GPU Pixel Tracks at HLT: doublet generation

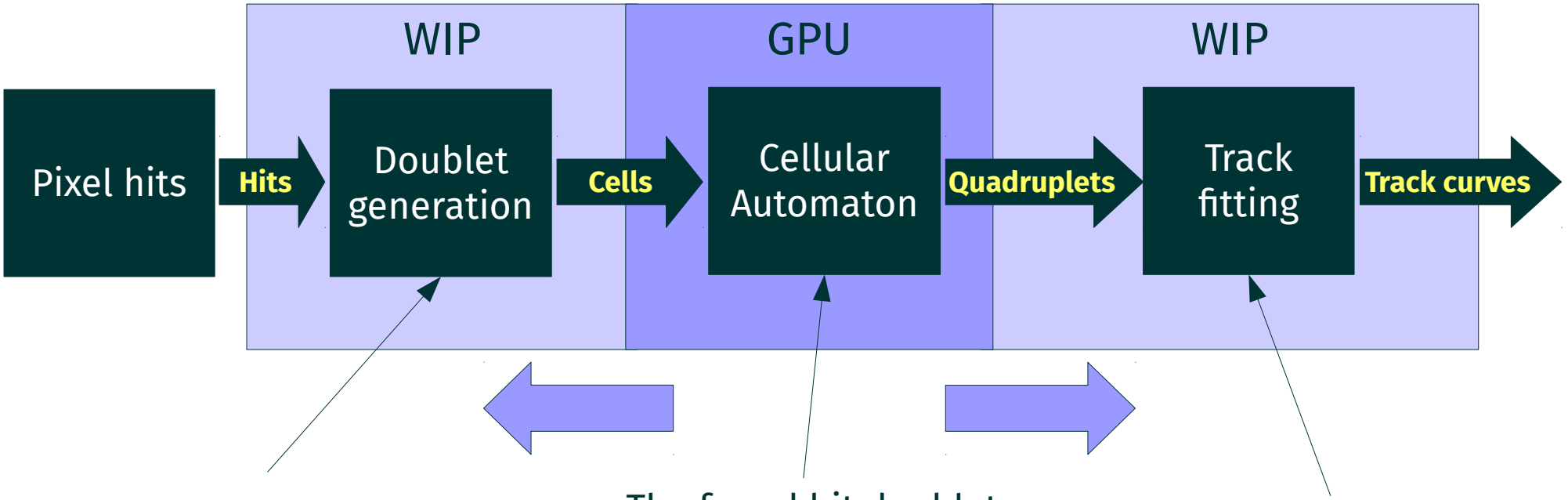
Status and plans

Simone Bologna

Università & INFN, Milano-Bicocca

06 december 2016

Track generation



Doublet generation: hit pairs are filtered and candidate **track segments (cells)** between neighbour pixel layers are produced

The found hit doublets feed the **Cellular Automaton** which combines them to create hit quadruplets consistent with a track

The quadruplets are **fitted** to obtain a continuous track curve

Future plans
January

- Once that existing algorithms have been ported to GPU, we will work on improving the existing code
- First **priority**: filtering of hits on the inner layer
  - ⚠ r and z filtering is performed by checking every hit that has passed the φ selection ⚠
    - Poor performance with high hit density
- Two solutions have been suggested so far:
  1) **Splitting** the check between multiple threads
     - Re-uses the existing code
     - Can be implemented easily in short time
  2) **Pre-sorting** the hits in the r-z space using a *k-d tree* has been proposed
     - Trade-off in performance will be investigated
     - Might be vital in high pile-up environment

Backup

Doublet generation
Multithreaded implementation

- Each thread considers an outer hit in a layer pair:
  - It detemines the φ, r and z range of the compatible hits in the inner layer
  - It filters the inner hits and creates doublets