Titolo (provvisorio): The forward model of a Micro-Pet imaging system

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Motivazione e campo di applicazione

The goal of this work is to solve the forward problem in image formation of a commercial Micro-PET used at IRCCS San Martino-IST and obtain realistic data.

Obiettivi generali e principali attività

The data we retrieve from a PET exam, i.e. the number of coincidence events occurred between pairs of detectors, can be modeled as Poisson variables with mean value depending on the unknown tracer concentration and the Pet scanner sensitivity function.

Many factors influence the sensitivity function, from the geometry of the PET scanner to the physical processes that take place during data acquisition. Some methods manage to model the geometrical configuration of the scanner and its response to a radiative emission. However, many of these don’t take into account the physical effects of the radiation-matter interaction and they are, therefore, insufficient to correctly model a PET exam. To overcome these limits, we plan to use an alternative approach based on Monte Carlo techniques.

Obiettivi di apprendimento (strumenti tecnici e analitici, metodologie sperimentali)

Data acquired by a MicroPet will be simulated using an open source software called GEANT4 Application for Emission Tomography (GATE) which relies on Monte Carlo techniques. During the thesis work, the direct problem of the formation of PET images will have to be modeled for a specific commercial scanner. The final result should be the space-variant Point Spread Function that completely characterizes the imaging system.

Luogo/i in cui si svolgerà il lavoro: Dibris- Via Dodecaneso and San Martino-Ist

Numero massimo di studenti: 1