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Adaptive Hough Transform for Charged Particles Tracking at the LHC

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The Adaptive Hough Transform (AHT) is a variant of the Hough transform for particle tracking. Compared to other solutions using Hough Transforms, the benefit of the described algorithm is a shifted balance between memory usage and computation, which could make it more suitable for computational devices with less memory that can be accessed very fast. In addition, the AHT algorithm's flexibility is explored to suppress the number of false positives while maintaining high efficiency.

The algorithm's efficiency has been tested on single muon and pion events as well as high pile-up simulated data consistent with the High Luminosity LHC experiment using the ODD detector available in the ACTS toolkit. The AHT for single muons events yielded an efficiency of over 99% with an average of 9.9 reconstructed particles for a single truth particle. Filtering methods reduced the number of reconstructed particles to 1.8 while maintaining very high tracking efficiency. For pile-up cases, efficiency is above 98%. Additional peak filtering cuts the number of reconstructed tracks over 12 times.

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