

From: Preston Byargeon
Sent: Tuesday, May 22, 2001 9:44 AM
To: Amir Majidimehr; David Workman; Mike Beckerman; Brian Crites; Jordi Ribas; Steve Sklepowich; Kevin Unangst; Linda Averett; Chadd Knowlton; John Enslin; Tom Honeybone; Dave Fester; Geoff Harris
Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Geoff Harris; Kathy Demaree (WALLING); Ming-Chieh Lee; Mike Wall; Lin Liu; Dan Penn
Subject: RE: Frame Interpolation: status, meeting summary, and open issues

Since you were asking a question, I'll answer and then end my part of the thread ☺

There are many features we would like to do, but due to time constraints and our ability to verify the quality of the feature, I am suggesting we narrow the focus. I am looking at the issue from a quality perspective.

As for your arguments, I hope in a meeting we can discuss the following:

- You indicate that 80% of the content out there is with WMVideo 3, yet this feature will not work for that type of content. I would think that you would want this feature to work for WMVideo 9 and beyond to help encourage the use of the new codec. Don't you want to have features to move content creation off of WMVideo 3? IF WMVideo 7 and WMVideo 8 have not made much progress, then I would think that we really don't need to support those codecs for this feature. We would be pushing WMVideo 9, the latest and greatest.

I'm an interested party for your meeting ☺

Thanks,
-Preston

-----Original Message-----

From: Amir Majidimehr
Sent: Tuesday, May 22, 2001 9:30 AM
To: Preston Byargeon; David Workman; Mike Beckerman; Brian Crites; Jordi Ribas; Steve Sklepowich; Kevin Unangst; Linda Averett; Chadd Knowlton; John Enslin; Tom Honeybone; Dave Fester; Geoff Harris
Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Geoff Harris; Kathy Demaree (WALLING); Ming-Chieh Lee; Mike Wall; Lin Liu; Dan Penn
Subject: RE: Frame Interpolation: status, meeting summary, and open issues

Just double checking Preston. You are not saying that the market requirements are different than I said (which was the main focus of my reply). Your concern is regarding our ability to test this and performance issues. Correct?

As to the CPU hit, I think there is a disconnect here.

1. XP predominantly gets installed on new machines. This means 1.2 Ghz plus machine.
2. Intel is going to launch a huge price war to push its 1.7+ Ghz P4 systems in time for Xmas/XP launch. AMD will do the same with 1.4 Ghz Athlons. This means that most everyone will be buying high-performance systems come this Fall.
3. A lot of video on the web is low resolution, not 320x240. It would be great to accelerate this regardless of codec version number.
4. We need to drive adoption of new PCs as this drives sales of Windows. It would be just fine if people had to buy a new PC to get this feature.

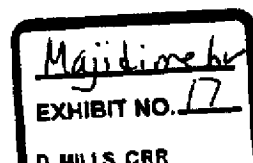
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Note that I am not saying that we shouldn't look at the performance or have a minimum bar for it. We must. But we should not overly focus on it. Anything too slow now will be just fine six months from now. What's more, we have had zero ability to get people to use our latest codecs. Today, 80% of the content on Windowsmedia.com is using WMV 3 or older! WMV 7 is an exception and WMV 8 is almost nowhere to be found. I hate to see us do so much work on this feature and have it sit someplace, gathering dust for a year or two while Real catches up. On the latter front, let me mention that Real had a poor implementation of this same feature for three years now and it is not codec version specific.

Jordi, I recommend that we stop this thread here and instead, call a meeting with interested parties.

Thanks,
Amir

---Original Message---

From: Preston Byargeon

Sent: Tuesday, May 22, 2001 9:08 AM

To: Amir Majidmehr; David Workman; Mike Beckerman; Brian Crites; Jordi Ribas; Steve Sidepovich; Kevin Unangst; Linda Averett; Chadd Knowlton; John Enslin; Tom Honeybone; Dave Fester; Geoff Harris

Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Geoff Harris; Kathy Demaree (WALLING); Ming-Chieh Lee; Mike Wall; Lin Liu; Dan Penn

Subject: RE: Frame Interpolation: status, meeting summary, and open issues

I beg to differ. Testing content is a huge test hit considering how much CPU power is required for this feature. You could even argue trying to enable it for the Corona time frame, but considering the time crunch we currently have, I don't see how this feature can be tested well without extremely narrowing the focus. I find it important to narrow the focus to:

- WMVideo9 only
- Windows XP only
- Don't frame interpolate unless the source content is between 5 fps and 15 fps. These are the sweet spots.

Remember, there is still a lot of work to be done here which you can see with the attached raid query. The demo is maxing out a very high end machine, and we have very limited resources for the player team.

Also, here are the areas that will take a lot of time to test well:

- PERFORMANCE: We cannot frame interpolate on a recommended XP client. Codec team needs to work on increasing performance so that a user can frame interpolate with X% more CPU power. Hopefully, this is less than 50%.
- Player frame interpolates content, but the machine is not powerful enough. The codec has to thin down back to normal playback
- Player frame interpolates content in a lossy environment such as the Internet.
- Player frame interpolates content and the audio and video are out of sync.
- Player frame interpolates MBR content and the player thins the video down.
- Player frame interpolates VBR content (actually, do we allow this?)
- Player frame interpolates and you FF, FRewind or Seek.
- Player frame interpolates and the video is stretched.
- Player frame interpolates with seamless stream switching
- Player frame interpolates 3 times, but can only do 2 times.

This is off the top of my head, but as you can see, this feature needs to be extremely narrowed. I really believe we need to do this for WMVideo 9 only.

Thanks,

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-Preston

-----Original Message-----

From: Amir Majidmehr
Sent: Monday, May 21, 2001 11:36 PM
To: David Workman; Mike Beckerman; Brian Crites; Jordi Ribas; Steve Sklepowich; Kevin Unangst; Linda Averett; Chadd Knowlton; John Enslein; Tom Honeybone; Dave Fester; Geoff Harris
Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Preston Byargeon; Geoff Harris; Kathy Demaree (WALLING); Ming-Chieh Lee; Mike Wall; Lin Liu; Dan Penn
Subject: RE: Frame Interpolation: status, meeting summary, and open issues

I think David makes a good point here. I have always said that Frame Interpolation should be available only on XP. As such, it is unnecessary and counterproductive to have it only work with the latest codec. We need to be able to demo this easily to press and analyst by just going to a random site on the internet and show how much better XP runs. If we tell them that we need new content for this to work, the story will be much weaker.

Having said this, I do think we can write-off some of the older codecs to reduce the test burden. My vote is that we stay with WMV 7+.

Amir

-----Original Message-----

From: David Workman
Sent: Monday, May 21, 2001 3:09 PM
To: Mike Beckerman; Brian Crites; Jordi Ribas; Steve Sklepowich; Kevin Unangst; Linda Averett; Chadd Knowlton; John Enslein; Amir Majidmehr; Tom Honeybone; Dave Fester; Geoff Harris
Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Preston Byargeon; Geoff Harris; Kathy Demaree (WALLING); Ming-Chieh Lee; Mike Wall; Lin Liu; Dan Penn
Subject: RE: Frame Interpolation: status, meeting summary, and open issues

>> I'd prefer we have frame interpolation work only with v9 ... It (also) encourages migration to XP.

Actually, I believe the opposite is true. Since the frame interpolation only works in Windows Media Player for XP, enabling frame interpolation so it works with WMV 7 and WMV 8 content will encourage migration to XP, since using MPXP will then make Windows Media playback a better experience.

Only enabling WMV 9 may encourage format adoption by ICP's, but the total percentage of content in WMV 9 will be so small for the next year that it will not be much of an incentive for an end-user to migrate to XP.

DW

-----Original Message-----

From: Mike Beckerman
Sent: Friday, May 18, 2001 11:42 AM
To: Brian Crites; Jordi Ribas; Steve Sklepowich; Kevin Unangst; Linda Averett; Chadd Knowlton; John Enslein; Amir Majidmehr; Tom Honeybone; Dave Fester; Geoff Harris
Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Preston Byargeon; Geoff

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Harris; Kathy Demaree (WALLING); Ming-Chieh Lee; Mike Wall; David Workman;
Lin Liu; Dan Penn
Subject: RE: Frame Interpolation: status, meeting summary, and open issues

I'd prefer we have frame interpolation work only with v9. As you said, it
minimizes resources. It also encourages migration to XP.

I agree w/Brian that it's tough to give an opinion on having it on/off by default w/o
further perf information.

-----Original Message-----

From: Brian Crites
Sent: Thursday, May 17, 2001 7:06 PM
To: Jordi Ribas; Steve Sklepowich; Kevin Unangst; Linda Averett; Chadd
Knowlton; John Enslin; Mike Beckerman; Amir Majidimehr; Tom
Honeybone; Dave Fester; Geoff Harris
Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Preston
Byergeon; Geoff Harris; Kathy Demaree (WALLING); Ming-Chieh Lee;
Mike Wall; David Workman; Lin Liu; Dan Penn
Subject: RE: Frame Interpolation: status, meeting summary, and open
issues

Comments below...

-----Original Message-----

From: Jordi Ribas
Sent: Thursday, May 17, 2001 6:48 PM
To: Steve Sklepowich; Kevin Unangst; Linda Averett; Chadd
Knowlton; John Enslin; Mike Beckerman; Amir Majidimehr; Tom
Honeybone; Dave Fester; Brian Crites; Geoff Harris
Cc: Dhananjay Mahajan; Bill Schiefelbein; Becky Weiss; Preston
Byergeon; Geoff Harris; Kathy Demaree (WALLING); Ming-Chieh
Lee; Mike Wall; David Workman; Lin Liu; Dan Penn
Subject: Frame Interpolation: status, meeting summary, and
open issues

Those in the CC line met yesterday to review the spec on Frame
Interpolation [jordi:\Public\Docs\Final-FrameInterpolation.doc](file://jordi:\Public\Docs\Final-FrameInterpolation.doc).

Summary

Frame interpolation increases the frame rate when playing the
content, and hence reduces the motion jerkiness when a video
clip is encoded at low frame rate, e.g., below 24 or 30
frames/sec. Alternatively, one can use frame interpolation to
improve video quality, or to reduce bit rate for a given level of
quality. For example, one may save bits when encoding a clip by
reducing the frame rate since the player will upsample to the full
frame rate. As a result, the near-VHS video quality that we get
today at 250 Kbps may be achieved at about 175 Kbps for a wide
variety of content (we must do more tests to confirm this).

This feature has been a DCR for the last couple of months and
has finally made it into the SDK (thanks to great "late-night" work
by BeckyW and BrianCr), and is currently working very well in
Zeus+Rosetta. A few work items remain, e.g., the Player team will
soon add a switch to let users turn this feature On/Off.

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For a quick "canned" demo, feel free to compare the files "flower_7.avi" (original, 7 frames/sec) and "flower_7to21.avi" (interpolated from 7 to 21 frames/sec). The files are in \\prod1\Demos\CodecReview\FramesInterp, but you may should copy them locally for smooth playback. We just learned that this AVI clip has a copyright, so please do not show/share this clip externally and may want to delete it after you use it. Observe that the algorithm inserts two frames using motion compensation between each couple of original frames, and hence the motion is much smoother. We can actually do this same demo in Zeus+Rosetta with the original coded using WM Video. We also have other demos running on Zeus+Rosetta, so let me or MingCl know if you want to take a look.

[BrianCr] Has anyone tried to see what impact this has on content with lip sync requirements? Are there any negative artifacts?

[BrianCr] Your example above is going is 3 to 1 interpolation. This brings up the interesting point about how you will at runtime determine which scale factor to use. More below...

Somekey details:

1. The Player (Rosetta) will implement a Group policy switch (in addition to the switch in the UI) to turn this feature On/Off.
2. The algorithm will turn itself off automatically if a) the CPU is not capable of interpolating frames (e.g., the original video clip resolution is too high for the given CPU), b) interpolation is too difficult (e.g. the frame rate is too low and hence the coded frames are too far apart in time), and c) the frame rate is too high (e.g., the motion smoothness is already good enough, so there is no need to increase the frame rate further).
- 3.
4. (These points, functional diagrams, quality and perf requirements, reg keys and other details are in the spec).

We reached agreement on the following:

This feature will be enabled only for XP/XP.1, WM Format SDK (Zeus), WM Player 9 (Rosetta), and respective future versions. This is because a) we want frame interpolation to encourage customers to move to our newer OS, SDK, Player, b) this feature requires high-perf CPUs and XP will usually run in faster PCs, and c) the feature is a DCR in a tight schedule and we desire to minimize test impact. Observe that Players 6.4 and 7 will not support this feature, and that Player apps built on top of Zeus will only be able to enable this feature if they are running on an OS >= XP.

1. [BrianCr] How will we enforce this? Will the codec/frame interpolator have OS version checking for this similar to what it does for M-C? I recommend that the Player have the smarts in the UI to disable this if the platform is not Whistler (not an issue until Corona) and that the Frame interpolator component fail at runtime (with a friendly error) if it is attempted to be used on a non-supported platform. Frame interpolation will ship with both HMX and Eclipse/XP.1. This was decided a while back in a meeting with KevinU, LindaAv, ChaddKn, JohnEn, AmirM and myself.

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Open Issues:

1. We currently have enabled Frame Interpolation for WM Video 7, 8, 9. We are considering limiting it just to WM Video 9. We need your input, especially from marketing, to close this ASAP, because the test impact is significant. The benefit of enabling it for WM Video 7 and 8 is that users will be able to take advantage of frame interpolation on all such content created so far. If we limit it just to WM Video 9, it may help push users/content creators to version 9 and it will certainly reduce the test matrix.
2. We did not agree on whether to turn this feature On or Off by default. We decided to set it Off for now, but need more input here as well. The benefit of having it On is that the feature will get more exposure — this is an advanced feature that's hard to turn On/Off and many users may not find the switch easily. The benefit of keeping it Off is that the Player will have higher performance by default.
- 3.
4. [BrianCr] Until we hear some numbers about what the perf hit is for different content (different frame rates, different degrees of motion, ...) it is difficult to comment on this. Are we roughly talking 50% more CPU, 5%, what?
- 5.
6. [BrianCr] If the component will be able to do multiple degrees of scalability (2:1, 3:1, ...) then I recommend that the value set by the client be a number scale factor rather than a boolean. For example, a value of 1 means no interpolation, 2 means 2:1 scaling and 3 means 3:1 and so on. But this does raise the question as to when will the component auto curve the algorithm. If the CPU is pegged, obviously we don't want to do 3:1 if 2:1 would continue to work. Who is responsible for this determination and setting? I am thinking that the frame interpolator will handle this automatically.
- 7.

1.
I'd like to make sure that we get enough feedback on everything above, particularly on the open items. I plan to hold a quick meeting soon to resolve them. I'll invite at least KevinU, StevSk and one pgm from each affected team (BillSch, KathDem?). If anybody else would like to participate, please let me know.

Thanks,
Jordi

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