Update on validation tool for biasing techniques

A. Zaborowska, CERN
based on work of Kyungseop Yoon,
CERN Summer Student

Geant4 Generic Processes and Materials WG
16/09/2019
Need for statistical test suite

- Need for verification tool for biasing applications
- Many observables common to various biasing options

Marc Verderi (23rd Collaboration Meeting)

- to be used:
  - for high-statistics validation (e.g. geant-val)
  - for new techniques development (by developer)
  - by users.
Status

Work started by summer student, Kyungseop Yoon.

• First, generalisation of the existing examples (examples/extended/biasing).

• Radiation protection example and comparison of:
  ◦ geometry importance,
  ◦ weight window,
  ◦ non-biased simulation.

• Scoring replaced by SD for richer output.

• Information on steps stored in ROOT ntuples.

• Histograms prepared for comparison.

• Needs to be checked/validated, documented (more), and extended to GB0x examples.
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# Event Biasing Example B01

Default output:

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<th>FluxWRTOTdet</th>
<th>Av.T(TE WRTOT)</th>
<th>SL</th>
<th>SW</th>
<th>SW_he</th>
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First results based on slides from summary talk by Kyungseop

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A. Zaborowska, CERN

16/09/2019
First results

Event Biasing Example B01

Default output:

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</tr>
</tbody>
</table>

based on slides from summary talk by Kyungseop
First results

Event Biasing Example B01

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First results

Event Biasing Example B01

based on slides from summary talk by Kyungseop
Next steps

I will continue this work (>November).

- Extend and validate 'analysis' part:
  - distance between 2 interactions of same type
  - population of particles as a function of e.g. x/y/z or layer
  - number of created secondaries as a function of process or material or layer, etc.
  - weight change in the step
  - deposited energy as a function of x/y/z or layer, etc.

- Implement messengers for better flexibility (e.g. adjust geometry, size and number of cells, which biasing option is used, ...)

- Introduce a switch between 'save all steps' and 'only histograms' for high-statistics analysis

- Integrate this as part of existing examples and ultimately also geant-val
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- Extend and validate ‘analysis’ part:
  - $\times$ distance between 2 interactions of same type
  - $\checkmark$ population of particles as a function of e.g. $x/y/z$ or layer
  - $\checkmark \times$ number of created secondaries as a function of process or material or layer, etc.
  - $\checkmark$ weight change in the step
  - $\checkmark \times$ deposited energy as a function of $x/y/z$ or layer, etc.

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  - ✓✖ number of created secondaries as a function of process or material or layer, etc.
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  - ✗ ✓ number of created secondaries as a function of process or material or layer, etc.
  - ✓ weight change in the step
  - ✓ ✗ deposited energy as a function of x/y/z or layer, etc.

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  ✓ distance between 2 interactions of same type
  ✓ population of particles as a function of e.g. x/y/z or layer
  ✔️ number of created secondaries as a function of process or material or layer, etc.
  ✔️ weight change in the step
  ✔️ deposited energy as a function of x/y/z or layer, etc.

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