

WIT2012 Workshop on Intelligent Trackers



Thursday, 3 May 2012 - Saturday, 5 May 2012

INFN Pisa

Scientific Programme

With the increasing capabilities of microelectronic technology, future particle detectors will be able to yield high level features that are not only simple geometrical positions or energy measurements in the sensors used. The ability to compute such high level primitives in near real-time is what we characterize as "intelligence". This will enable the construction of detectors with novel functionalities, allowing the trigger logic or even the off-line analysis in experiments to handle immediately more complex features of the measurements. Two examples of new primitives are near real-time charged particle direction or charge clusters without pixel boundary effects. But the addition of such intelligence has practical challenges and in particular system issues must be addressed, such as material budget and power density. This Workshop would provide a discussion forum for the community of scientists and engineers working on development of intelligent devices. The objectives of the workshop will be to enhance the cross breeding of ideas, to compare concepts for incorporating intelligence in particle trackers, and to explore possibilities for application to other areas. The format of the workshop is on plenary sessions, for a duration of 2.5 days.

"This Workshop is the second of the series. The first one was held in Berkeley in 2010.
<https://indico.cern.ch/conferenceDisplay.py?confId=68677>

Applications of intelligent detectors

What are we triggering on with trackers today, what could we use intelligent tracker for tomorrow?
Review of current applications and future desiderata from HEP experiments and non HEP applications.

Coupled sensors and monolithic architectures

Basic designs for trackers that measure angle, or some other primary. Not so much emphasis on the application itself, but in the construction and operation.

Development of critical technologies and system integration

R&D work on novel interconnects (interposers, flex-circuits, etc.), integrated cooling, power, and mechanical support.
Especially to solve specific challenges presented by structures implementing local intelligence (as opposed to generic developments applicable to conventional trackers).

On-module electronic circuits (3D and conventional), intra-module and off-detector communication

Development of new IC's for implementation of on-detector intelligence. High bandwidth connections between modules and to the off-detector DAQ. (E.g. wireless communication and high-speed rad-hard fibers.)

Real time pattern-recognition and advanced algorithms

Advanced algorithms and pattern-recognition located on-detector or off-detector.
Interplay between data movement and data processing. Novel vector tracking.
Vertices identification, and vertex to muon/calo-primitive association.