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Direct3D «ü©w`ã D3D µwÅé¥[³t`à□OªºÅã¥Ü¾⁄¹□¶±¥dÄ³,Ó¥î¥H°ð|æ³»ÂlÃú□Æ©îÃä½tÃú□ÆᵢC|³°Ç¹CÀ,µLªk¥¿½T|a~d,ß D3D
µwÅé©Ã`àᵢA`Ã»ÝnÃä½tÃú□Æ□ä´©ᵢC¿î³⁄⁄Ü!¹¿!¶µ±N¥î¥H½T«O±zªº NVIDIA ¹î§î³B²z¾⁄¹¥î¥H¥¿½T°ð|æ!¹Ãp¹CÀ,ᵢC

l¹¿i¶µ®e³±zÃð³¬ÅX°Êµ{l¹ªº.s DirectX ¥\¬à;C

¬Y¨ÇÂÂª©¹CÀ,¥u¾A¥Î©ó,ûÂÂª©¥»ªº DirectX;A³o¨Çª©¹CÀ,¥ΓàµLªk°t{Xðw|w,Ëªº DirectX ª©¥» 6 ©Î 7 ð{l|bÅX°Êµ{l¹ªº±ò°Êðá´©¥
V¬àªº±jªpªU¥¿±`°ð{æ;C¿i¾Ül¹¿i¶µ¥i±j¬ÅX°Êµ{l¹;D DirectX 5 ¬Ü®e¾Ò;l¹ªU°ð{æ;A¥H¬ÅÂª©¹CÀ,¥i¥H¥¿±`°ð{æ;C

|pªG±zn°ð{æ¬Y¨ÇµLªk¥¿±±ò°Ê©Î°ð{æªºÂÂª©¹CÀ,;A½D¬¥Îl¹¿i¶µ;C

±j`îµwÂé!Û°Ê±N`ä Z ½w½Ä°j²`«×½Ö¾ã¬°À³Ÿîµ{!i©Ö»Ý^{ao2`}«×iC

³q±`jA±z·|±N!¹¿îŸµ«O«ù±Ö°Êª¬°A¡A°E«D±z^{ao}µu\$@½T¹ê»Ýn¬YÓ¯S©w^{ao} Z ½w½Ä°j²`«×iC!pªG±zÃð³¬µF!¹¿îŸµ¡A«h¥ð!óµu\$@®É
Z ½w½Ä°j²`«×»P¥Ø«eµwÂé²Ö°Aµ\$½w½Ä°j²`«×µE¬Û²Â^{ao}À³Ÿîµ{!i\$¡±NµLªk°ð!æiC

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30¥i¥HÄýµwÁé"ï¥i¥ta@Ö,É,m|b 16 |ia,À³¥iµ{|;ia¶|j|æ²"«x1/2w1/2Ä³B²z;C±Ö°Ê|13|©w¥i¥H²£¥i§ó^{oao} 3D 1/4v13µÛ|â«~1/2è;C

±Ö°Ê Direct3D ¢¢ªº NVIDIA Å²¼Đ;C

!pªG±Ö°Ê!¹³]©w;A|b°õ|æ Direct3D Å³¥î{;i®É;A¿Ã¹õ¢U¢èªº"ª, "±N·|Åã¥Ü NVIDIA Å²¼Đ;C

±z^{ao} NVIDIA 1ŝŝ³B²z³/₄1¥i¥H!Ů°Ê³B²z MIP ¶K¹İ;A¥H´£^{°a}¶x~y±Æ^{ao}S÷½è¶K¹İ¶Ç°e@Ä²v;A¨Ä´£¨ÑSó^{°ao}Ä³¥İμ{;i@Ä¯à;C

İŸ~O;A; b±Ö°Ê!Ů°Ê²£¥İ^{ao} MIP ¶K¹İ@Ê;A¤@¨ÇÄ³¥İμ{;i¥İ¯àμL^ak¥ç½TÄã¥Ů;CnSó¥ç;11°ŸÄD;A½Đ´İ¤Ö!Ů°Ê²£¥İ MIP

¶K¹İμ¥¯Ä^{ao1}/₄Æ¶q;A^{a1}/₂¨İ¼v¹³¥İ¥H¥ç½TÄã¥Ů~°¤İ;C´İ¤Ö MIP ¶K¹İμ¥¯Ä^{ao1}/₄Æ¶q³q±`¥İ¥H@Ø°£S÷½è¶K¹İ^{ao}¤£¹İ»ô©İıuµe-

±¼¹μō;v°ŸÄD;İİŸ~O³o¼Ä«o·|°§C@Ä¯à;^;C

®e³±zçî¼Üîî§î³B²z¾¹©Ò¥îªoîÛ°Ê³B²z MIP ¶K¹îªèîîîC

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º¾@tÈªª¶¶¡¡æ¿¡¾Ü¡C

±zpwÅx|s^{ao}!Ûq³]©wÈ;j|©îiu½Ö¾ãÈ;vı^¤\$²M³æ;C¿ĩ¾Üı¹²M³æ¤¤^{ao}¤@Ó¶µ¥Ø±N·|±Ö°Ê³]©wÈ;Cn®M¥î³]©w-
È;A½Đ¿ĩ¾Üiu½T©wıv©îıu®M¥îıv«ð¶|sıC

®e³±zz±N¥Ø«e³]©wÈij¥]-A;u`ã¥L Direct3D;v⁴;Üæ¶||ôððª³]©wÈ;^Àx;s-°|Ûq;u½Ö¼ãÈ;v;CªwÀx;sª³]©wÈ±N·|
·s¼W`î-Û¾Fª²M³æªW;C

|bSä`î`S©w Direct3D `CÀ,ª³;î`î³]©wÈª§«á;A½D±N³]©wÈÀx;s-°|Ûq;½Ö¾ãÈ;C³o¼È±z´N¥;¥H;b±Ò°Ê`CÀ,ª§«e`³³;²Ö°A
Direct3D;A;ÓµL»ÝªÀ§O³]©w`CÓ¿î¶µ;C

SR°£¥Ø««e|b²M³æ□□¿|©wª|Ùq³]©wÈ;C

±N©Ò¡³³J©wÈÁÙ¡Û"ä¹w³JÈ¡C

Åã¥Ü¤@Ó©e³±z!Üq`ã¥L Direct3D ³©wÈª01î,Ü¤ë¶||ô;C

!1ç!¶µ¥HÄÜSó¶Kıİ13-Äj]S÷½è¶Kıİ¶, -Äı^aoµwÄéS÷½è¶Kıİ©wS}oè@×ıC

ÄÜSó³o`ÇÈ±N·|ÄÜSó©w,q¶Kıİ13-Ä·½ao¶j,mjC¹w³]È»P Direct3D ³W@æo@PıCı³`Ç³nÄé¶ı-à·|n`D|bSO³B©w,q¶Kıİ13-Ä·½ıCıpªG-
«·s©w,q¶Kıİ13-Ä·½ıA«hı¹ÄpÄ³¶ıµ{ııaoı¼v¹³«~½è±N·|´£ªaıC±z¥ı¥H`İ¶ı·Æ´İ±±`ııb¶Kıİ13-Ä¥ªoW`o»Poo¥ııı,moS¶ıı½Ö%ã¶Kıİ13-Ä·½ıC

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µù¡G ¥¡«O¯d¥í©óS÷½è¶K¹îÄx!s°îªªˆt²î°O¾DÁé³¡¡¡@e¶q¡A~O®Ú¾Ú±z¹q,£ªW!w,ËªªêÁé RAM ®e¶qˆÓpªªª¡Cˆˆt²î RAM

¶Vª¡jA±z¥¡¥H³¡©wªªÈˆN¶Vª¡jC

!¹³¡©wÈ¶È®M¥í©ó PCI Åã¥Ü¾¹ª¶±¥d¡j]©!¡b PCI ~Ú®e¼Ò!¡ªU°ð!ªªª AGP Åã¥Ü¾¹ª¶±¥d¡^¡C

čĩ¼Ü!¹čĩ¶µ¥¥HÃö³~««ª½!P`B¡C

@e³¹q,E¥ßSY±N½¼v¹³´yÃ,|bčÃ¹δ▯W¡A!ÓµL»Ýµ¥«ÝÃã¥Ü¾¼¹ªº!P`B««ª½!^±½²°T,¹¡C³o·|`ĩ!i®Ø³t²vªª©óÃã¥Ü¾¼¹ªº§ó·s²v¡A!ý~O¥ĩ¯à·|
²E¥!µøÃ±°Æ§@¥ĩ©M!j¹³¼¹µðªª¥ÃD¡A±q!Ó°§C¾¼v¹³«~½è¡C

l¹¿i¶µ®e³±z`M©w|b`S©wªº D3D Å³¶µ{¶iªª`i¶i¶·Æ³B²zªºµ{«×iC

¶·Æ³B²z-Oª@ºØ¶i©ó¶iªªªÆi³®É·|¶X²{¶b 3D º«¶óÃä½tªWªºi¶¶±èjv®ÃªGªSSP³NjC±z¶i¶H|bS¹¶pÃó³-¶·Æ³B²z»P¿i³¼Ü¶i¶i©ó`S©wÅ³¶µ{¶iªª³iªj¼Æ¶qªS¶i¶i|æ¿i³¼ÜjC

[illegible]
$$\frac{1}{2}D^{a^*} \cdot N_j A \neg Y^* \mathbb{C} \nabla \frac{1}{4} \odot \hat{U} \frac{1}{2} T \ll \ddot{u} \nabla X \nabla i \partial \acute{a}^* \odot \nabla \cdot \mathbb{A} \mathbb{E}^3 B^2 z^{a0} \mathbb{A}^3 \nabla \{\mu \nabla \{\downarrow \nabla i^* \neg \grave{a} \mu L^{ak} \nabla \zeta \frac{1}{2} T \mathbb{A} \tilde{a} \nabla \mathbb{J} \frac{1}{4} v^{43} \downarrow \mathbb{A} \odot \hat{I} \nabla i^* \neg \acute{a}^* y \tilde{A}, \square$$

E³W«h^{a01}/₄v¹³iA|j|^{l1}iA¹/₂D∅pαβ̣ȲĩĤıÇİŋμiC|p^aG±z|ḅĩĩ∅ε∅ắ©¥·Æ³B²z^{a01}CẠ̀©îÄ³¥Îμ{|ı®É¹J̣ıîÄã¥Ü°ÝÃDıA¹/₂DÄö³-ı^{l1}ıÇİŋμiC

!¹¿í¶µ®e³±z`î CPU !b¹[šî¹±ù¶]©|³B²z±§«e¥i¥H·Ç³Æª¹j|@Ø¼/4Æij|!b««ª½|P`BÃö³~®É;^iC

!b¬Y`Ç±iªp±U;A®e³ª¹w¥ýµû!â¹î|@Ø¼/4Æ¶VªªiA;^À³·n±i;B¹CÀ,¥x©îÁä½Lµ¥,Ë,mªiuzé±J©µ½wiv´N¶V±[iC

!pªG±z!bª±¹CÀ,®É;A³s±µ!Ü±zª¹q,£ª§¿é±J,Ë,m!³©úÃä!^À³©µ½wª²{¶H;A½Ð´îp!¹È;C

OpenGL © 1991-2008 Khronos Group Inc. All rights reserved. GL_KTX_buffer_region.C

3o1/4Ë°μ¥i¥H´£¤É¤ä´©!¹©μ!ù¥¬¬àªº 3D 1/4Ö«¬¤ÆÀ³¥Îμ{!;¤§À³¥Îμ{!;®Ä¬à;C

@e³\|b GL_KTX_buffer_region ©μ'ù¥À¯à±Ò°Ê®É·'¥|¥»¾⁄⁄¼v¹³°O¾⁄⁄DÅé;C

|ý-O;A|pªG¥í¥îª°¥»¾⁄⁄¼v¹³°O¾⁄⁄DÅéªÖ©ó 8MB;A«hμLªk±Ò°ÊÂù¥±©μ'ù¥À¯àªä´©;C

|pªGÃö³-ªFªWz;u±Ò°Ê½w½Ä°î©μ'ù¥À¯à;v¿'î|μ;A¹¹³]©w±NμLªk\$@¥î;C

@e³sÖ3¹½u©Ê MIP ¶K1¹½u©Ê¹LÂo¥¹¬±N¥¶H'£°aÄ³¶µ¶¶¹a0ÖÄ`à¡A¡y-O«o-|°SCa@`Ç¹/v¹³«-½è¡C
 ¦b¶h¡h¹/4E±¹p0U¡A¹/v¹³«-½èa0°SC`Ä°E©ÚÄâ¡A¶¶¹±z¥¹¬à.Qn³z¹L±0°Ê¹¹¹¬à`ÔÄ0°úS0°aaoÖÄ¬à¡C

!²¿î¶@e³\ OpenGL ·ÿŒ«DS;½è¹LÂo¥H´£ª¼v¹³«~½è;C

¿İ¼Ü¹¿İ¶µ¶î¶HÃö³¬ÅX°Êµ{;¹î¬Y¬Ç CPU ¶¶î¹º¹/4W±j«¬«ü¶Oªºµä´©;C

¬Y¬Ç CPU µä´©ªp¶[ªº 3D «ü¶O;A³o¬Ç«ü¶O¶î¶H»²§U NVIDIA ¹İ§İ³B²Z³/4¹¬¬Å´Eªª 3D ¹CA,©İÅ³¶İµ{;¹ªº@Å¬à;C;¹¿İ¶µ@e³\ ±z;bÅX°Êµ{;µµÃö³¬¹;³o¬Çªp¶[ªº 3D «ü¶Oªºµä´©;C³o;b¶¶İ;æ@Å¬àµĥ,û©İ¬G»Ü±Æ°E®Ê«Ü¹³¶İ;C

3o`Ç¿i¶µ¶i©ó±±`i OpenGL ÅX°Êµ¶i^{ao}¶p¿Ã¹ð¥·Æ³B²ziC¥·Æ³B²z-O±@°Ø¶i©ó`iµe±±^{aoa}«¥óÃä½t¥·ÆiA¥H`i±Öi³®É·|
¥X²{^{ao}¿÷¾i^a¬ju¶i¥±èjv®ÄªG±§§b³NjC1.5 x 1.5 ±èi^j`£`Ñ³i`i®Ä^{ao}¥·Æ³B²ziA¡Ó 2 x 2 ±èi^j`£`Ñ³i^{oaa01/4V13}«~½èjC

@e³\ÅX°Êμ{||çé¥X¥ßÅé¹³-À@æ!||COpenGL Å³¥îμ{||²{||b¥i¥H"ï¥î¥ßÅé"Ã±N·|±Ò°Ê¥ßÅé§ÖªÛ³zÃè;C

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!~ç!¶|μ@e³\ OpenGL`"ŸŸ!«D§i½è¹LÂo¥H´E°a1/4v¹³«~½èiC½Ðª`·N¡A±Ö°Ê¡¹¥\¯à±N·||b´E°a1/4v¹³«~½èªº|P®É°§C®Ä¯à¡C

!b±Ò°Ê®É;AOpenGL ÅX°Êμ{!;±N·|¥H¬Û!P^{ao}Åã¥Ü,Ñ^aR«×¤À°t¤@Ól±½w½Ä°ĩ»P¤@Ó²`«×½w½Ä°ĩ;C

³o¥iÄý«Ø¥ß!hÓμμi^{ao}À³¥íμ{!;Só!³®Ä!a¬ĩ¥î¼v¹³°O¾₄ÐÄé;C

!bÃö³¬®É;AOpenGL ÅX°Êμ{!;±N·|¬°À³¥íμ{!;«Ø¥ß^{ao¬}CÓμμi¤À°t¤@Ól±½w½Ä°ĩ»P¤@Ó²`«×½w½Ä°ĩ;C

!¹¥¬¬ã¥i¥H´£¤É¬ĩ¥î!hÓμμi^{ao} OpenGL Å³¥íμ{!;¤S®Ä¬ä;C

OpenGL 3.3 Core Profile

!¹¿ï¶µ¶i¶HSPÂ_¬OS_À³,Ó|b OpenGL À³¶|µ{|i¶¶iA«ö·Ó¹w³]È¬¶|¬S©w|â±m²`«×ªoS÷½è¶K¹i|C
¬¶¶|@â±|â±m²`«×±N©|²x¬¶| Windows @â±¥Ø«e¥¿|b°õ|æª|â±m²`«×ªSS÷½è¶K¹i|C
©|²x¬¶| 16 bpp »P ©|²x¬¶| 32 bpp ¿ï¶µ±N±j¬¶|¬S©w|â±m²`«×ªoS÷½è¶K¹i|A|ÓªE|Ò¼₄|@â±³]©wÈiC

!¹¿í¶µ¶iSPÂ_¥p¿Ã¹ð OpenGL Â³¶íµ¶í;ªº½w½¿Ã°íÃ½¶í¼Öí;C

±z¶i¥H±q°í¶ø¶Ç°eªèí;BÃ½¶íªèí;©îíÜ°Ê¿í¾Üªª¿í¾Ü;CíÜ°Ê¿í¾Ü@e³ÃX°Êµ¶í;@Ú¾Ü±zªºµwÃé²Õ°A°Ö¿í¾Ü³í°ªèí;C

l¹¿i¶µ¶iÂý±z«ü©w|p|ó|b OpenGL ¢¢³B²Z««ª½|P''B¡C

©l²xÃö³¬±N|b©Ö|³ OpenGL À³¥Îµ{¡¡¢¢©l²xÃö³¬««ª½|P''B¡C

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«ö·Ó'w³]È¶}±Ö°£«DÀ³¥Îµ{¡¡©ú½Tn''DÃö³¬««ª½|P''B¡AS_«h¥|±N«O«ù±Ö°Êª¬°A¡C

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OpenGL¡A!ÓµL»ÝªÀ§O³]©w`CÓ¿i¶µ¡C

·Æ'Î±±~ï®e³|±z¬°¿ï©w^{ao1}â±mÀW¹D¹½Õ³¼ă«G«×¡B¹ïañ«×©Î|÷°¿È¿C

|â±m,É¥¿±±ˆŸí“ó§U±z!bÂã¥Ü,Ë,mªW½Ö,Ë“Ó·½¼√¹³»P¨ä¿é¥Xª§¶¡ªº¥ú«×®t²§¡C|¹¥

$$\sqrt[4]{\frac{1}{v^{133}B^2z\tilde{A}^3\mu\{j\}}}\otimes\acute{E}\ll D\pm^{\frac{1}{3}}\acute{f}jA\neq\acute{y}i\neq H|b\pm z^{a0}\tilde{A}\tilde{a}\neq\ddot{U}^{\frac{3}{4}}\alpha W\tilde{A}\tilde{a}\neq\ddot{U}S\acute{o}e^{\frac{1}{2}}T|\hat{a}\pm m^{a0\frac{1}{4}}\sqrt[4]{v^{13}j}|p-\hat{U}\alpha\grave{u}:\wedge C$$
$$\begin{aligned} & \left| \text{O}\Psi\text{B}_i\text{A}\langle\text{U}\rangle\right| \text{H}^{\frac{1}{2}} \text{3D} \Psi\left\{ \left(\Psi^{\frac{1}{2}} \text{a}^{\text{a-1}} \text{C}\bar{\text{A}}_i, \mu \pm \frac{1}{2} \text{E} \cdot \text{U} \right) \text{t} \right\} \text{C} \left| \text{b} \right| \text{O}^{\frac{1}{2}} \bar{\text{A}} \text{W}^{\text{D} \pm \frac{1}{2}} \text{W} \Psi \left[-\text{U} \right] \text{P}^{\text{a} \pm \frac{1}{2}} \langle \text{G} \times \text{O} \left| \text{M}_i \right| \rangle \left| \bar{\text{I}}_i \right\rangle \cdot \text{U} \cdot \bar{\text{E}} \pm \text{N} \Psi \left\{ \text{H}^{\frac{1}{2}} \right\} \text{O} \cdot \bar{\text{C}}^1 \text{C}\bar{\text{A}}_i, \mu \pm \frac{1}{2} \text{S} \bar{\text{O}} \langle \text{G} \rangle \cdot \bar{\text{C}}_i \text{A}^{\text{a} \pm \frac{1}{2}} \bar{\text{E}} \pm \text{N} \Psi \left\{ \text{H}^{\frac{1}{2}} \text{S} \bar{\text{O}}^2 \text{M} \cdot \text{j} - \bar{\text{Y}}^1 \text{E}^1 \text{C}\bar{\text{A}}_i, \mu \pm \frac{1}{2} \text{C} \right\} \end{aligned}$$

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¼Æ!ì®¶°Ê¥iÂý±zSó!n!a±±¬¶!â±mªÀÂ÷»P±j«×;A±q!Ó¬¶©Ò!³À³¥!μ{!;ªªªº¼v¹³Só«GÄR²M´·;jC

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Áý±zzN¥Ø«e^{ao}!â±m³]©wÈÀx|s¬°|Ûq³]©wÈ;CªwÀx|s^{ao3}]©wÈ±N·|·s¼W"i¬Û¼F^{ao2}M³æªW;C

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±N©Ò!³!â±mÈÁÙ!ÛµwÁé^{ao}¼t³]©wÈ!C

®e³±zçî¼ÜÃ¥Ü¾¹ªp®É¼Ò!jG

!Û°Êº»´ú®e³\ Windows º½±µ±qÃ¥Ü¾¹¥»´´±µ!¬¥ç½Tªp®É,ê°T¡C!¹¬°¹w³]È¡C½Ðª·N¡A¬Y´ÇÂÂ¡¡Ã¥Ü¾¹¥!¬à£ªä´©!¹¥
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¤@¯ëp®Éª½!¡©Î **GTF** ¬O¤j!h¼Æ,û·s¡iµwÃé´!¥!ªº¼Ð·Ç¡C

Â÷´²Ã¥Ü¾¹p®É©Î **DMT** ¬O¤@°Ø,ûÂÂªº¼Ð·Ç¡A¬Y´ÇµwÃéª´µM´!¥!¹¼¼Ð·Ç¡C!pªG±zªµwÃén´D´!¥!
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±N NVIDIA QuickTweak 1İ¥Ü.s¼W!Ü Windows ¢u\$@!CjC

!¹1İ¥Ü@e³±z³z¹L¤@Ó¤è«KºSÖÅä!j¿İ³æjAjuSÖ³t!ajv®M¥İ©Ò!³!Ûq Direct3DjBOpenGL ©İ!â±m³]©wÈjC!¹¿İ³æÁÜ¥]St¥İ©óÁÜi¹w³]-
È»P!s`újuÅä¥Ü¼¹¤@ejv¹İ,Ü¤è¶İöº¶¶µ¥ØjC

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