Subject: [FIXED] GLDraw,GLCtrl would be nice to work properly Posted by luoganda on Fri, 17 Jun 2022 10:54:20 GMT View Forum Message <> Reply to Message

Since this are a part of nonBazaar core packages, this would be nice to work properly. I tested this on w7x64 with latest upp-included-clang(16299) and msvc17 producing 32bit debug executable with reference example - GLDrawDemo. But for this - i used msvc17 since debugger gave me a little more info. I have also tested this with producing 64bit code, but it was even worse(only blank white screen).

Anyhow, i attached screenshots where bug happens, if one is a little bit more familiar with underlying code, one could probably resolve this quite easily.

Commented code also mostly all produces such bugs.

Bazaar(uppHub) thing:

i suggest - don't throw away Bazaar archive - it has a lot of usefull code. I didn't for example found Serial package or non-bazaar FontSel(dialog) in uppHub(maybe i overlooked something), which are mostly just copy/paste packages - since all works out of the box.

For Serial bazaar package i just added this, to adjust a few things, for linux, i am not sure if this is needed or how it's done.

```
void SetWriteTimeout(dword ms){
    COMMTIMEOUTS ct;memset(&ct,0,sizeof(ct));
    ct.WriteTotalTimeoutConstant=ms;SetCommTimeouts(fd,&ct);
}
void SetTimeouts(dword msRead,dword msWrite){
    COMMTIMEOUTS ct;memset(&ct,0,sizeof(ct));
    ct.ReadIntervalTimeout=ct.ReadTotalTimeoutMultiplier=MAXDWORD;
    ct.ReadTotalTimeoutConstant=msRead;
    /*ct.WriteTotalTimeoutMultiplier=MAXDWORD;*/
    ct.WriteTotalTimeoutConstant=msWrite; SetCommTimeouts(fd,&ct);
}
```

File Attachments
1) GLDrawDemo-sshots.7z, downloaded 140 times

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by Klugier on Sat, 18 Jun 2022 07:53:30 GMT

Hello,

Thank you for your feedback! In context of UppHub this is the step forward in comparison to bazzar and we shouldn't back to it anymore. The reason for that is that many packages are outdated and there are lack of maintainer. I know that currently we do not have Serial package on UppHub, but why do not create one? If you are interested you can create UppHub repository with Serial package from bazaar. This package will be maintain by you.

To create UppHub package, just create git repository and full-fill them accordingly. You could follow the repository structure of AutoScroller. If everything will be ready just let us know that you have created Serial package, so we could add it to UppHub registry.

BTW, You put two topics into one thread. Please raise separate topic for GLDraw issue. For me it works correctly on Windows10. Are you compiling GLDrawDemo on virtual machine or something, there might be a problem with a drivers. Also, you should migrate to more modern system. Windows7 hit end of the life, so there is no grantee that everything will be working as expected. Could you try on Windows10. Windows11 or GNU/Linux?

EDIT: OK, after testing we have a fatal error at the begging of the program when targeting 32 bit operating system on Windows. On 64 bit everything works correctly. If you compile with USEMALLOCK it should works fine.

Klugier

File Attachments
1) Screenshot 2022-06-18 100342.png, downloaded 604 times

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by mirek on Sun, 19 Jun 2022 18:16:51 GMT View Forum Message <> Reply to Message

luoganda wrote on Fri, 17 June 2022 12:54 Bazaar(uppHub) thing:

i suggest - don't throw away Bazaar archive - it has a lot of usefull code. I didn't for example found Serial package or non-bazaar FontSel(dialog) in uppHub(maybe i overlooked something), which are mostly just copy/paste packages - since all works out of the box.

For Serial bazaar package i just added this, to adjust a few things, for linux, i am not sure if this is needed or how it's done.

void SetWriteTimeout(dword ms){
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```
ct.WriteTotalTimeoutConstant=ms;SetCommTimeouts(fd,&ct);
}
void SetTimeouts(dword msRead,dword msWrite){
    COMMTIMEOUTS ct;memset(&ct,0,sizeof(ct));
    ct.ReadIntervalTimeout=ct.ReadTotalTimeoutMultiplier=MAXDWORD;
    ct.ReadTotalTimeoutConstant=msRead;
    /*ct.WriteTotalTimeoutMultiplier=MAXDWORD;*/
    ct.WriteTotalTimeoutConstant=msWrite; SetCommTimeouts(fd,&ct);
}
```

Why do not you start UppHub package for serial?

Seriously, the problem with bazaar was that while it contained a lot of great code, 90% of it was unmaintained.

Mirek

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by luoganda on Mon, 20 Jun 2022 12:29:32 GMT View Forum Message <> Reply to Message

I think that at least Serial and Sound(wrapped PortAudio soundsystem+plugin/wav) should go into plugin or core packages, since they are fundamentals. Serial code won't change in the future, and probably neither PortAudio, so maintaining code is not an issue, copy/paste packages to core would be fine.

Of course, i have made copies of bazaar archive, just in case you'll be stubborn :). Personally, i prefer main upp-download to be as small as possible, without bazaar and git, but bazaar and/or github as an option. Upphub may be a plus for some situations and of course - it could be a handy option and probably "flaten out" newVers diferences between bazaar and upp bugs.

If one is eager for upphub thing, then one could probably create converter

from bazaar to upphub, and mark/review packages as fullyFuncional or unmaintained, etc. If this is started: from my experience - Serial and Sound are fully functional.

SoundExample code is also there and functional albeit for blocking mode. Streamed mode is from my experience fully functional also.

The same goes for FontSel that was proposed soooo many times but not integrated into core(uppsrc/CtrlLib),

all is there only this is lacking for dialogs(colorchooser,FileSel,etc) to be complete. FontSel code was written by someone else - but i think i changed it a bit some time ago, anyhow - it's attached(if integrated - only check/correct FontSel.h and FSel.cpp header paths -2linesOfCode).

What about GLDraw and GLCtrl - core of this topic?

This are also fundamentals..

It's a simple correction for one that knowns how underlying code should work.

File Attachments
1) FontSel.7z, downloaded 172 times

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by Klugier on Tue, 21 Jun 2022 23:39:55 GMT View Forum Message <> Reply to Message

Hello Luoganda,

Serial is niche. It shouldn't be part of the Core package and any developer that is currently engage in Upp framework development do not have much experience with that. So putting it there doesn't make sens to me.

However, the different story is with UppHub. It fits there perfectly. It is great addition that expands capabilities of whole Upp framework.

As you see there is no maitaner and the person who wants to move that package there. Could you help with this? Do you want to be a person deserved to our community? If yes, please create GitHub repository in accordance to instruction in this documentation page and let us know when it will be ready. We will handle the package publishing process for ourselves.

Luoganda, I believe in you that you publish your first package on UppHub! Good luck!

Klugier

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by mirek on Sun, 03 Jul 2022 18:55:20 GMT View Forum Message <> Reply to Message

luoganda wrote on Mon, 20 June 2022 14:29 What about GLDraw and GLCtrl - core of this topic?

Tested (with RX580), works. Unfortunately this can be GPU/GPU driver releated; I will try again once I have got Nvidia sometimes this or next month.

Meanwhile, why do not you try to investigate? Have tried to e.g. get backtrace for starters?

Mirek

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by mirek on Sun, 03 Jul 2022 19:00:13 GMT View Forum Message <> Reply to Message

luoganda wrote on Mon, 20 June 2022 14:29I think that at least Serial and Sound(wrapped PortAudio soundsystem+plugin/wav) should go into plugin or core packages, since they are fundamentals. Serial code won't change in the future, and probably neither PortAudio, so maintaining code is not an issue, copy/paste packages to core would be fine.

I am not fundamentally opposed to this.

Quote:

If one is eager for upphub thing, then one could probably create converter from bazaar to upphub, and mark/review packages as fullyFuncional or unmaintained, etc.

This would be a mistake.

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by Klugier on Sun, 03 Jul 2022 20:51:35 GMT View Forum Message <> Reply to Message

Hello Mirek,

Did you tested with 32 bit clang on Windows (not 64 bit)? I reproduce it with default CLANG build method (not CLANGx64). The error is only with 32 bit, 64 works without crash. It reproduces for both Nvidia and AMD GPU, so I am sure that it is not driver related. I attached screenshot with crash.

Here is backtrace:

Upp::Panic(msg=b2430c "Writes to ") at C:\Prototable\upp\uppsrc\Core\Util.cpp 119 Upp::BlkHeap<Upp::Heap::LargeHeapDetail,256>::DbgFreeCheck(p=7acfd58, size=2024) at C:\Prototable\upp\uppsrc\Core\HeapImp.h 101 Upp::BlkHeap<Upp::Heap::LargeHeapDetail,256>::CheckFree(h=7acfd40) at C:\Prototable\upp\uppsrc\Core\HeapImp.h 120 Upp::BlkHeap<Upp::Heap::LargeHeapDetail,256>::MakeAlloc(h=7acfd40, wcount=8) at C:\Prototable\upp\uppsrc\Core\HeapImp.h 211 Upp::Heap::TryLAlloc(i0=5, wcount=8) at C:\Prototable\upp\uppsrc\Core\lheap.cpp 55 Upp::Heap::LAlloc(size=) at C:\Prototable\upp\uppsrc\Core\lheap.cpp 111 Upp::Heap::AllocSz(sz=) at C:\Prototable\upp\uppsrc\Core\sheap.cpp 458 Upp::MemoryAllocSz(size=) at C:\Prototable\upp\uppsrc\Core\heapdbg.cpp 142 Upp::MemoryAlloc(size=2032) at C:\Prototable\upp\uppsrc\Core\heapdbg.cpp 155 Upp::Index<Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long> >::Key>::ReallocHash(n=73) at C:\Prototable\upp\uppsrc\Core\Index.hpp 41 Upp::Index<Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long> >::Key>::GrowAdd<const

Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long> >::Key &>(k=, sh=2394942300) at C:\Prototable\upp\uppsrc\Core\Index.hpp 78

Upp::Index<Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long > >::Key>::AddS<const

Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long.unsigned long > ::Key &>(m=, k=, sh=2394942300) at

C:\Prototable\upp\uppsrc\Core\Index.hpp 86

Upp::Index<Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long > ::Key>::AddS<const

Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long > ::Key &>(k=, sh=2394942300) at C:\Prototable\upp\uppsrc\Core\Index.hpp

102

Upp::Index<Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long > ::Key>::Put0<const

Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long >::Key &>(k=, sh=2394942300) at C:\Prototable\upp\uppsrc\Core\Index.hpp 237

Upp::Index<Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long long,unsigned long long,unsigned long > ::Key>::Put(k=) at C:\Prototable\upp\uppsrc\Core\Index.h 92

Upp::LRUCache<Upp::ImageGLData,Upp::Tuple<unsigned long long,unsigned long

long, unsigned long> >::Get(m=) at C:\Prototable\upp\uppsrc\Core\Other.hpp 187

Upp::GetTextureForImage(flags=3, img=, context=0) at

C:\Prototable\upp\uppsrc\GLDraw\Texture.cpp 90

Upp::GetTextureForImage(img=, context=167162738539356648) at

C:\Prototable\upp\uppsrc\GLDraw\GLDraw.h 38

Upp::GLDraw::PutImage(p=, img=, src=, color= #000000) at

C:\Prototable\upp\uppsrc\GLDraw\GLDrawS.cpp 400

Upp::SDraw::SysDrawImageOp(x=1674, y=593, img=, src=, color= #000000) at

C:\Prototable\upp\uppsrc\Draw\SDrawPut.cpp 23

```
Upp::SDraw::DrawTextOp(x=1674, y=605, angle=1200, text=251e5d8, font=<:12>, ink= #000000, n=1, dx=0) at C:\Prototable\upp\uppsrc\Draw\SDrawText.cpp 81
```

```
Upp::Draw::DrawTextA(x=1694, y=640, angle=1200, text=7b09610, font=<:254>, ink= #000000,
```

n=23, dx=0) at C:\Prototable\upp\uppsrc\Draw\DrawText.cpp 49

Upp::Draw::DrawTextA(x=1694, y=640, angle=1200, text=, font=<null>, ink= #FE0000, dx=0) at C:\Prototable\upp\uppsrc\Draw\DrawText.cpp 162

Upp::Draw::DrawTextA(x=1694, y=640, angle=1200, text=7b468d0 "x Text w", charset=0,

font=<:254>, ink= #FE0000, n=23, dx=0) at C:\Prototable\upp\uppsrc\Draw\DrawText.cpp 174

Upp::Draw::DrawTextA(x=1694, y=640, angle=1200, text=7b468d0 "x Text w", font=<:254>, ink= #FE0000, n=23, dx=0) at C:\Prototable\upp\uppsrc\Draw\DrawText.cpp 189

Upp::Draw::DrawTextA(x=1694, y=640, angle=1200, text=, font=<:640>, ink= #FE0000, dx=0) at C:\Prototable\upp\uppsrc\Draw\DrawText.cpp 203

OpenGLExample::GLPaint() at C:\Prototable\upp\reference\GLDrawDemo\main.cpp 31

Upp::GLCtrl::DoGLPaint() at C:\Prototable\upp\uppsrc\GLCtrl\GLCtrl.cpp 24 Upp::GLCtrl::GLPane::WindowProc::<lambda0>::operator()() at C:\Prototable\upp\uppsrc\GLCtrl\Win32GLCtrl.cpp 135 Upp::Function<void ()>::Wrapper<`lambda at C:\Prototable\upp\uppsrc\GLCtrl\Win32GLCtrl.cpp:135:21'>::Execute() at C:\Prototable\upp\uppsrc\Core\Function.h 17 Upp::Function<void ()>::operator()() at C:\Prototable\upp\uppsrc\Core\Function.h 76 Upp::GLCtrl::GLPane::ExecuteGL(hDC=e7011033, paint=, swap_buffers=1) at C:\Prototable\upp\uppsrc\GLCtrl\Win32GLCtrl.cpp 113 Upp::GLCtrl::GLPane::WindowProc(message=15, wParam=0, IParam=0) at C:\Prototable\upp\uppsrc\GLCtrl\Win32GLCtrl.cpp 135 Upp::Ctrl::WndProc(hWnd=25064c, message=15, wParam=0, IParam=0) at C:\Prototable\upp\uppsrc\CtrlCore\Win32Wnd.cpp 645 759a7c92 7598714a 75985d7f 74bcc889 759a7c92 7598714a 75986bda 7598fa9f 76f4719c Upp::Ctrl::UpdateDHCtrls() at C:\Prototable\upp\uppsrc\CtrlCore\DHCtrl.cpp 126 Upp::Ctrl::UpdateDHCtrls() at C:\Prototable\upp\uppsrc\CtrlCore\DHCtrl.cpp 123 Upp::Ctrl::WindowProc(message=15, wParam=0, IParam=0) at C:\Prototable\upp\uppsrc\CtrlCore\Win32Proc.cpp 261 Upp::TopWindow::WindowProc(message=15, wParam=0, IParam=0) at C:\Prototable\upp\uppsrc\CtrlCore\TopWin32.cpp 70 Upp::Ctrl::WndProc(hWnd=16067a, message=15, wParam=0, IParam=0) at C:\Prototable\upp\uppsrc\CtrlCore\Win32Wnd.cpp 645 759a7c92 7598714a 75986bda 7598fa9f 76f4719c 759855b0 Upp::Ctrl::sProcessMSG(msg=) at C:\Prototable\upp\uppsrc\CtrlCore\Win32Wnd.cpp 740 Upp::Ctrl::ProcessEvent(quit=251fb47) at C:\Prototable\upp\uppsrc\CtrlCore\Win32Wnd.cpp 762 Upp::Ctrl::ProcessEvents(quit=251fb47) at C:\Prototable\upp\uppsrc\CtrlCore\Win32Wnd.cpp 781 Upp::Ctrl::EventLoop(ctrl=251fcf8) at C:\Prototable\upp\uppsrc\CtrlCore\Win32Wnd.cpp 805 Upp::TopWindow::Run(appmodal=0) at C:\Prototable\upp\uppsrc\CtrlCore\TopWindow.cpp 323 GuiMainFn_() at C:\Prototable\upp\reference\GLDrawDemo\main.cpp 49 Upp::AppExecute__(app=621500) at C:\Prototable\upp\uppsrc\Core\App.cpp 450 WinMain(hInstance=620000, lpCmdLine=27e0721 "", nCmdShow=10) at C:\Prototable\upp\reference\GLDrawDemo\main.cpp 40 main() WinMainCRTStartup() 74d66739

As I wrote previously, using malloc instead of our allocator solves the problem in this case.

Klugier

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by mirek on Sun, 03 Jul 2022 22:41:03 GMT View Forum Message <> Reply to Message

Does not crash for me, but backtrace is helpful. You have not posted the screenshot, but it appears like "Writes to freed blocks detected" issue?

Obviously, this is not detected with USEMALLOC for simple reason that normal allocator does not have any such detected.

Anyway, probably the problem is somewhere about image cache recycling/freeing (related to rendering the text). Can you try with

```
w.DrawLine(80, 90, 400, 0, PEN_DASHDOT);
// w.DrawImage(200, 10, CtrIImg::reporticon());
// w.DrawImage(280, 10, CtrIImg::reporticon(), Red());
const char *text = "This text is centered";
Size tsz = GetTextSize(text, Arial(25).Bold());
// w.DrawText((sz.cx - tsz.cx) / 2, (sz.cy - tsz.cy) / 2, text, Arial(27).Bold(), SBlue);
w.Clipoff(200, 50, 95, 100);
// w.DrawText(0, 80, "CLIPPED", Roman(25));
w.End();
// ter(int angle __0; angle : 200; angle : __20)
```

// for(int angle = 0; angle < 360; angle += 30)
// w.DrawText(sz.cx - sz.cx / 3, sz.cy - sz.cy / 3, angle * 10, "x Text with angle " +
AsString(angle));</pre>

just to test if we are onto something?

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by mirek on Sun, 03 Jul 2022 23:04:25 GMT View Forum Message <> Reply to Message

Next thing to try is to comment GLDraw/Texture.cpp:43 SysImageRealized

Hello Mirek,

Commenting SysImageRealized doesn't help. Also, commenting w.DrawImage(), too. What helped is commenting loop with angle:

//for(int angle = 0; angle < 360; angle += 30)
// w.DrawText(sz.cx - sz.cx / 3, sz.cy - sz.cy / 3, angle * 10, "x Text with angle " +
AsString(angle));</pre>

So, following code works fine on 32-bit windows:

```
virtual void GLPaint() {
  Size sz = GetSize();
```

GLDraw w;

w.Init(sz);

```
w.DrawRect(0, 0, sz.cx, sz.cy, SWhite);
w.DrawRect(10, 10, 30, 30, SRed);
w.DrawLine(45, 45, 80, 120, 4, Blue);
w.DrawLine(80, 90, 400, 0, PEN_DASHDOT);
```

```
w.DrawImage(200, 10, CtrIImg::reporticon());
w.DrawImage(280, 10, CtrIImg::reporticon(), Red());
```

```
const char *text = "This text is centered";
Size tsz = GetTextSize(text, Arial(25).Bold());
```

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w.DrawText((sz.cx - tsz.cx) / 2, (sz.cy - tsz.cy) / 2, text, Arial(27).Bold(), SBlue);
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```

```
//for(int angle = 0; angle < 360; angle += 30)
// w.DrawText(sz.cx - sz.cx / 3, sz.cy - sz.cy / 3, angle * 10, "x Text with angle " +
AsString(angle));</pre>
```

```
w.End();
```

}

```
-----
```

OK, after digging more AsString(angle) is causing crash. It works good with following line of code:

w.DrawText(sz.cx - sz.cx / 3, sz.cy - sz.cy / 3, angle * 10, "x Text with angle " /*+ AsString(angle)*/);

Replacing AsString with IntStr cause the same error. I think the problem must be with utoa32 (Format.cpp) function and it's memory management on 32 bit architecture.

Klugier

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by mirek on Mon, 04 Jul 2022 23:05:27 GMT View Forum Message <> Reply to Message

Klugier wrote on Mon, 04 July 2022 23:36 w.DrawText(sz.cx - sz.cx / 3, sz.cy - sz.cy / 3, angle * 10, "x Text with angle " /*+ AsString(angle)*/);

Replacing AsString with IntStr cause the same error. I think the problem must be with utoa32 (Format.cpp) function and it's memory management on 32 bit architecture.

Klugier

Well, accidentally, AsString in this case does not allocate any memory.... :)

What is more likely that glyphs for digits are maybe causing the problem. Maybe you can replace AsString with "123" ?

Mirek

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by Klugier on Tue, 05 Jul 2022 08:44:14 GMT View Forum Message <> Reply to Message

Hello Mirek,

You are right inserting numbers in the string cause crash. Below line crashes:

w.DrawText(sz.cx - sz.cx / 3, sz.cy - sz.cy / 3, angle * 10, "x Text with angle 123");

So, it is not a problem with number to string conversion. Thanks for explanation about memory allocation ;)

Klugier

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by mirek on Tue, 05 Jul 2022 09:13:20 GMT View Forum Message <> Reply to Message

Klugier wrote on Tue, 05 July 2022 10:44Hello Mirek,

You are right inserting numbers in the string cause crash. Below line crashes:

w.DrawText(sz.cx - sz.cx / 3, sz.cy - sz.cy / 3, angle * 10, "x Text with angle 123");

So, it is not a problem with number to string conversion. Thanks for explanation about memory allocation ;)

Klugier

Keep experimenting. What about "xxx" instead of "123" ? (These are glyphs that already should be cached).

Mirek

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by Klugier on Tue, 05 Jul 2022 09:28:35 GMT View Forum Message <> Reply to Message

Hello Mirek,

xxx works correctly without crash.

Klugier

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by luoganda on Tue, 05 Jul 2022 10:43:39 GMT View Forum Message <> Reply to Message

The card is a little older intel Q965/Q963 Express Chipset Family. So yes, Mirek - it might be this. Although i think that with gl2.0 should also work fine for basic line etc drawing, if there are limits what glVer upp needs - then it might be this. On w7x64 i have also directx11.

On windows - there are only drivers till 2.0 for opengl(rev 8.15.10.1930), on linux - i think there are for 2.1 too.

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by luoganda on Mon, 25 Dec 2023 10:24:10 GMT View Forum Message <> Reply to Message

Checked,

minimum OpenGL version on any platform is fully supported v2.1.

Meaning:

with older graphics card mentioned in previous post,

in this case - GLDraw/GLCtrl works ok on linux with latest drivers but not on win7(drivers not supporting full 2.1 capabilities).

Subject: Re: GLDraw,GLCtrl would be nice to work properly Posted by Klugier on Mon, 25 Dec 2023 16:06:07 GMT View Forum Message <> Reply to Message

Hello luoganda,

Any chances to update your Windows machine at least to Windows 10. Our policy right now is not to invest in operating systems that are not supported by their maintainers. Windows 7 is not supported since January 14, 2020. You can read more about this topic here.

Klugier

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