

Fly Elise-ng B.V. Waterstad 31 5658RE Eindhoven The Netherlands Web: http://fly.elise-ng.net Email: info@elise-ng.net Tel: +31 (0)40-7114293

> Fly Elise-ng Immersive Display Frame Interpolation AI Assisted Frame Interpolation

Copyright © 2012/2024 Fly Elise-ng, All Rights Reserved

1	Int	roduction	3
2	Fly	Elise-ng AI based frame interpolation	4
3	Exa	amples frame interpolation configurations	6
3	3.1	Prepar3D	6
3	3.2	Microsoft Flight Simulator MSFS2020	9
3	3.3	X-Plane 11/12	.12

1 Introduction

Frame interpolation, a technique that generates additional frames between existing ones to enhance visual smoothness and reduce motion blur, has become a crucial component of modern gaming. NVIDIA's DLSS 3 and AMD's FSR 3 are two leading contenders in this space, each offering unique approaches to improve gaming experiences.

NVIDIA DLSS 3

DLSS 3, the latest iteration of NVIDIA's Deep Learning Super Sampling technology, introduces a feature called Frame Generation. This technology leverages AI to create entirely new frames, effectively doubling frame rates without compromising image quality. DLSS 3 achieves this by analyzing the scene and predicting the motion of objects, allowing it to generate realistic intermediate frames. However, DLSS 3 requires RTX 40 series GPU.

AMD FSR 3

AMD's FSR 3 also offers frame interpolation capabilities, but it takes a more traditional approach. FSR 3 utilizes motion vectors and optical flow analysis to predict intermediate frames between existing ones. While it doesn't offer the same level of frame generation as DLSS 3, FSR 3 still provides significant improvements in smoothness and reduces motion blur.

Both NVIDIA DLSS 3 and AMD FSR 3 are powerful tools for enhancing gaming experiences by increasing frame rates and improving visual quality. The choice between the two ultimately depends on individual preferences, hardware compatibility, and specific game requirements.

However, both NVIDIA DLSS 3 and AMD FSR 3 require tight integration with the game engine. Both require additional information from the game engine for each rendered frame. The game engine needs to calculate and provide motion vectors and scene depth information along with the rendered frame to DLSS 3 or FRS 3 engines. Although the set of games engines that support DLSS 3 or FRS 3 is growing, there is a huge amount of game engines that are not able to integrate with DLSS 3 or FRS 3. In addition, DLSS 3 requires at least RTX 40 series GPU and does not work on RTX 30 or older GPUs.



2 Fly Elise-ng AI based frame interpolation

Fly Elise-ng adds a seamless integration of frame interpolation for any game engine based on DirectX, OpenGL or Vulkan. It **does NOT require motion vectors or any other motion flow information from the game engine**.

Fly Elise-ng frame interpolation is based on a set of novel, highly optimized AI-trained algorithms executed on the GPU between each frame generated by the game engine. This effectively doubles the output frame rate (2 x FPS) while allowing the game engine to spend more time in processing and generating the game frames.

Frame interpolation takes only a fraction of the time needed to process and render the game frame. On a typical setup with 60 Hz displays, the game engine has a deadline of 16 ms to prepare and render each frame.

Our frame interpolation algorithms take between 0.5 and 3 ms per frame on the GPU, thus allowing the game engine to spend double the time per frame.

Just limit the application frame rate and increase rendering quality in the game. The game can render at 30 FPS, and for each game frame we will generate an interpolated frame and ensure both the real game frame and the interpolated frame are paced and presented with 60 FPS.

Another use case is ignoring the VSync and simply doubling the game frame rate. Let the game render as many frames as possible (unlimited FPS) and for each game frame we will generate an interpolated frame and ensure both the real game frame and the interpolated frame are paced and presented with 2 x FPS.

Frame interpolation can be enabled and configured per game, using the Immersive Display PRO – Ultimate or Immersive LCD PRO – Advanced Profile settings.

File View	Warping	Help				Desktop v	varping <mark>DISAB</mark>	LED Wi	ndow warping	ENABLED	M[GB]: H[0.2] F	[0.2]	DPI 100% 🖵
Load/Save	i Info) Display	vs Profiles	Simulators	\$ Settings	[] ^{Sets} 🚽	⊠ Support _→	Lock	ب License	(i About	Mi	nimize	} Exit
MSFS02020 X-Plane 12 Prepar3D DX11 DX12		+ -	Profile Profile name Executable nam Warp & e DirectX OpenGL Vulkan Frame int DX11/12 frame Class name Window title Frame interpor Dump timing in	me dge blending <i>A</i> erpolation (Exp e interpolation lation VSync	MSI *Fl & () () () () () () () () () ()	FS02020 ghtSimulator. Off DX9 On Off Off off off off off off off	exe DX10/DX1: ast) rs class name of rs title name of rs settings rs change of	I/DX12	ard pattern ma rd pattern mate n instructed i	tch (E.g. Ace. h (E.g. *Viev by custome	App*) v1*) r support!	on 🖌 I	Enabled
tonfig	ure alignmer	it 🚦	Enable Desk	top warping						Ţ	DWM - Windows	Desktop	Warping▼

Two frame interpolation algorithms are available: FITypeA (Super fast) and FITypeB (Super accurate) with a simple tradeoff between speed and fidelity.

In some specific cases the interpolation can be limited to a specific application window based on the windows class name or window captions. Those can be defined using full explicit names or using the wildcards "*" and "?'. They can match any or exactly one character. For most of the cases, the windows class and title names can be left empty.

The VSync settings determine the maximum frame rate of the game and interpolated frames. The available options are 'Application VSync settings", "VSync On" and "VSync Off'.

When application-defined vSync is On or Frame Interpolation VSync is On, then the total frame rate (real + interpolated) is limited to the connected display refresh rate. In case of 60 Hz displays, the application will render 30 frames per second and the frame interpolation will insert additional 30 frames per second.

In cases when the VSync is off, then the application frame rate is unbounded. In such a case, frame interpolation will again generate a new frame for each application frame and by this doubling the total frame rate.

Frame interpolation can be temporarily enabled or disabled using the Enable toggle.

3 Examples frame interpolation configurations

3.1 Prepar3D

Prepar3D is based on the DirectX 12 rendering pipeline. Frame interpolation can be enabled in both single view mode (2D Surround) and multi-view mode (ViewGroups).

Start P3D and configure the P3D target frame rate to 30 FPS and keep the VSync On.

General	Display Global Settings	Full Screen Settings
	Profile:	Display:
Application	Custom	NVIDIA GeForce RTX 3090.0.0
Information		Resolution:
Sound	Save Settings Reset Defaults	1280x1024x32
Traffic		
Realism		Black-out Desktop 💽 Auto-fill Main View
Graphics	Image and Texture Quality	Frame Rate Controls
	FXAA: AA:	VSync:
Display	On • 8xMSAA •	On Triple Buffering
World	Texture Filtering: Texture Resolution:	Target frame rate: 30
Lighting	Anisotronic 8x High - 2048x2048	
Weather		
Controls		View and Panel Settings
		Wide-view Arnert Ratio
Key Assignments	LOCKHEED MARTIN	
Axis Assignments		
Calibration		2-D panei transparency (76): 0
Other		
		Cancel OK

Create a profile for P3D. In the Executable name field enter *Prepar3D.exe (do not forget the *). This will ensure that Prepar3D.exe from any system path will be used for frame interpolation.

Leave the VSync to "Application defined VSync" and Enabled to True. Select one of the available frame interpolations FITypeA or FITypeB. Start with FITypeA (fastest) and if some GUI artifacts are observed, try FITypeB.

File View	Warping	Help				Desktop w	varping DISAB	LED	Vindow warping	ENABLED	M[GB]: H[0.2] P[0.1]	DPI 100% 🚽
Load/Save	i Info	III Display	s Profiles	X Simulators	ç Settings	[] Sets 🗸	<mark>⊠</mark> Support _↓	Lock	ب License	i About	Minimiz	e Exit
MSFS02020 X-Plane 12 Prepar3D DX11 DX12		+	Profile Profile name Executable nam Executable nam Warp & e DirectX OpenGL Vulkan Frame int DX11/12 frame Class name Window title Frame interpol	ne dge blending / erpolation (Ex e interpolation ation VSync	Preg *Pro & C & C & C & C & C & C & C & C & C & C	par3D epar3D.exe off DX9 On off off peB (Super ac oty or windows by or windows ication VSync anced setting	DX10/DX11 curate) a class name o s title name or settings gs: Change o	/DX12	card pattern mat ard pattern matc en instructed l	tch (E.g. Ace h (E.g. *Vie by custome	On (*App*) w1*) er support!	Enabled
			Dump timing in	ifo	× • • • • • • • • • • • • • • • • • • •)ff						
de Configu	ure alignmen	nt	Enable Desk	top warping						-	DWM - Windows Deskt	op Warping▼

After Prepar3D is started it will report the game FPS of max 30 frames per second. However, output sent to the GPU (shown by Display PRO frame timing graph) is doubled to max 60 FPS.



3.2 Microsoft Flight Simulator MSFS2020

Microsoft Flight Simulator is based on the DirectX 11 or DirectX 12 (experimental) rendering pipeline. Frame interpolation can be enabled for both DirectX 11 and 12 modes and in both single view mode (2D Surround) and multi-view mode ungrouped displays mode.

Start MSFS2020 and limit MSFS2020 frame generation to 50% of the supported display frame rate. Keep the VSync On.

	GENERAL OPTIONS		6		· ۷			
				1	1			
> GENERAL	OPTIONS							
GRAPHICS		PC	>	DI	ESCRIPTION			
CAMERA	SEARCH	P RESULTS FOUND: 6	B	Th Gle	ese settings are af obal Rendering Qua			
SOUND	DISPLAY MODE		WINDOWED		1.150			
TRAFFIC	FULL SCREEN RESOLUTION	FULL SCREEN RESOLUTION						
DATA	ANTI-ALIASING	NVIDIA DLSS SUPER RESOLUTION	DN >					
ELIGHT MODEL	NVIDIA DLSS SUPER RESOLUTION	QUALITY						
	AMD FIDELITYFX SHARPENING		•	100				
MISC	V-SYNC		< ON					
ACCESSIBILITY	NVIDIA REFLEX LOW LATENCY		C OFF					
DEVELOPERS	FRAME RATE LIMIT		50% MONITOR REFRESH RATE					
1011005	HDR10							
VR MODE	DIRECTX VERSION		DX11	2				
EXPERIMENTAL	GLOBAL RENDERING QUALITY		CUSTOM	>				
	ADVANCED SETTINGS							
	TERRAIN LEVEL OF DETAIL			150				
	44			-	-			
ESC GO BACK F12 RESET TO DE	FAULTS							

Create a profile for MSFS. In the Executable name field enter *FlightSimulator.exe (do not forget the *). This will ensure that FlightSimulator.exe from any system path will be used for frame interpolation, for both standalone or Steam based installations.

Leave the VSync to "Application defined VSync" and Enabled to True. Select one of the available frame interpolations FITypeA or FITypeB. Start with FITypeA (fastest) and if some GUI artifacts are observed, try FITypeB.

File View	Warping	Help				Deskto	p warping DI	ISABLED	Window warping	<u>ENABLED</u>	M[GB]: H[0.2] H	P[0.2]	DPI 100% 🖵
Load/Save	i Info	H Displays	Profiles	X Simulators	🔅 Settings	[] Sets	Suppor	t _e Loc	k License	i About	м	nimize	₽ Exit
MSFS02020 X-Plane 12 Prepar3D DX11.exe DX12			Profile Profile name Executable nam Warp & e DirectX OpenGL Vulkan Frame int DX11/12 frame Window class Window name Frame interpo Dump timing in	me dge blending A erpolation (Ex e interpolation name lation VSync	MSF *Fil & C & C & C Derimental) FITy Emp Emp Use Use Vadv.	S02020 ghtSimula off DX9 (off peA (Supe obty or wind the applicit anced se o	or,exe)n ⊘ DX10/ r fast) iows class na ows title nar ation settings things: Char	DX11/DX12	idcard pattern m iccard pattern ma rhen instructed	atch (E.g. Acc tch (E.g. *Vie I by custome	(On #App*) w1*) er support!	Enat	num in the second
tonfig	ure alignment	t 📲	Enable Desk	top warping							DWM - Windows	Desktop '	Warping▼

After MSFS2020 is started it will report the game FPS of max 30 frames per second. However, output sent to the GPU (shown by Display PRO frame timing graph) is doubled to max 60 FPS. The main thread can spend up to 30 ms per frame while the output is generated every 16 ms with one game frame and one interpolated frame.



3.3 X-Plane 11/12

Both X-Plane 11 and X-Plane 12 are based on the Vulkan rendering pipeline. Optionally, X-Plane 11 can be configured to use the OpenGL rendering pipeline. Frame interpolation can only be applied on the DXGI based rendering pipeline used by DX11 and DX12.

Fortunately, the recent NVidia drivers and control panel allow configuring Vulkan/OpenGL based software to use the DXGI layer for presentation. Thai makes it possible to apply frame generation to all Vulkan and OpenGL based game engines.

Open the NVidia Control Panel, create a profile for XPlane and at the bottom of the settings select "Prefer layered on DXGI Swapchain" for Vulkan/OpenGL present method. Apply the settings and exit the NVidia Control Panel.



Start X-Plane and configure the graphics settings. Keep the Use VSync option On.

Texture Quality		Maximum	Cloud Quality	Maxim
Ambient Occlusion Quality (SSAO)		Ultra	Shadow Quality	Maximu
Rendering Resolution (FSR Supers	amp	Ultra	Rendering Distance	Maximu
Robust Contrast Adaptive Sharper	ning (RCAS)	0%	World Objects Density	Maximur
Anisotropic Filtering		16x	Vegetation Density	Maximun
MSAA Antialiasing Enable FXAA Antialiasing ACCESSIBILITY		8x MSAA	Draw parked aircraft Enable 3D vegetation Use Zink plugin bridge	ľ
Base Font Size		14 px	User Interface Size 100% X-Plane cannot increase the user interface size at this screen si	
MONITOR CONFIGURATION				
Monitor usage	Full Screen Simulator	~	VISUAL OFFSETS	
Resolution VISUAL SETTINGS	Default Monitor Settings	~	Wraparound (Rotation) Offsets Use rotation offsets for wraparound views, where your monito	rs are angled around you,
Default view [w] FIELD OF VIEW	Forward with 3-D cockpit	~	Lateral rotation offset Vertical rotation offset Roll rotation offset Roll offsets are typically used when a monitor is turned sideways.	0.00 degree 0.00 degree 0.00 degree

Create a profile for X-Plane. In the Executable name field enter *X-Plane.exe (do not forget the *). This will ensure that X-Plane.exe from any system path will be used for frame interpolation.

Leave the VSync to "Application defined VSync" and Enabled to True. Select one of the available frame interpolations FITypeA or FITypeB. Start with FITypeA (fastest) and if some GUI artifacts are observed, try FITypeB.

Important: In the profile Warp and edge blend API make sure that Vulkan and OpenGL are disabled and only DirecX10/11/12 is enabled. This will ensure that DXGI will be used for presentation and frame interpolation.

File View	Warping	Help				Desktop v	varping <mark>DISA</mark>	BLED Wir	ndow warping	<u>ENABLED</u>	M[GB]: H[0.2] P[0	.1] DPI 100% 🗸		
Coad/Save	i Info	III Displays	Profiles	X Simulators	ç Settings	[] Sets 🗸	∑ Support _→	Cock	ب License	i About	Minin	nize Exit		
MSFS02020 X-Plane 12 Prepar3D DX11 DX12		+ -	Profile Profile name Executable nam Warp & e DirectX OpenGL Vulkan	me dge blending A	X-PI *X-I PI & 0 & 0 & 0 & 0	ane 12 Plane.exe ff DX9 On (ff	✓ DX10/DX1;	1/DX12			-			
			▼ Frame interpolation (Experimental)											
			DX11/12 frame	e interpolation	FITy	peA (Super fa	ist)	•			Or	🖌 🖌 Enabled		
			Class name		Emp	Empty or windows class name or a wildcard pattern match (E.g. AceApp*)								
			Window title		Emp	ty or window		r a wildcard						
			Frame interpol	lation VSync	VSyr Adva	VSync On Advanced settings: Change only when instructed by customer support!								
			Dump timing ir	nfo	On	0n 🤣								
2			🔻 NVidia DL	SS frame aene	eration (Expe	rimental)								
🎝 Confi	gure alignmen	t	Enable Desk	top warping							DWM - Windows De	sktop Warping▼		

After X-Plane is started it will report the game FPS of max 30 frames per second. However, output sent to the GPU (shown by Display PRO frame timing graph) is doubled to max 60 FPS.

