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#08-227 Handheld Spectrometers: From CZT To NaI, an Embedded Template Analysis for Isotope Identification

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This paper presents a solution for embedding an isotope identification algorithm on portable gamma spectrometry systems based on template approach. There exist many algorithms able to identify isotopes in a spectrum. These algorithms can be classified into two large families. The first family is based on peak search or Region Of Interest (ROI) in the spectrum, the second on a global template analysis or deconvolution [1]. All of these algorithms can be evaluated using off-line solutions as described in a large amount of papers [2-4]. In the case of algorithm embedded on handheld spectrometers, the first family is commonly used due to their low requirements in term of computing resources and memory. However, the new generation of microcontrollers or small board computers allows template analysis algorithm that need more computing resources to be embedded.

In this paper, we present a template analysis, based on MLEM algorithm [5], and its implementation on two different targets, a STM32 microprocessor and a Raspberry PI. Time performances show that this kind of approaches can be used in handheld system such as spectrometers and portable isotope identifier. Experimental results are based on two use cases, the first applies the requirement of ANSI42.34 [6], the algorithm can be performed at the end of the measurement, the second needs to provide evolution of the isotope identification as the progress measure.

Some promising results have already shown that this kind of algorithms can be uses for handheld spectrometers. Both implementation will be described and results of their implementation will be presented for a set of different detectors from CZT to NaI. The study will be focused on CZT, LaBr3/CeBr3 and NaI detectors. For each detectors, a spectra database is performed based on isotopes described in ANSI 42.34 norm. We have developped pocket spectrometer providing spectral information on an ultra-portable and wireless CZT prototype capable of providing identification information on the radioelement being detected. The system includes a battery, a screen allowing the visualization and an on-board PC (raspberry PI) that perform online identification of the detected. Base on this system and others developments for others detectors, the impact of energy resolution and algorithm implementation will be discussed in the full paper.

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