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Amplitude analysis of four-body decays using a massively-parallel fitting framework

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GooFit, a GPU-friendly framework for doing maximum-likelihood fits, has been extended in functionality to do a full amplitude analysis of scalar mesons decaying into four final states via various combinations of intermediate resonances. Recurring resonances in different amplitudes are recognized and only calculated once, to save memory and execution time. As an example, this tool can be used to study the amplitude structure of the decay $D^0 \to K^-\pi^+\pi^+\pi^-$ as well as a time-dependent amplitude analysis of $D^0 \to K^+\pi^+\pi^-\pi^-$ to determine particle-antiparticle oscillation and CP violation parameters. GooFit uses the Thrust library to launch all kernels, with a CUDA back-end for nVidia GPUs and an OpenMP back-end for compute nodes with conventional CPUs. Performance of the algorithm will be compared between a variety of supported platforms.

Tertiary Keyword (Optional)

High performance computing

Secondary Keyword (Optional)

Parallelizarion

Primary Keyword (Mandatory)

Analysis tools and techniques

Authors: HASSE, Christoph (Technische Universitaet Dortmund (DE)); SOKOLOFF, Michael David (University of Cincinnati (US))

Co-authors: Dr ALVES JUNIOR, Antonio Augusto (University of Cincinnati (US)); ALBRECHT, Johannes (Technische Universitaet Dortmund (DE)); RADEMACKER, Jonas (University of Bristol (GB)); D'ARGENT, Philippe (Ruprecht-Karls-Universitaet Heidelberg (DE)); EVANS, Timothy David (University of Oxford (GB))

Presenter: SOKOLOFF, Michael David (University of Cincinnati (US))

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