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Tracks pattern recognition for the SHiP Spectrometer Tracker

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The SHiP is a new fixed-target experiment at the CERN SPS accelerator. The goal of the experiment is searching for hidden particles predicted by the models of Hidden Sectors. The purposes of the SHiP Spectrometer Tracker is to reconstruct the tracks of charged particles from the decay of neutral New Physics objects with high efficiency, while rejecting background events. The problem is to develop a method of the tracks pattern recognition based on the SHiP Spectrometer Tracker design. Baseline algorithms gives efficiency of 95%.

In this study we compare different tracks pattern recognition methods adapted to the experiment geometry. We present how widely-used algorithms such as RANSAC regression and Hough transformation can be effectively used in the experiment. We compare their performances and show their advantages and limitations.

In addition, in this study we develop new linear regression algorithm which effectively uses the SHiP Spectrometer Tracker strawtubes structure and geometry. We describe properties of the regression and how it helps to reach the high tracks efficiency.

Moreover, we demonstrate how the tracks pattern recognition can be solved in term of classification problem. We show how classifiers helps to search tracks with high efficiency. We compare this approach with others and describe its advantages.

All the methods presented demonstrate track efficiency statistically better than baseline algorithm.

Tertiary Keyword (Optional)

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