

Music Player with USB File Transfer support for VS1010D

Here is a music player program 'TreePlayer' and some libraries for VS1010D, which make it possible to make an MP3 player that supports transferring music files from a PC to the player. The main purpose of this release is to allow file playback from an SD card, and also the transfer of music files from the PC to the SD card.

This document is a tutorial and manual for using the TreePlayer program. It also provides some information on what could one do with the examples provided. This tutorial contains many references to the MP3 player source code, which was introduced in the VS1010 Handbook. You can find more information about the VS1010 Handbook here:

<http://www.vsdsp-forum.com/phpbb/viewtopic.php?f=15&t=2392>

Testing the provided binaries:

- Copy TreePlayer.dlx, ums.dlx, usbprobe.dlx and usbhdd.dlx files to the SYS folder in your device.
- Copy some MP3 music files to your SD card. The files can be copied to the root of the SD card, or to a subdirectory somewhere in the SD card.
- Run the TreePlayer program, either by typing "TreePlayer" in the VSOS Shell command prompt, or by adding the line TreePlayer to your CONFIG.TXT
 - You should now hear some music and see time print on your terminal window.
- If you connect your PC while playing, player should print 'Connecting to PC...' and when you disconnect, you should hear some music again.

Further developing the firmware:

Requirements

There are some requirements for creating and implementing functional player using this document.

- You must be using VS1010D device. Older models are not supported!
- VLSI Solution's Integrated Development Environment VSIDE must be preinstalled. VSIDE is available for free for Windows at <http://www.vlsi.fi/en/support/software/vside.html> VSIDE also partially works under Linux' Wine.
- You must have UMS.dlx (program for running USB mass storage) in your SYS folder! This file is provided in the package.

- You must have USBHDD.dlx and USBPROBE.dlx (highly experimental driver that supports reading (playing music) from USB flash memories) in your SYS folder.
 - Since this feature is experimental we neither guarantee it will work on your device nor provide instructions on that matter in this document.
- You must have TreePlayer.dlx in your SYS folder.
- You must have at least one MP3 file on your SD card so there is something to play.

Using provided player with USB mass storage

To make player functional and try it yourself you just have to place files mentioned in the requirements into right folders. After you have done that you can just write TreePlayer on command line tool you are controlling your VS1010 with or add lines:

```
[?]
```

```
TreePlayer
```

into your CONFIG.TXT file so that player starts playing instantly after VS1010 has been rebooted to runlevel 15.

Now if everything has been done correctly you should have your VS1010D playing music and printing playing time every second. You can control player with developer board buttons PWR, B0-B4 and stop the player with ESC from computer's keyboard. You can also move to next song with Enter from computer's keyboard. Here are some of the main functions:

- Stop player with PWR button or ESC
- Lower the volume with B3
- Increase the volume with B2
- Move previous song with B1
- Move to next song with B0 or Enter

Since this player works also with USB mass storage you might ask yourself how this works. Well, you can just plug in your PC to VS1010D board with USB. When you do that, player automatically connects to mass storage so that you can add more music to SD card. After you are done, you can unplug or disconnect your PC and your player starts playing again.

Implementation

Now when you know what functions are provided in example you might wonder, how is this done. To understand the basic functions of that mp3 player we advice you to read VS1010 Handbook. Functionality related to USB is being implemented in functions called main, MyPlayerCallback, checkStatus and checkAgain. Lets look at those little closer.

The player is looping in the main function. It also handles the connection of USB stick (experimental and currently not working with every USB-stick!). Main function also handles changing the disk and initializing the player.

MyPlayerCallback is the function in which we try to notice if any button is being pressed or the state of USB has been changed (which means we might have PC connected). In MyPlayerCallback we also print play time and changes in volume if the volume has been changed. Since pretty much everything else has been presented in VS1010 handbook or is pretty clear and easy to understand we look only at a little detail in that function.

```
//printing time every second
timer++;
if(timer > ((1000/pollInterval) - 1)){
    PrintTimeCount();
    timer = 0;
}

// Checking if usb state is being changed
if(checkStatus()){
    keepPlaying = 0;
    restart = 1;
    goto RESTART;
}
```

This is how we determine when to print the time and when to check USB status since it is not that critical to notice changes immediately. With variable called pollInterval we tell the function to check USB and button status every lets say 100 ms which means that we print time when the tenth check occurs. To notice, we want to restart the player if checkStatus returns 1 (some change has occurred in USB ports).

Moving on to checkStatus in which we check the status of USB ports in case something has been connected to them. Since the details are well commented and we don't want to go to level of talking about registers we take look at just one detail which explains a lot about function of this player.

```
// PC is connected
else if(!(status >> 14) && !(status >> 15)){

    if(checkAgain(CABLE)){
        printf("\nTrying to connect PC...\n");
        RunLib("ums", "d");
        DelayL(1000000);
        return 1;
    }
    return 0;
}
```

This is how we notice that PC has been connected and connect to USB mass storage. After we notice that USB_UTMIR register bits refers to PC we call function checkAgain which checks that changes wasn't just an error and if everything is like we think it is we call separate program "ums" which connects to USB mass storage. After that we want to restart the player which is done by returning value 1.

Next we want to know how checkAgain function works. As an example we have short caption of that function.

```
// cheking if we truly are connected to PC
else if(n == PC){
    while((idleCounter < count) && !(status >> 14) && !(status >> 15)){
        status = PERIP(USB_UTMIR);
        sofCount = status&0x3FFF;
        idleCounter++;
    }
}
```

In that part we try to confirm that PC is being connected. If we get same result as many times as count variable says we can confirm that PC has been connected. Why we do that is because USB connection can sometimes be little uncertain and we can get results that doesn't mean anything. This has a lot to do with USB start of frame and at the beginning of checkStatus we have implemented another fail safe to be almost sure that we do not get any values to check if those are not valid.

Now you should have more or less good understanding of the functionality of TreePlayer with USB mass storage. By modifying the example code you can make your own functions and implement something new to your own purposes.

USB mass storage and USB flash supported

Since function of this example use another programs (UMS and USBHDD/USBPROBE) you might want to read more about those also.

Main functions of program for running USB mass storage are mainly similar to program released in this thread but there is some critical differences so you can ONLY use packages provided with this document. Still, here is some more information about the topic:

<http://www.vsdsp-forum.com/phpbb/viewtopic.php?f=15&t=2309>

Programs related to USB flash support are more or less modified versions of packages provided in forum thread below so you can ONLY use files provided with this document. Still, there is a link to a that forum thread to provide some more information about USB driver and its basic functions:

<http://www.vdsp-forum.com/phpbb/viewtopic.php?f=15&t=2368>