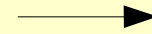


That's it!

:-)

(small print: the summary is yet to come)

Summary



**the “needle vs. balloon
end of lecture indicator”**

- **Why do we need simulation?**
 - detector studies, “unmeasured” physics
- **Types of simulation**
 - event generators:
 - detector independent, simulates “physics”
 - experiment simulation
 - passage of particles through matter - >>Geant4<<
 - detector response (digitization)
- **Basic Ingredients (and how to use them in Geant4)**
 - quantities, units
 - materials & their static character in Geant4
 - geometry
 - basic requirements (shapes, materials, external fields)

Summary



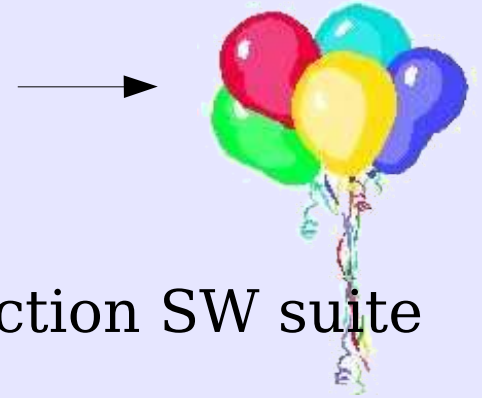
- Details of Geant4 geometries
 - G4LogicalVolume, G4VSolid, G4Material
 - geometrical aspects (inside, outside, ..) of solids
 - hierarchies - G4VPhysicalVolume & the geometry graph
 - flexible & extensible model
- Principles of tracking of particles in Geant4
 - global point look-up algorithm and G4VTouchable
 - stack of G4VPhysicalVolumes as geometrical context
 - geometrical aspects of tracking
 - steps between volume boundaries
 - particularities in external (magnetic) fields

Summary



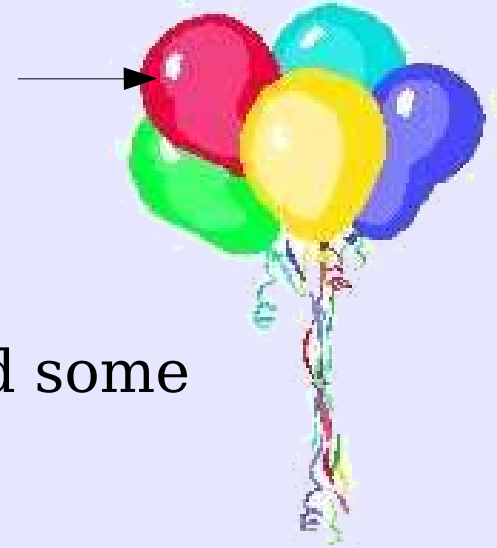
- **Side track: origins of the Monte Carlo method**
 - ENIAC, FERMIAC, brain & bomb-power, 1947 ff
 - tracking & sampling principles haven't changed
- **Principles of physics interactions in bulk material**
 - mean free path length
 - tracking with physics, concurrent processes
 - basics of the Geant4 physics model: processes & particles
- **Basics of a Geant4 simulation**
 - mandatory user-actions:
 - detector description, physics list, primary particles
 - Geant4 event-loop & optional user-actions
 - run, event, track, step and their user-actions
 - Sensitive detectors, & hits; Digitization & digis

Summary



- Experiment simulation at CMS
 - Glance at the CMS simulation & reconstruction SW suite
 - Selected topics
 - detector description
 - visualization
 - simulation example: CMS pixel vertex tracker
 - framework issues
 - user interface
 - computing infrastructure
- In between the lines I hope to have pointed out
 - some important points for experiment simulation at the LHC
 - what game Geant4 has to play
 - where one deviates from the simulation flow suggested by Geant4

Want to know more?



- <http://www.cern.ch/geant4>
 - FAQs, user forum, problem reporting, talks & papers, the code itself (sources and some supported binaries)
 - User manuals
 - for application developers, for Geant4 extensions
 - physics manual, SW reference manual
- **Go to one of the excellent Geant4 tutorials (typical 3-5 days)**
 - USA: <http://geant4.slac.stanford.edu>
 - GOE: <http://www.cern.ch/geant4> (GO = good old)
- **CMS simulation, OSCAR, FAMOS, ORCA**
 - always short of wo/man power!
 - <http://cmsdoc.cern.ch/cms00/cms00.html>



a real shower!



“I gave a presentation today but I only pretended to know what I was talking about. Fortunately, my audience was only pretending to listen.”