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Global strategy of tracking on the basis of Graph Neural Network for BES-III CGEM inner detector

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Particle tracking in modern high-energy physics experiments is a challenging task. Well-proven algorithms are no longer capable of providing satisfactory results in terms of processing throughput due to an enormous amount of data being produced through the detector's environments. At the same time, Graph Neural Networks (GNN) have shown great potential, namely the GNN approach, which was introduced by the HEP.TrkX project at LHC. We have already applied such approach for the BM@N experiment of the NICA megaproject and, despite the fact that the straightforward adaptation of the original approach did not achieve significant results for the simulated data from the BM@N GEM detector, we proposed a novel Line Digraph approach with the usage of GNN model, which demonstrated a big potential in the BM@N GEM detector's fixed target environment. Because of such success, we decided to adapt our algorithm to experiments with the collider environment, such as BES-III experiment in China. The overall potential of Line Digraph approach generalization is demonstrated: we achieved encouraging results in terms of tracking efficiency and processing speed on Monte-Carlo simulated data.

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