Video1

            g_u8Flag1 = 1;

            break;

        case ID_IMAGE_1://Video2

            g_u8Flag1 = 2;

            break;

        case ID_IMAGE_2://Video3

            g_u8Flag1 = 3;

            break;
        case ID_IMAGE_3://Video4
            g_u8Flag1 = 4;
            break;
        case ID_IMAGE_4://Video5
            g_u8Flag1 = 5;
            break;
        case ID_IMAGE_5://Video6
            g_u8Flag1 = 6;
            break;
        case ID_IMAGE_6://Temp1
            g_u8Flag1 = 7;
            break;
        case ID_IMAGE_7://Setting1
            g_u8Flag1 = 8;
            break;
        }
    }
}

// USER END
```

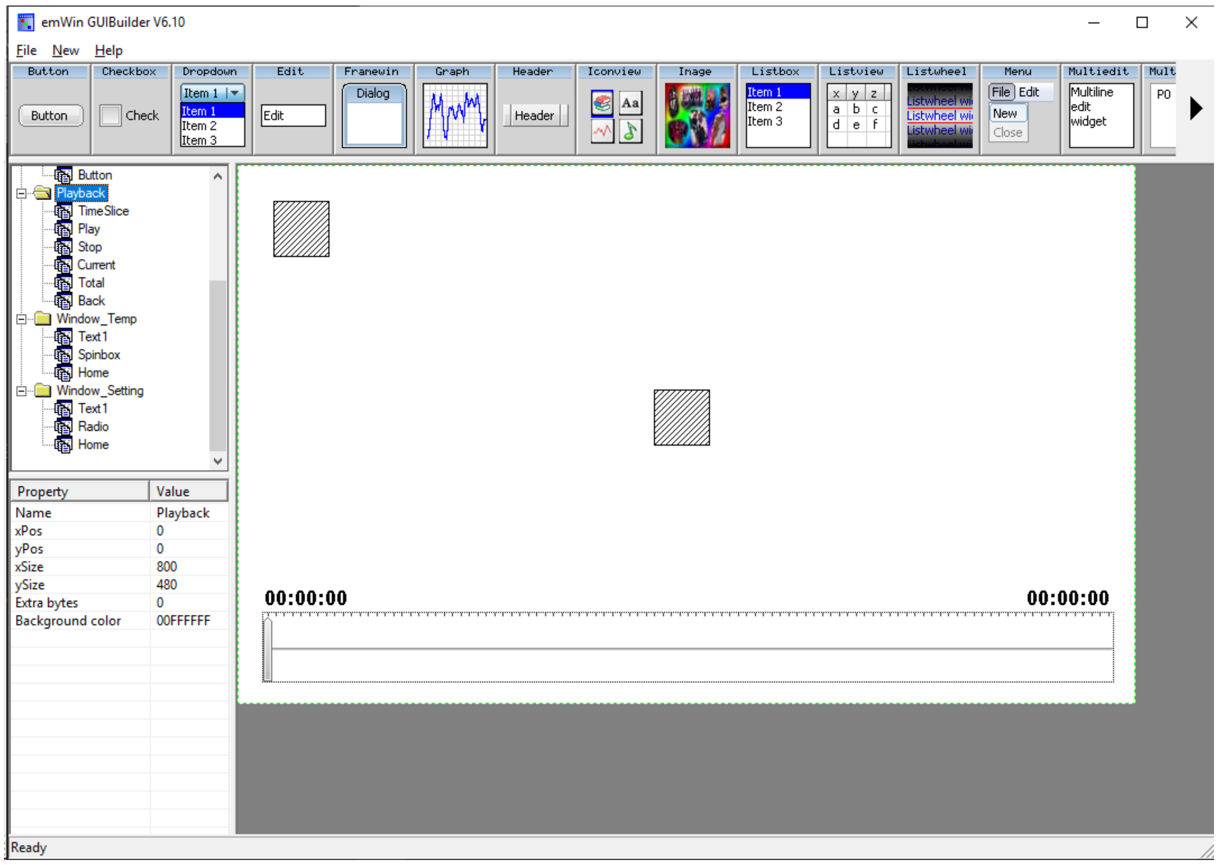
User defined dta in “*NVT_Cooking1.c*”:

Note: the size of dta with alpha-channel is bigger than dta.

```
#define NVT_COOKING_VIDEO1 "D:\\01_dessert.dta"
#define NVT_COOKING_VIDEO2 "D:\\02_meat.dta"
#define NVT_COOKING_VIDEO3 "D:\\03_rice.dta"
#define NVT_COOKING_VIDEO4 "D:\\04_seafood.dta"
#define NVT_COOKING_VIDEO5 "D:\\05_soup.dta"
#define NVT_COOKING_VIDEO6 "D:\\06_vegetable.dta"
#define NVT_COOKING_TEMP1 "D:\\07_temp_time.dta"
```

```
#define NVT_COOKING_SETTING1 "D:\\08_setting.dta"
```

5.2 Playback Menu Control


emWin GUIBuilder V6.10
File New Help
Button Checkbox Dropdown Edit Framewin Graph Header Iconview Image Listbox Listview Listwheel Menu Multiedit
00:00:00
00:00:00
Ready

- Button
- Playback
  - TimeSlice
  - Play
  - Stop
  - Current
  - Total
  - Back
- Window_Temp
  - Text1
  - Spinbox
  - Home
- Window_Setting
  - Text1
  - Radio
  - Home

Property	Value
Name	Playback
xPos	0
yPos	0
xSize	800
ySize	480
Extra bytes	0
Background color	00FFFFFF

Figure 5-2 Playback Menu

Playback menu is generated from GUIBuilder, called “*PlaybackDLG.c*”. You can open this file by GUIBuilder and re-arrange widget postion, size and property. It contains 1 SCROLLBAR, 2 TEXT and 3 IMAGE.

Note: PlaybackDLG.c contains NVTMediaSDK API control flow, details can be found at “*NVTMediaSDK\Doc\NVTMediaSDK User Guide.pdf*”.

By “*NVT_Playback1.c*”, you can assign user define dta file to replace the original.

```
// USER START (Optionally insert additional code for further widget
initialization)

hItem = pMsg->hWin;

WINDOW_SetBkColor(hItem, DEF_OSD_COLORKEY);



// Set SLIDER width

hItem = WM_GetDialogItem(pMsg->hWin, ID_SLIDER_0);
```

```
SLIDER_SetWidth(hItem, 32);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_0);

NVT_Playback1Play(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_1);

NVT_Playback1Stop(hItem);


hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_2);

NVT_Playback1Back(hItem);


// Create file list.

filelist_create(DEF_PATH_MEDIA_FOLDER);


// Dump media file name in file list.

filelist_dump();


play_first_media();


// USER END
```

Click IMAGE will invoke related function, e. g., ID_IMAGE_1 is to pause video and ID_IMAGE_2 is to go cooking menu:

```
// USER START (Optionally insert additional code for further Ids)

case ID_IMAGE_0://Play

case ID_IMAGE_1://Stop

case ID_IMAGE_2://Back

    invoke_player_command(NCode, Id);

    break;
```

```
// USER END
```

The implementation of invoke_player_command:

```
// USER START (Optionally insert additional static code)
static void invoke_player_command(int NCode, int Id)
{
    printf("[%s] id=%d, NCode=%d, \n", __func__, Id, NCode);
    if (NCode == WM_NOTIFICATION_CLICKED)
    {
        switch (Id)
        {
        case ID_IMAGE_0://Play
            player_play();
            break;
        case ID_IMAGE_1://Stop
            player_pause();
            break;
        case ID_IMAGE_2://Back
            player_stop();
            break;
        }
    }
}


// USER END
```

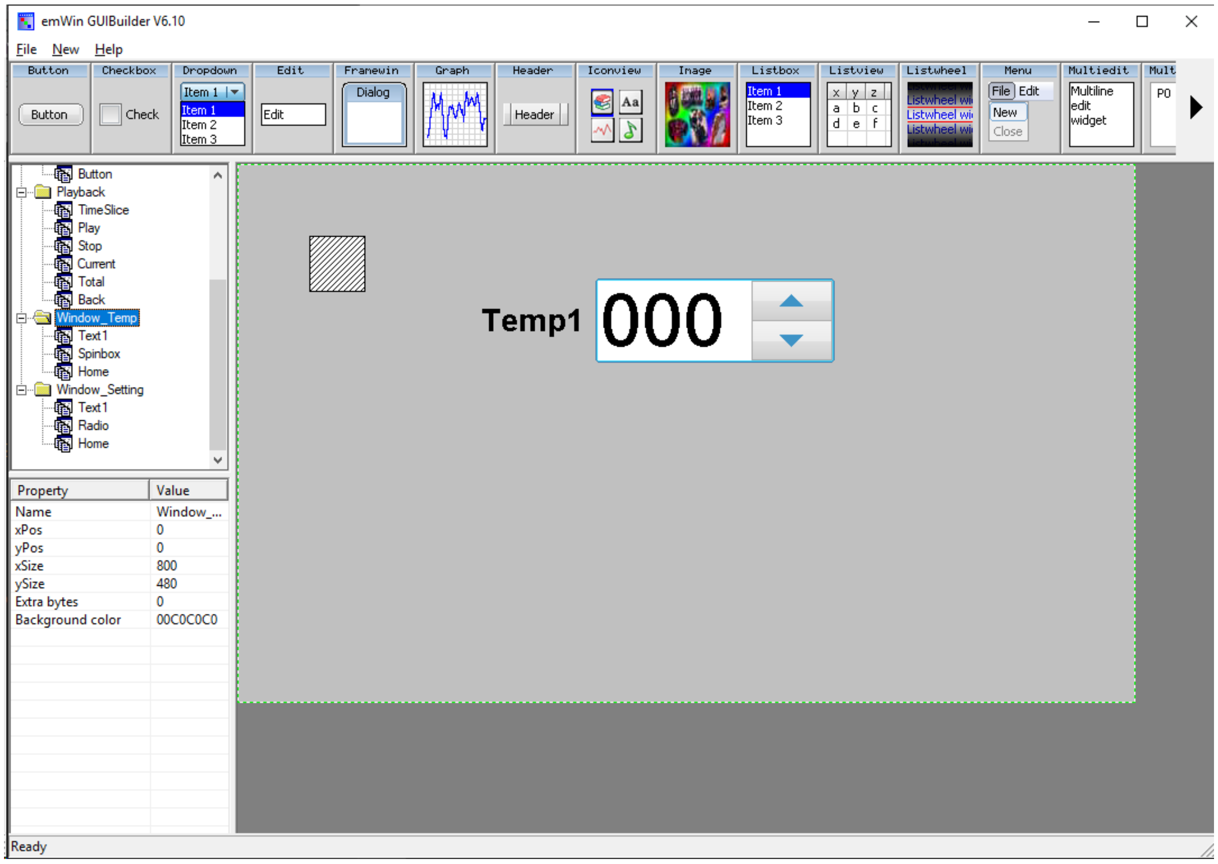
User defined dta file name in “*NVT_Playback1.c*”:

Note: the size of dta with alpha-channel is bigger than dta.

```
#define NVT_PLAYBACK_PLAY "D:\\Play_01.dta"
#define NVT_PLAYBACK_STOP "D:\\Pause_01.dta"
```

```
#define NVT_PLAYBACK_BACK "D:\\Home_01.dta"
```

5.3 Temperature and Setting Menu Control



Property	Value
Name	Window_...
xPos	0
yPos	0
xSize	800
ySize	480
Extra bytes	0
Background color	00C0C0C0

Figure 5-3 Temperature Menu

Temperature and setting menu are generated from GUIBuilder, called “*Window_TempDLG.c*” and “Window_*SettingDLG.c*”, respectively. You can open these files by GUIBuilder and re-arrange widget postion, size and property. “*Window_TempDLG.c*” contains 1 back BUTTON, 1 TEXT and 1 SPINBOX.

By “*NVT_Temp1.c*”, you can assign user define dta file to replace the original.

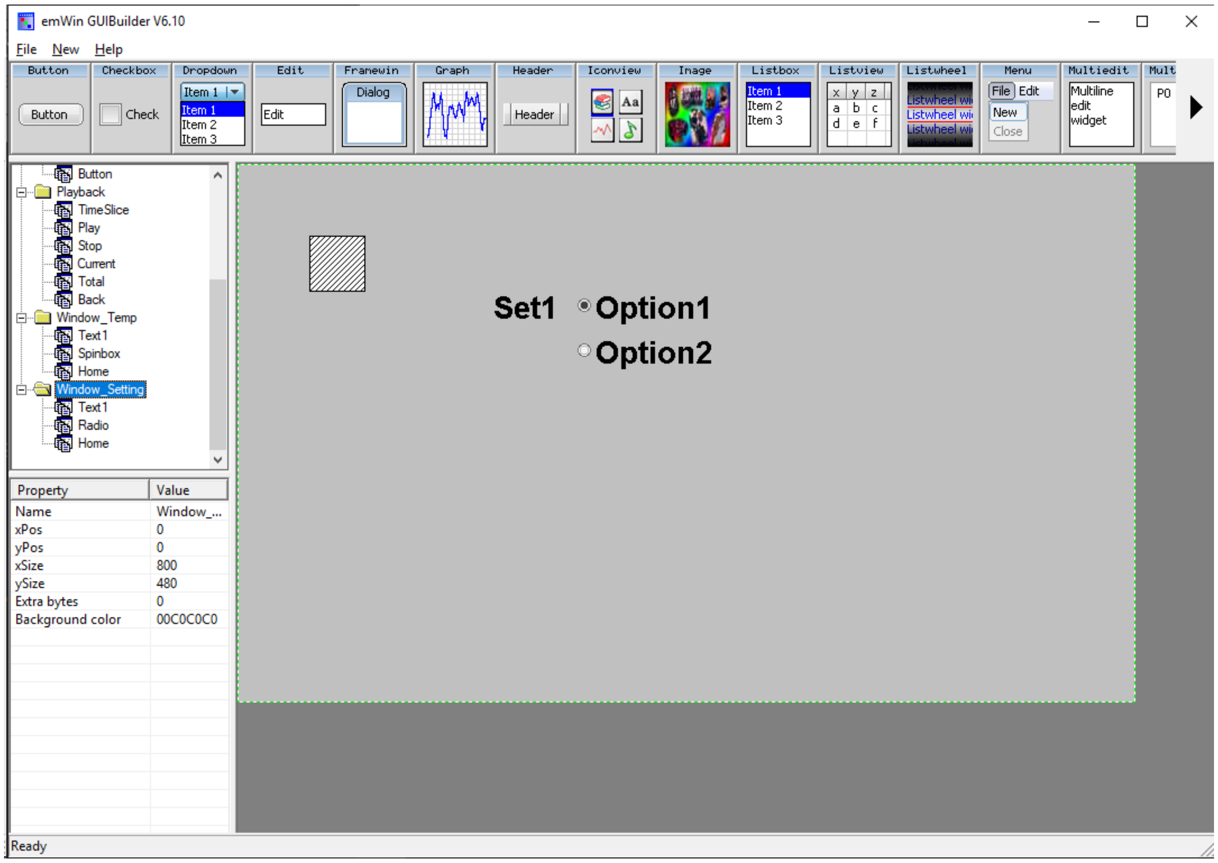
```
// USER START (Optionally insert additional code for further widget
initialization)

g_u8Flag1 = 0;



hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_0);

NVT_Temp1Back(hItem);



// USER END
```

Click IMAGE will back to cooking menu::

```
// USER START (Optionally insert additional code for further Ids)

case ID_IMAGE_0:

    g_u8Flag1 = 7;

    break;


// USER END
```

User defined dta file name in “*NVT_Temp1.c*”:

```
#define NVT_TEMP_BACK "D:\\Home_01.dta"
```



Property	Value
Name	Window_...
xPos	0
yPos	0
xSize	800
ySize	480
Extra bytes	0
Background color	00C0C0C0

Figure 5-4 Setting Menu

"*Window_SettingDLG.c*" contains 1 back BUTTON, 1 TEXT and 1 RADIO.

By "*NVT_Setting1.c*", you can assign user define dta file to replace the original.

```
// USER START (Optionally insert additional code for further widget
initialization)

g_u8Flag1 = 0;



hItem = WM_GetDialogItem(pMsg->hWin, ID_IMAGE_0);

NVT_Setting1Back(hItem);



// USER END
```

Click IMAGE will back to cooking menu::

```
// USER START (Optionally insert additional code for further Ids)

case ID_IMAGE_0:

    g_u8Flag1 = 8;
    break;


// USER END
```

User defined dta file name in “*NVT_Setting1.c*”:

```
#define NVT_SETTING_BACK "D:\\Home_01.dta"
```

6 FAQ

6.1 How to replace dta?

Use the same image filename, width and height and utilize 9To565 to convert to dta then copy to SD1-2.

6.2 How to replace MP4?

Use AnyToMp4 to convert to MP4 then copy to SD1-2 / DCIM.

6.3 How to utilize dta with alpha-channel?

Use 28ToA565 to convert to dta with alpha-channel then copy to SD1-2.

Note: need same image filename, width and height.

7 REVISION HISTORY

Date	Revision	Description
2020.12.10	1.00	1. Initially release.

Important Notice

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