

VisIt - Bug # 1291: Error with double precision MIR when reading Silo file

Status:	Resolved	Priority:	Urgent
Author:	Cyrus Harrison	Category:	
Created:	01/04/2013	Assigned to:	Mark Miller
Updated:	01/15/2013	Due date:	
Likelihood:	4 - Common		
Severity:	4 - Crash / Wrong Results		
Found in Version:	2.6.0		
OS:	All		
Support Group:	Any		
Subject:	Error with double precision MIR when reading Silo file		
Description:	Cyrus has a reproducer. The problem appears when there are mixed zones in a material region. Instead of the proper result garbage values appear (1e7, instead of ~10). These values stride though out the mesh - they aren't near the actual mixed cells. The error does not occur when force single is on and appeared with the release of VisIt 2.5.		

History

01/08/2013 07:17 pm - Cyrus Harrison

We think the issue is due to the fact that the avtmaterial / species data structs are still single precision, if so we need to do a conversion to float.

While double prec isn't likely necessary for vol fracs and spec mass fracs, it may be useful for mix vars, so we may actually need to provide full double prec support in the future.

01/08/2013 07:17 pm - Cyrus Harrison

- Assigned to set to Cyrus Harrison

01/09/2013 01:37 pm - Cyrus Harrison

I looked at the Silo DB plugin: ConvertToFloat appears to be used when we create avt material, avt mixed var, and avt species instances. So something else may still be wrong.

01/10/2013 06:35 pm - Cyrus Harrison

More info:

It looks like the mixvar is actually float array, even though the datatype is double for the standard var section.

It could be that:

*Silo expect this data to be float, or coerces it to be even if force single is off.

*The sim code incorrectly wrote the data as a float

01/15/2013 12:04 am - Mark Miller

I looked at an example file that demonstrates the problem with VisIt 2.5.2 on rzalastor. Although I do see some oddities in behavior between force single on/off cases, I don't see the kinds of corruption described here.

The example file I was given definitely has double data for both the main variable as well as the mixed values. I confirmed this with h5ls.

The file I was given also has some oddities in volume fraction data. Two materials are present and mixed values are such that material A's value is 1 and material B's value is 0.001. The 'average' variable value also varies between 0.001 and 1.

With force single off (the default Silo plugin read options setting), when I turn off material B, I get correct shapes for MIR'd zones but PC color displayed is the average value, not the material specific values which in this case would be 1 everywhere (or red). With force single on, I get correct shapes for MIR'd zones and I get material specific values everywhere (so all red).

01/15/2013 12:18 am - Mark Miller

I am seeing this on current trunk too.

I have inspected the mixed variable values in the Silo plugin just before we hand them to the `avtMixedVariable` constructor with and without force single and in both cases, the values passed into the constructor are identical. Something is happening elsewhere, maybe with the volume fractions themselves. Although, analysis with picks shows same volume fractions for 2 materials in both cases (0.001 and 1).

01/15/2013 12:11 pm - Eric Brugger

- Status changed from New to Pending

- Priority changed from Normal to Urgent

01/15/2013 01:03 pm - Mark Miller

- Assigned to changed from Cyrus Harrison to Mark Miller

01/15/2013 02:21 pm - Mark Miller

I've convinced myself that in either case, Silo is returning to the VisIt plugin the data values that it should and that the VisIt plugin is in turn handling those values and passing them to VisIt as it should.

In the case that Force Single is on (the default), VisIt winds up getting float (single precision) for all of the following...

- * material volume fractions
- * variable 'average' values
- * variable mixed values

In the case that Force Single is off, VisIt winds up getting...

- * material volume fractions as float
- * variable 'average' values as double
- * variable mixed values as float

I ran with valgrind on the engine_ser and no memory faults were reported for either setting of Force Single.

01/15/2013 02:56 pm - Mark Miller

Ok, I have found the problem. There is a place in MIR that assumes the main variable array (e.g. the 'average' value array) is float. There is a `(float*)GetVoidPointer(0)`. Upon adjusting that logic, I can get both cases to display correctly. There is a broader question here and that is how to handle all the different types that could be encountered here instead of an assumption of float values.

01/15/2013 04:25 pm - Mark Miller

- Status changed from Pending to Resolved

The problem is that there was some logic in MIR involved in `_overwriting_` values in the main variable array that assumed the `vtkDataArray` was a `vtkFloatArray` and that `GetVoidPointer(0)` could be casted to `float*` without issue.

I adjusted the loop to overwrite values to use `arr->SetTuple()` method instead.