報告080717

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目的

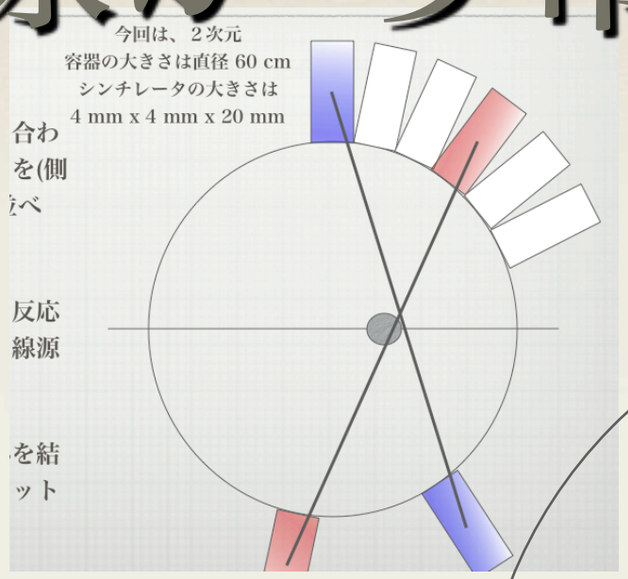
＊PET simulation を行うにあたり、C++で実際にプログラムを作成し、PET simulator の動作原理を学習する。

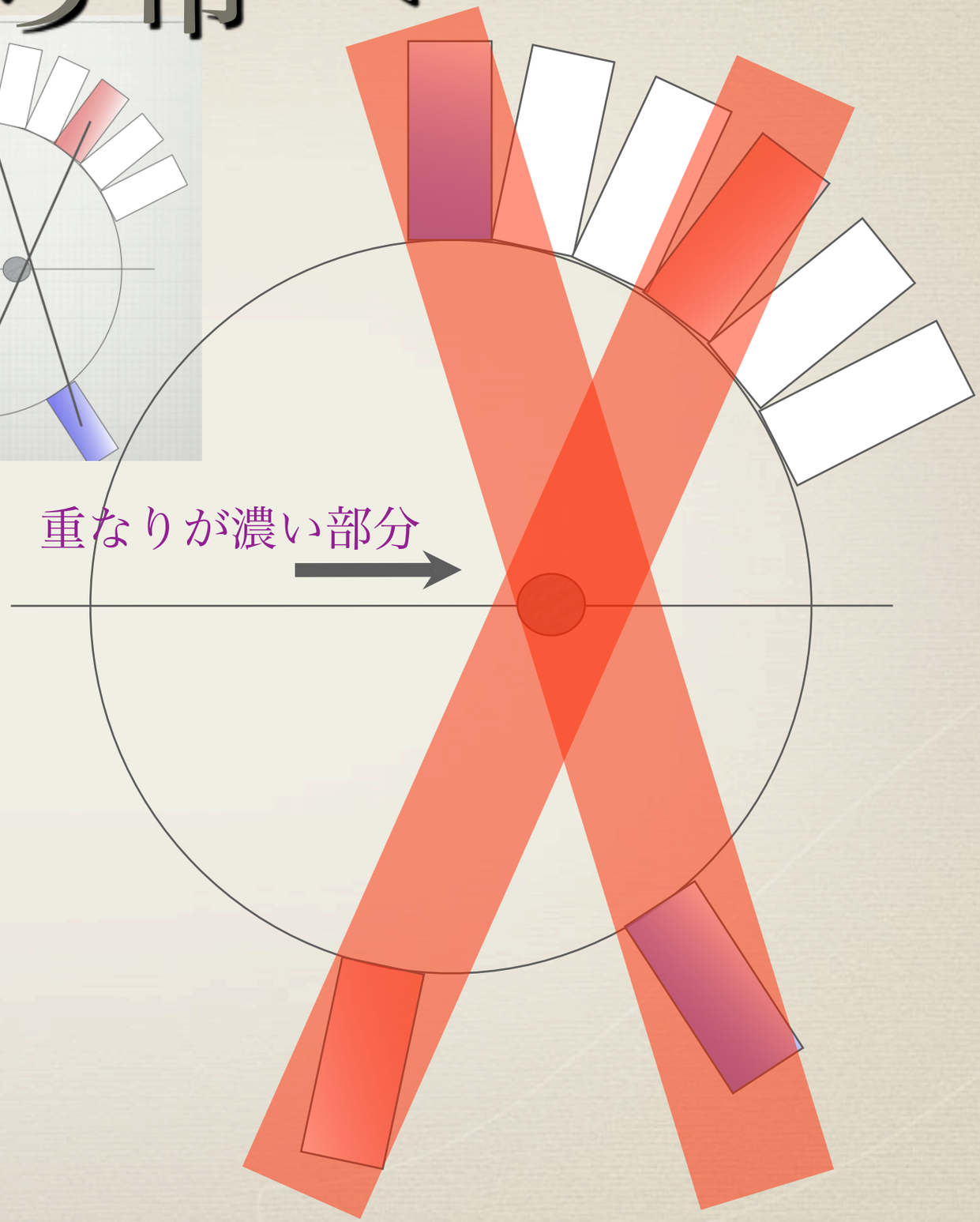
Contents

＊C++で作成したプログラムの改良

＊GATE(Geant4)の準備

線から帯へ





＊ 線で交点を求めるプログラムではなく、帯で重なりの濃い部分を探るようなプログラムに書き換えを行う。

線から帯へ

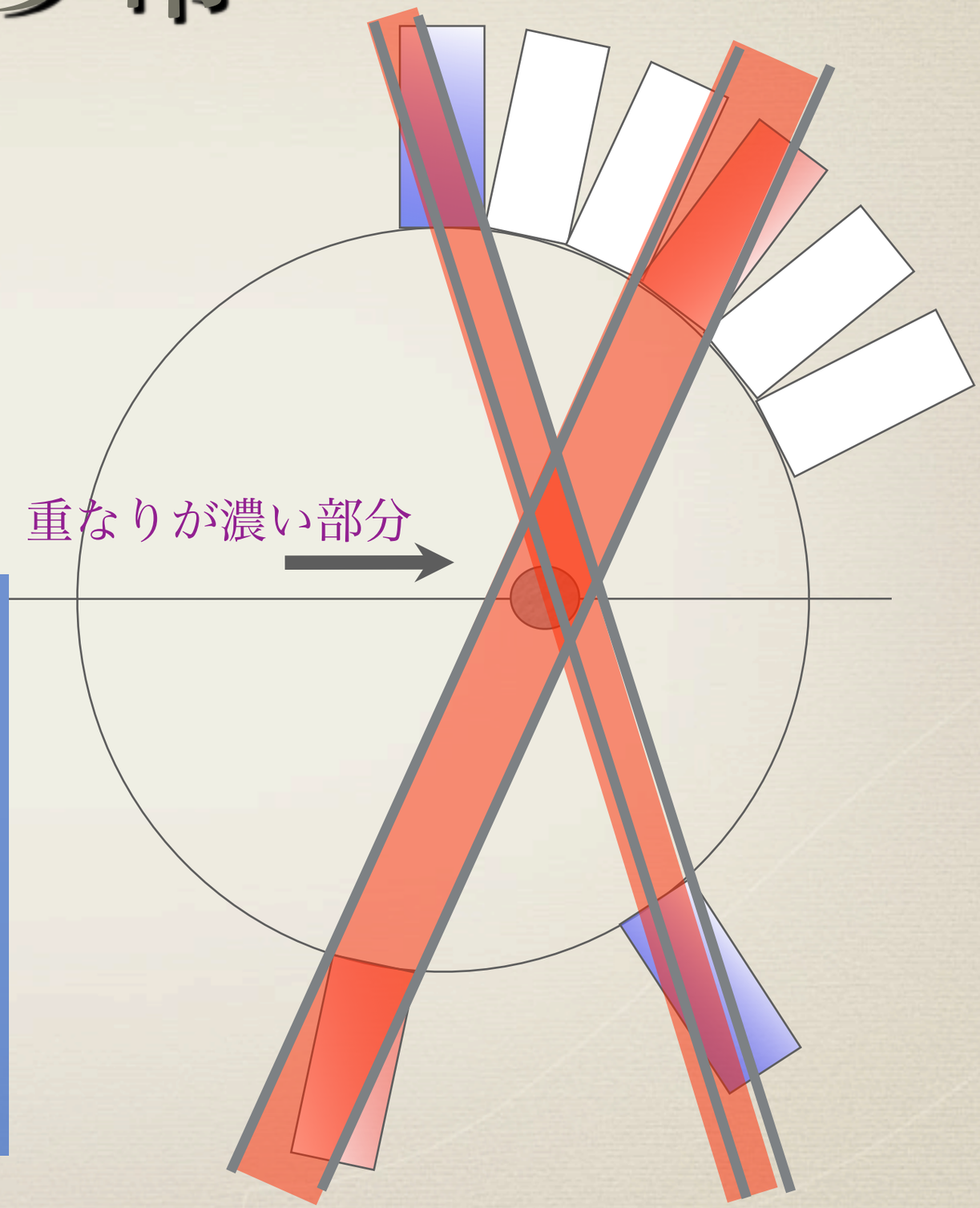
- 濃い部分の表現がうまくいかなかったので２直線同士の交点からまず出した。
- エラーが大きい(どこか間違っている)ので、調整中。

容器:直径60cm

帯数：3本

線源：3cmの位置

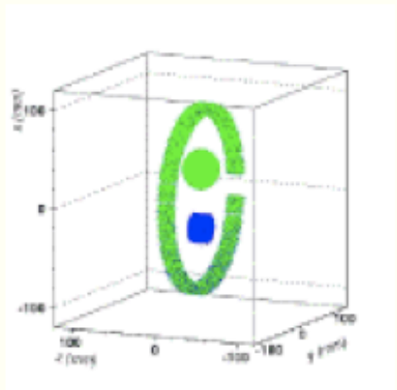
```
(274.711,-120.557)
(274.607,-119.258)
(-439.793,237.871)
(-438.796,224.307)
average(-82.3177,55.5907)
real position err: (-112.318,55.5907)

(24.9765,0.14891)
(31.7186,2.16192)
(35.511,0.266097)
(28.7236,-1.66221)
average(30.2324,0.228681)
real position err: (0.232409,0.228681)

(259.414,70.1457)
(-412.714,-130.534)
(-412.963,-127.146)
(259.906,64.0168)
average(-76.5892,-30.8792)
real position err: (-106.589,-30.8792)
```

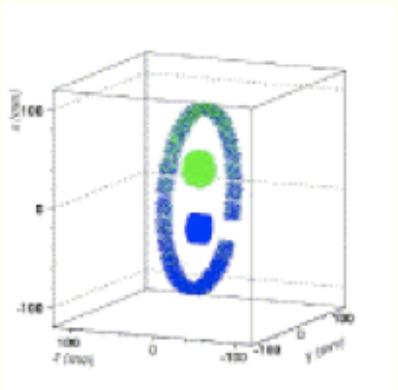


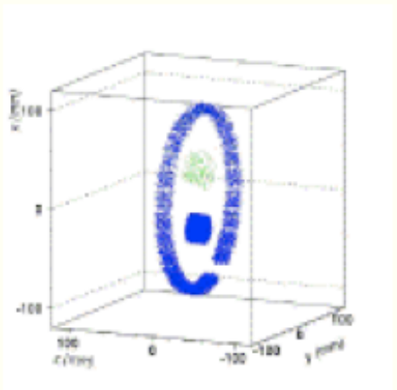
GATE

GATE, the *Geant4 Application for Emission Tomography*, incorporates the Geant4 libraries in a modular, versatile, and scripted simulation toolkit which is adapted to the field of nuclear medicine. In addition, GATE allows the accurate description of time-dependent phenomena such as source or detector movement and source decay kinetics. The ability to synchronize all time-dependent components allows a coherent description of the acquisition process and is one of the most innovative features of GATE. It makes it possible to perform realistic simulations of data acquisitions in time. The example below shows the simulation of the decay of O-15 (in green) and C-11 (in blue) sources throughout 3 time frames with the GATE: 0-2 min (left), 7-9 min (centre), and 14-16 min (right). On all frames, one detector has been hidden (gap in the detector ring) to illustrate the scanner rotation steps.

＊ GATEとはGeant4 Application for Emission Tomography の略で、PET用のシミュレーションツールキットです。







In addition to the timing features, a dedicated scripting mechanism extends the native command interpreter of Geant4 and allows to perform and control the Monte Carlo simulation in an intuitive manner. Moreover, the Geant4 interaction histories or *hits* can be further processed to realistically mimic detector output pulses. This *digitization* of the *hits* allows for the modeling of the detector response by using a chain of processing modules designed by the user. In the example below, GATE has been used to study the effect of detector dead-time (DT) and coincidence time window duration (CW) on the Noise Equivalent Count (NEC) rate of a prospective small animal PET scanner design. Detector electronic response was modeled including detector cross-talk, transfer efficiency of the scintillation photons to the photodetector, quantum efficiency of the photodetector, detector energy resolution, and trigger efficiency.

GATEの準備

Welcome to the GATE user's download pages

GATE release

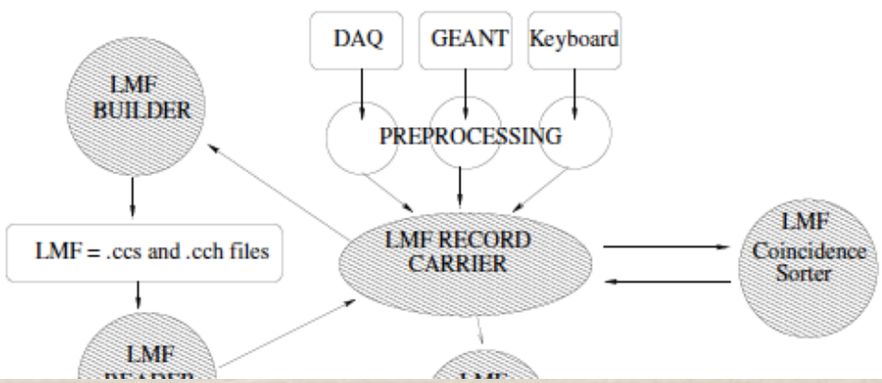
Release date	GATE version	GEANT4 version (see README)	ROOT version	CLHEP version	LMF version	gcc version
17/9/2007	gate 3.1.2	geant4 9.0	root 5.14	clhep 1.9.3.1 - 2.0.3.1	lmf 3.0	gcc 3.2 to 4.1
4/5/2007	gate 3.1.1	geant4 8.1.p02	root 5.12	clhep 1.9.2.3 - 2.0.2.3	lmf 3.0	gcc 3.2 to 4.1
12/4/2007	gate 3.1.0	geant4 8.1.p02	root 5.12	clhep 1.9.2.3 - 2.0.2.3	lmf 3.0	gcc 3.2 to 4.0
1/6/2006	gate 3.0.0	geant4 8.0.p01	root 5.xx	clhep 2.0.2.2	lmf 3.0	gcc 4.0
3/8/2005	gate 2.2.0	geant4 7.0.p01	root 4.03/04	clhep 1.8.1.0	lmf 2.0	gcc 3.4

- gate3.1.2
- geant4.9.0 ダウンロード済(未インストール)
- root 5.19 インストール済
- CLHEP 2.0.3.1 インストール済(最新は2.0.3.3)
- LMF 3.0 ダウンロード済

Introduction

The LMF library contains tools that implement and exploit the List Mode Format (LMF) developed for the ClearPET project of the Crystal Clear Collaboration. This format allows to store events of the small animal ClearPET demonstrator on an event-by-event basis. This document describes how to install, compile and execute some examples of the LMF library. And, in the lat part, how to generate LMF files from a GATE simulation.

An interfile 3D sinogram builder is implemented within STIR (Software for Tomographic Image Reconstruction). Figure 1 gives an overview of the LMF library.



予定

＊C++の新しいプログラムの完成

＊GATEのサンプルプログラム

今日中にインストール

＊来週、GATEのチュートリアル