Re: Program for synthetic BOS image generation

Rajendran, Lalit <lrajendr@alumni.purdue.edu>
Thu 11/24/2022 13:53
To: Liu, Felix <liu2730@purdue.edu>
Cc: felix.liu@dlr.de <felix.liu@dlr.de>

Ok, that is representative of the typical shift in BOS.

Can you try to run the images through a cross correlation algorithm and check if the displacements match?

You can also scale the entire density field by 10x and check for a visible displacement in the images.

Sent from my iPhone

> On Nov 24, 2022, at 7:40 AM, Liu, Felix <liu2730@purdue.edu> wrote:
>
>
> Hi Lalit,
>
> So based on my calculations for each position, the difference appears to be less than 1 pixel so then they would not be visible. However, I am wondering if you were intending for your sample density gradient to produce a visible shift. Let me know how I should continue with this.
>
> Thanks,
> **Felix Liu**
> Purdue University | *Class of 2023*
> Electrical Engineering
>
> ---
>
> **From:** Rajendran, Lalit <lrajendr@alumni.purdue.edu>
> **Sent:** Wednesday, November 23, 2022 19:42
> **To:** Liu, Felix <liu2730@purdue.edu>
> **Subject:** Re: Program for synthetic BOS image generation
>
> Great. Yes the ray tracing is working!

Can you calculate the difference between the light ray positions (units of microns) and divide it by the pixel pitch from the parameters to calculate the pixel displacement?

Sent from my iPhone

> On Nov 23, 2022, at 8:01 AM, Liu, Felix <liu2730@purdue.edu> wrote:
>
> Hi Lalit,
>
> Some of the code files in python contained similar functions to the ones in Matlab so I used your python functions to make a simple script and about 58,564,799 of 60,000,000 rays had different values between images 1 and 2 for the first binary files of each of the images. Does this mean that the calculations are working but the image generation is not?
>
> Thanks,
> **Felix Liu**
> Purdue University | *Class of 2023*
> Electrical Engineering
> ---
> **From:** Rajendran, Lalit <lrajendr@alumni.purdue.edu>
> **Sent:** Monday, November 21, 2022 23:41
> **To:** Liu, Felix <liu2730@purdue.edu>
> **Subject:** Re: Program for synthetic BOS image generation
>
> You can use this function:
>
> > <dot-tracking-package.png>
>
> > dot-tracking-
> > package/load_lightray_data_02.m at master
> > · lalitkrajendran/dot-tracking-package
> > github.com
>
> Sent from my iPhone

On Nov 21, 2022, at 8:45 AM, Liu, Felix <liu2730@purdue.edu> wrote:

Hi Lalit,

I was not sure if this is what you were talking about, but I compared the binaries of two of the 12 light position files for image 1 and 2. Let me know how I should interpret these.

Thanks,
Felix Liu
Purdue University | *Class of 2023*
Electrical Engineering

From: Rajendran, Lalit <lrajendr@alumni.purdue.edu>
Sent: Monday, November 21, 2022 10:52
To: felix.liu@dlr.de <felix.liu@dlr.de>
Cc: Liu, Felix <liu2730@purdue.edu>
Subject: Re: Program for synthetic BOS image generation

It looks like the code is using the density gradient file for the second image.

The code has an option to dump all the light ray positions and directions to a file. Could you dump them and compare the light ray positions for the reference and gradient cases?

Thank you,
Lalit

Sent from my iPhone

> On Nov 21, 2022, at 2:26 AM, felix.liu@dlr.de wrote:
>
>
> Hi Lalit,
>
> I have attached the terminal log for when I run the code in the link below.

https://github.com/liu2730/FileShares/blob/main/simTerminalOut.txt
Let me know if you need anything else.

Thanks,
Felix

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Felix Liu

felix.liu@dlr.de

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From: Rajendran, Lalit <lrajendr@alumni.purdue.edu>
Sent: Sunday, November 20, 2022 2:22 AM
To: Liu, Felix <felix.liu@dlr.de>
Subject: Fwd: Program for synthetic BOS image generation

It would be useful if you can send the log obtained by running the code, that would help me understand what's going on.

Thank you,
Lalit.

Begin forwarded message:

> **From:** "Liu, Felix" <liu2730@purdue.edu>
> **Date:** November 15, 2022 at 5:19:11 AM PST
> **To:** "Rajendran, Lalit" <lrajendr@alumni.purdue.edu>, felix.liu@dlr.de
> **Subject: Re: Program for synthetic BOS image generation**
>
>
> Hi Lalit,
>
> Thank you for the reply. I have already made sure that this option is enabled in the parameter files
> that I created with your code, and unfortunately, it still generates images with no displacement.
> <image001.png>
>
> <image002.png>

I believe that this option in the .mat file does not matter too much as the simulation code sets it to false to generate the first image then turns this option true to generate the second image. Also, I am unable to download the file as it is blocked on both my emails, so if you plan to share files with me, using github or something may be better. Perhaps you may have other leads that I should look into?

Thanks again,
Felix

From: Rajendran, Lalit <lrajendr@alumni.purdue.edu>
Sent: Monday, November 14, 2022 23:56
To: felix.liu@dlr.de <felix.liu@dlr.de>
Cc: Liu, Felix <liu2730@purdue.edu>
Subject: Re: Program for synthetic BOS image generation

Sorry for the late response.

I downloaded the images, and cannot see a displacement either.

I think this is because the default parameters have the density gradient simulation part turned off. This is the parameter data.density_gradients.simulate_density_gradients.

Shown below is a screenshot in Python:
<image003.png>

I have enabled the parameter in the attached mat file. Give that a try. You may have to adjust the file path etc.

Thank you,
Lalit

On Nov 7, 2022, at 6:38 AM, felix.liu@dlr.de wrote:

Hi Lalit,

I hope you are doing well. I am once again contacting you about your BOS simulation code. I have

played around with some of the features of your code and there are still some questions I have. Results of these simulations I have attached in the link below as the images are too large to share through email.
https://github.com/liu2730/FileShares/tree/main/DefaultSetting_Images

Regarding the example simulation that you provided, we used a cross correlation software and found no difference between the base image and the resulting image with the density gradients applied. We believed the problem may have been caused by the density gradient file itself so we created new gaussian density file based on the code provided. The results yielded mixed results and none which corresponded with an expected response. In the link above it shows results from the example and two sets of interesting interactions with our test NRRD file.

One of the interactions results in a zoom of pictures which is more expected for the gaussian distribution. The other interaction was a quadrant shift utilizing the same density gradient files but with changed min and max values for xyz within the file. We also took slices of the volume distributions and displayed them on a color map to discover that the problem may not lie in the density files themselves but in how the base code interacts or applies the density files. I have attached these colormaps in the link below (sample for the provided density, and test for the gaussian density that we created).
https://github.com/liu2730/FileShares/tree/main/Sample_Test_Colors

I apologize for such a long email summarizing some of our tinkering, but hope that it could provide some context for where our problems are. Since we can see that the density files are generated as expected, I am wondering where and what we could look into to see the densities properly applied to the second images. Your help in this is greatly appreciated!

Thanks,
Felix

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Felix Liu

felix.liu@dlr.de

From: Rajendran, Lalit <lrajendr@alumni.purdue.edu>

Sent: Thursday, October 13, 2022 5:35 AM
To: Liu, Felix <felix.liu@dlr.de>
Cc: liu2730@purdue.edu
Subject: Re: Program for synthetic BOS image generation

Hi Felix,

The displacements will be small in BOS - less than 1 pixel for most cases.

You can try to subtract the two images to observe the gradients

Sent from my iPhone

> On Oct 12, 2022, at 8:45 AM, felix.liu@dlr.de wrote:
>
>
> I apologize for keeping this email chain so long, but it appears I have a problem with generating two separate image files. It appears that the density gradient properties are not applied on the second rendering. I have attached the images I get if you would like to see. Let me know if there are any code I should look at or configurations I should change to fix this situation. I appreciate your help once again.
>
> Thanks,
> Felix
>
> _____
>
> **Deutsches Zentrum für Luft- und Raumfahrt** e.V. (DLR)
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>
> **Felix Liu**
>
> felix.liu@dlr.de
>
> ---
>
> **From:** Rajendran, Lalit <lrajendr@alumni.purdue.edu>
> **Sent:** Tuesday, October 11, 2022 6:06 PM
> **To:** Liu, Felix <felix.liu@dlr.de>
> **Cc:** liu2730@purdue.edu
> **Subject:** Re: Program for synthetic BOS image generation

The two images are displaced with respect to each other and you can measure this displacement using a dot tracking or a cross correlation algorithm. You can find a dot tracking code repository in my profile.

You can then use the optical model for BOS to calculate the density gradient field and the density field and the uncertainty. You can check the bos uncertainty package in my profile for that.

The positions and parameters are the inputs used for the image generation.

Sent from my iPhone

> On Oct 11, 2022, at 6:06 AM, felix.liu@dlr.de wrote:
>
> Hi,
>
> So I found some images and other files under the "Images" Folder. What I see from the .tif files is two bos pattern images that look identical. Is this what I should be seeing? Under sample-images folder is 2 .mat files for positions and parameters that were not edited in running the script. What are the next steps in generating the density gradient plots? Thanks again for the help!
>
> Best regards,
> Felix
>
> _____
>
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>
> **Felix Liu**
> felix.liu@dlr.de
> _____
>
> **From:** Rajendran, Lalit <lrajendr@alumni.purdue.edu>
> **Sent:** Tuesday, October 11, 2022 5:44 AM

To: Liu, Felix <felix.liu@dlr.de>
Cc: liu2730@purdue.edu
Subject: Re: Program for synthetic BOS image generation

Great! The images should be under the sample-images folder

Sent from my iPhone

> On Oct 10, 2022, at 9:30 AM, felix.liu@dlr.de wrote:
>
> Hi Lalit,
>
> Thanks for your response again! I have believe that I have the sample script running now. However I do not know what the output should look like. Is there an image file that I should be able to open and where would it be located?
>
> Best Regards,
> Felix
>
> _____
>
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>
> **Felix Liu**
>
> felix.liu@dlr.de
>
> **From:** Rajendran, Lalit <lrajendr@alumni.purdue.edu>
> **Sent:** Friday, October 7, 2022 5:27 AM
> **To:** Liu, Felix <liu2730@purdue.edu>
> **Cc:** Liu, Felix <felix.liu@dlr.de>
> **Subject:** Re: Program for synthetic BOS image generation
>
> Hi Felix,

Good point. I have not tested this code on multiple CUDA platforms. My recommendation would be to upgrade to the same one I used or later. But I must admit my knowledge of the toolkit is quite limited.

Thank you,

Lalit

> On Oct 6, 2022, at 9:15 AM, Liu, Felix <liu2730@purdue.edu> wrote:
>
>
> The obvious solution would be to get a new graphics card, but I am wondering if it would be possible without doing that.
>
> Thanks,
> Felix
>
> Get Outlook for Android
>
> ---
>
> **From:** felix.liu@dlr.de <felix.liu@dlr.de>
> **Sent:** Thursday, October 6, 2022 5:59:35 PM
> **To:** lrajendr@alumni.purdue.edu <lrajendr@alumni.purdue.edu>
> **Cc:** Liu, Felix <liu2730@purdue.edu>
> **Subject:** RE: Program for synthetic BOS image generation
>
>> ---- **External Email**: Use caution with attachments, links, or sharing data ----
>
> Hi Lalit,
>
> This problem has now been fixed, so all the code compiles by running on a Linux machine with Ubuntu 22.04. However, we get CUDA error code 35 (insufficient

driver or something along those lines) when trying the sample BOS simulation. Through searches, it appears that it may be a problem with our GPU setup. We are running on a NVIDIA Quadro 2000 with CUDA Toolkit 11.8 (I believe the code works with all toolkits above 10.1 Update 2). This is a Fermi GPU which is within the same group as the Tesla C2050 that you used in the experiment, but it says that the last support for Fermi GPU was CUDA toolkit 8.0 which would be incompatible with the program. Let me know if you have a solution for this or would be willing to tell me the versions of the programs/software that was used. Thanks again for all your help!

Best regards,
Felix

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Felix Liu

felix.liu@dlr.de

From: Rajendran, Lalit <lrajendr@alumni.purdue.edu>
Sent: Wednesday, October 5, 2022 7:29 PM
To: Liu, Felix <felix.liu@dlr.de>
Cc: liu2730@purdue.edu
Subject: Re: Program for synthetic BOS image generation

Hi Felix,

Thank you for the clarification.

The software package is only supported on Linux. All your errors are related to the C++ compiler on windows.

Please try this from a Linux platform with CUDA.

Thank you,
Lalit

> On Oct 5, 2022, at 12:38
> AM, felix.liu@dlr.de wrote:
>
>
> Hi Lalit,
>
> Thanks for the response! I am working at the DLR in the helicopters group, and we are interested in using your tool to enhance our results from BOS imaging. The problem I am facing thus far with the tool is that there are many errors when I try to run it. I am running all of this through windows and this may be easier to run on Linux, but I think I have downloaded most of the software and packages to get around this potential issue. Currently I am trying to fix this issue which may be related to the teems dependency:
>
> Creating library libparallel_ray_tracing.lib and object libparallel_ray_tracing.exp
> parallel_ray_tracing.o : error LNK2019: unresolved external symbol __imp_biffGetDone referenced in function loadNRRD
> parallel_ray_tracing.o : error LNK2019: unresolved external symbol __imp_nrrdNew referenced in function loadNRRD
> parallel_ray_tracing.o : error LNK2019: unresolved external symbol __imp_nrrdNuke referenced in function loadNRRD
> parallel_ray_tracing.o : error LNK2019:

unresolved external symbol __imp_nrrdLoad
referenced in function loadNRRD
parallel_ray_tracing.o : error LNK2019:
unresolved external symbol __imp_nrrdBiffKey
referenced in function loadNRRD
C:\Program Files (x86)\Windows Kits\10
\lib\10.0.19041.0\um\x64\bz2.lib : warning
LNK4272: library machine type 'x86' conflicts
with target machine type 'x64'
C:\Program Files (x86)\Windows Kits\10
\lib\10.0.19041.0\um\x64\png.lib : warning
LNK4272: library machine type 'x86' conflicts
with target machine type 'x64'
libparallel_ray_tracing.so : fatal error
LNK1120: 5 unresolved externals

Best regards,
Felix

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—

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Felix Liu
felix.liu@dlr.de

From: Rajendran, Lalit
<lrajendr@alumni.purdue.edu>
Sent: Sunday, October 2, 2022 2:13 AM
To: Liu, Felix <felix.liu@dlr.de>
Cc: liu2730@purdue.edu
Subject: Re: Program for synthetic BOS
image generation

Hi Felix,

Thank you for reaching out! It is great to hear from a fellow Purdue Alum.

Could you elaborate on the issues you are facing with that code? I am happy to help. All the required files should be on GitHub.

I am curious to learn of how you plan to use the code!

Thank you,
Lalit.

On Sep 27, 2022, at 7:03 AM, felix.liu@dlr.de wrote:

Hi Mr. Rajendran,

I am trying to get your code from https://github.com/lalitkrajendran/photon to work, but I feel that there are steps that I am perhaps missing or I do not have all the required software. It would be very helpful if you have a more detailed guide for this somewhere or maybe some extra instruction would be nice. I have cc'd my Purdue email, in case some parts can only be accessed with Purdue

credentials. Thanks in advance!

Best Regards and Boiler Up!

Felix Liu

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_____

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Felix Liu
felix.liu@dlr.de

<Screenshot from 2022-11-21 17-39-02.png>