Joint GATE-STIR Proposal (draft v1.0)

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Roadmap

Version	***Date***	***Author***	***Comment***
Draft 1.0	2004-8-7	Long Zhang	Fixed some typo error. Modify macro implement. Add Gate solution request for help. Update TODOs

Object:

Building tools to joint two software package Gate and STIR together. This will lead to a free availiable front-end toolkit for PET instrument design.

Method:

- *To provide standard interface between Gate and STIR*
- *Branch to the main stream source code, or best if possible, join their team.*
- *Easy to use.*

** As I know, STIR team is ready to accept patches to enhance STIR, I think Gate team is similar toward this.*

Analysis:

GATE, PET/SPECT dedicative Mont-Carlo simulation tools, based on Geant4. So its correctness is self-evident.
STIR, free availiable tomographic reconstruction framework and toolkit.

What the Gate do?

Simulations Gate can do are the following:

- Cylinder System (ECAT is a simplification of the Cylinder System)
- Multi-head System
- PET & SPECT Systems without geometry constrains.

What the STIR (Open version) do?

- Reconstruction framework (buildblock).
- 3D cylinder PET reconstruction using OSMAPOSL algorithm.

Most Possible Interface:

Gate produce PET output in ASII, LMF, ECAT7, Sinogram
STIR accept ECAT6(7) and Interfile
All format can be converted into Interfile. This makes Interfile the most possible interface.

Implementation:

Philosohpy

As discussed above, the Interfile 3.3 is the most possible interface now.

Modulization is always the best choice which requires a clear standard interface and as less as coupling among them. Expanding Gate and STIR ability through external modules, namely branches to the main stream projection is the best choice. Since this meathod can avoid conflicting with their oringal purpose and make no modification to their source code. And more important, the two team can easily merge this patch into main stream source.

Code convention

- For STIR

  First introduce a global marco: B_JOINT_STIRGATE, all code related to JOINT STIR GATE project will be in the macro pairs:

  ```
  #ifndef B_JOINT_STIRGATE
  Joint STIR-GATE code
  #endif
  ```

  or:

  ```
  #ifndef B_JOINT_GATESTIR
  Joint STIR-GATE code
  #endif
  ```

- For GATE

  First introduce a global macro: B_JOINT_GATESTIR, like STIR:

  ```
  #ifndef B_JOINT_GATESTIR
  Joint GATE-STIR code
  #endif
  ```

  or:

  ```
  #ifndef B_JOINT_GATESTIR
  Joint GATE-STIR code
  #endif
  ```

GATE Solution Quest for Help

These days, I am studying the GATE souce code (very beautiful code). And I found no reason not to use the GATESinogram in Cylinder system, thus the output of a Cylinder system can output Sinogram, as well as ECAT7, and hence Interfile. Anyway, I will try to add this and to see what will happen.

If it is impossible, please tell me to avoid my blindly trying. Also, any good comments, questions, suggestions are highly appreciated!

Thank you very much!

Simple description of my current proposal:

Let GATE output Interfile

Reason:

Gate know all information about a scanner, even without the ecat system type, however, STIR not (the only possible way is to ask).

Gate provides corresponding utilities for sinogram, sinogram to ecat7 and ecat7 to interfile conversion (What I add).

Usage:

Apply Patches

Eg.for STIR:

```
#gunzip bjoint.patch.gz | patch -p0
```

Enable JOINT GATESTIR options.

For STIR:

In ./local/config.mk

```
JOINT_STIRGATE=yes
```

For GATE:

Set enviroment varible:

JOINT_GATESTIR=yes in env_gate.csh

Or in the shell.

Build

please refer to the corresponding manule of the two package for reference.

********** NOTE **********

ECAT7 required, make sure you have ecat7 lib enabled.

e.g. for STIR, modify ./local/config.mk

LLN_INCLUDE_DIR=path_to_your_ecat7_include

LLN_LIB_DIR=path_to_your_ecat7_lib

TODO:

STIR

- ✓ Introduced macro.
- ✓ Add Scanner type Userdefined_Scanner
- ✓ Add mechanism to get three extra geometry parameter
- ✓ Bug fix for support .s directly in .par file.
- ✓ ifheaders_for_ecat7 supports Userdefined_Scanner

…

GATE

Help needed! Discussion, suggestions, and comments, and so on, in any form. Thank you!

- ✓ Introduced macro
- ✓ Add Userdefined Scanner support
- ✓ Add Interfile interface for ecat system in GATE.

Add Interfile interface for cylinder system.

1. Sinogram builder
2. Interfile generator
3. UI messager to support command

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