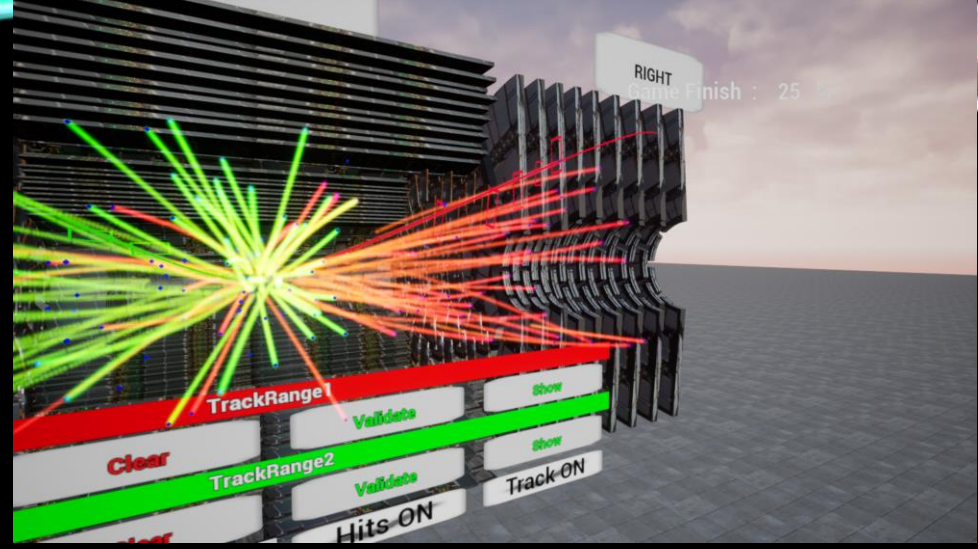


CMS IN YOUR POCKET

Between serious game and demonstration tool

Pierre Van Hove (IPHC Strasbourg)
On behalf of the CMS outreach group

ICHEP 2020 | PRAGUE
28 July – 6 August, Virtual conference

IPHC Institut Pluridisciplinaire Hubert CURIEN STRASBOURG
Université de Strasbourg
cnrs

HISTORY

- 2018, L. Gross start thinking on Virtual reality (VR) potential for research and technical developments
  - private visualisation of CMS detector for iphones
  - Attribution of the project to J. Hosselet, under the responsibility of D. Bloch
    - Add event display, use on many platforms (PC, headset, smartphones)

- 2019, presentation of first version in the CMS outreach group
  - Receives attention from many and help from
    - Tom McCauley (University of Notre Dame) for event display from ispy
    - Alberto Zambotti (CERN) provided access to full plan of CMS cavern produced for CMS safety by Lukas Ausserladscheider

- Team at IPHC Strasbourg :
  D. Bloch (physicist), L. Gross (Laboratory technical director),
  J. Hosselet (VR developer), P. Van Hove (Physicist)

SOME INSPIRATIONS

- Belle II Virtual reality presented at ICHEP 2018
  - Event visualisation with precise information on each track
- Ispy (http://cern.ch/ispy-webgl)
  - Easy to use event information for event in CMS
  - Direct acces trough webpage
- SketchupCMS
  - Simplified 3D representation of CMS
- CMS Picture library
  - Required material to give realistic representation of CMS

OUR AIMS (1)

- Show the detectors in details
- Explain how
  - particles leave signals in these detectors
  - Detector signals are used to reconstruct particle tracks

Part of CMS tracker endcap

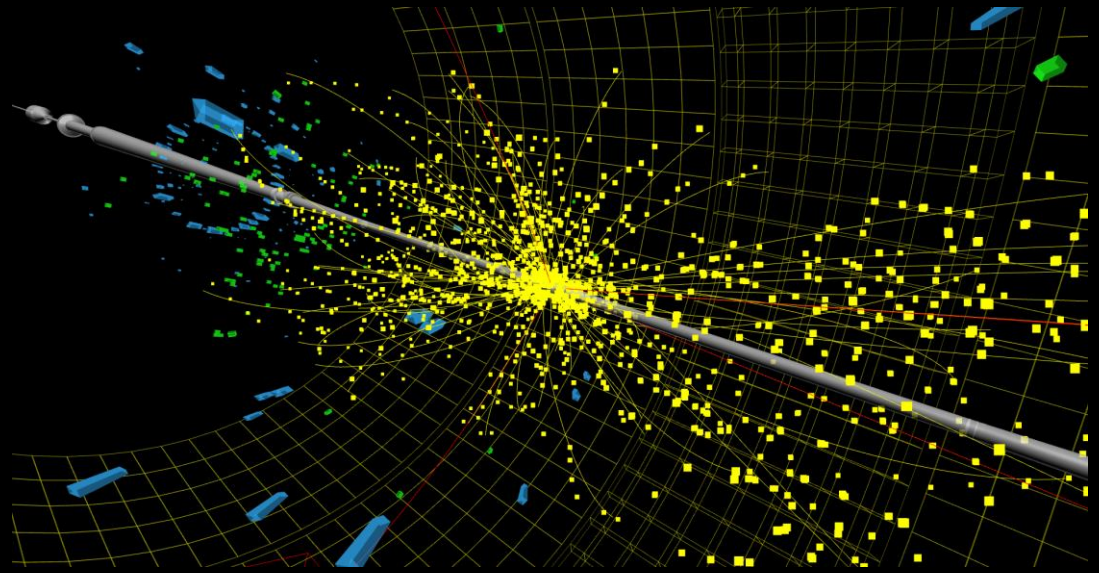
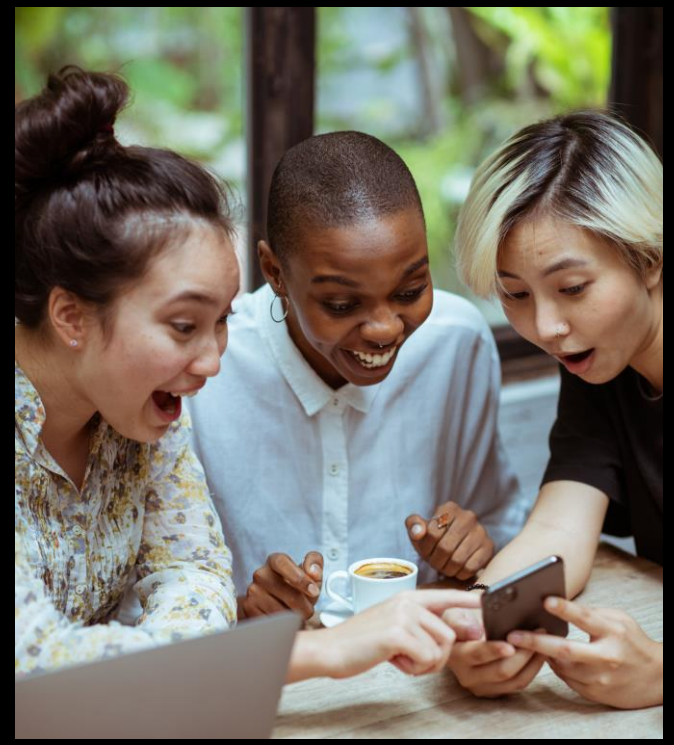


Image produced with ispy webgl

OUR AIMS (2)

- Feel and interact with the gigantism of the experiment
  - → make use of virtual reality
  - → rely on exact technical drawings and pictures
- Propose pedagogical information
  - → Insertion of posters, explanations
  - → Event display from simulation and data
  - → From event dynamic to publication
- **Enable anyone to share** this with friends
  - → target mainly smartphones (but also headset, computers…)
  - → Make it "fun"…



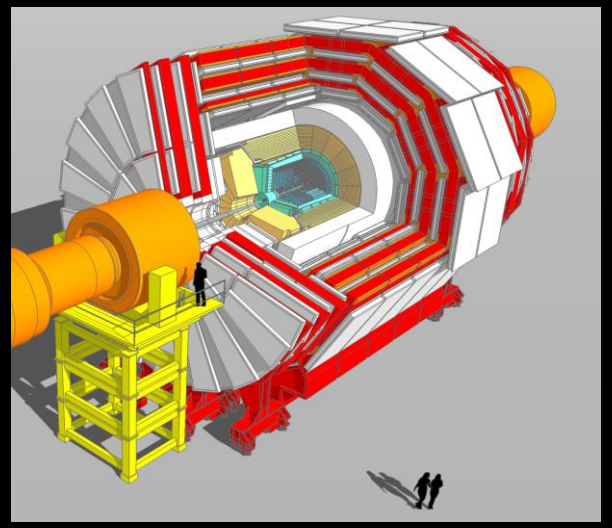
SOFTWARE

- 3D studio max
  - Object mapping
  - Track animations

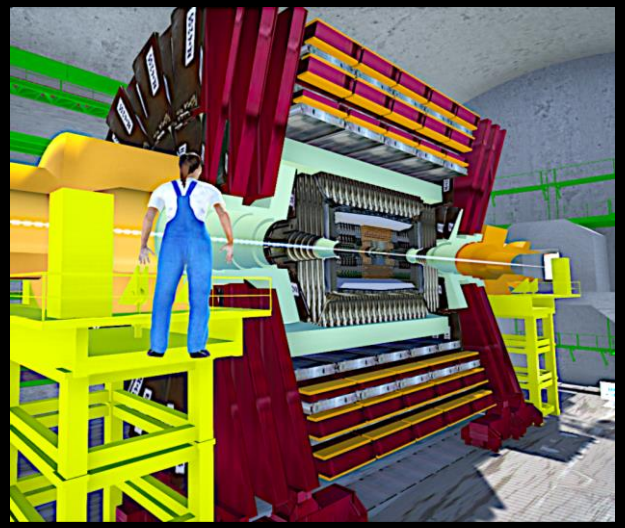
- Unreal engine
  - Interaction with target devices (smartphones, computers, headsets...)
  - Interactivity for the user
  - Scenario
  - Real time rendering

STEP I : DETECTOR

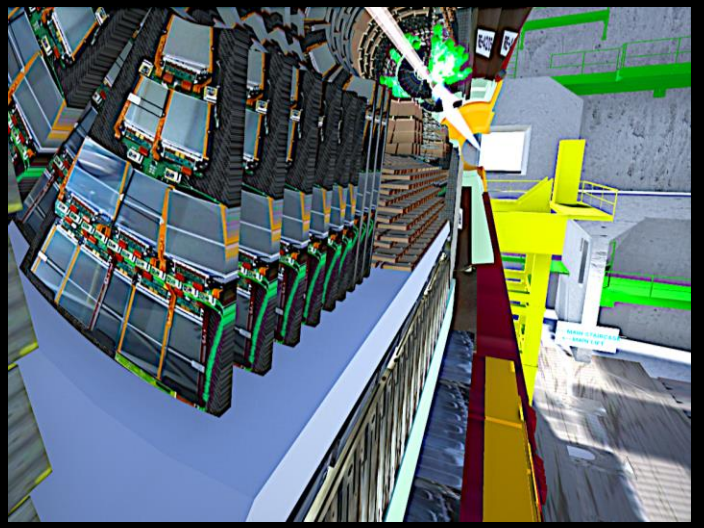
- From *CMS sketchup* model to *Unreal Engine*
  - Redefine all volumes
  - Map texture from pictures or from matter effect inside *Unreal Engine*
  - Insert a human to feel the scale (3rd person mode)



CMS Sketchup image (Tai Sakuma)



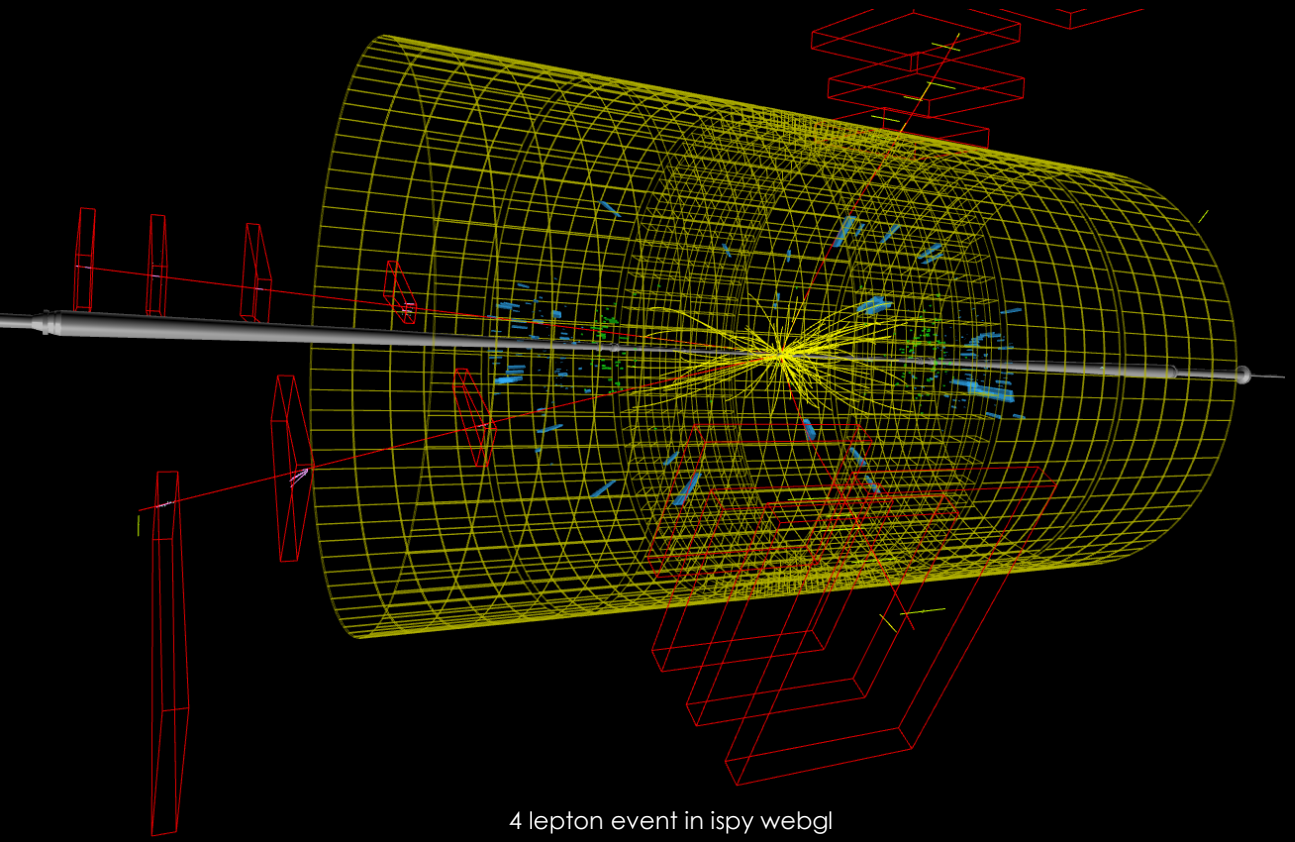
CMS in our VR world



Detail of CMS tracker in our VR world

STEP II : EVENT

- From *iSpy* model to *Unreal Engine*
  - Export event from iSpy
  - Import the result in 3DSmax using a homemade script to animate the tracks



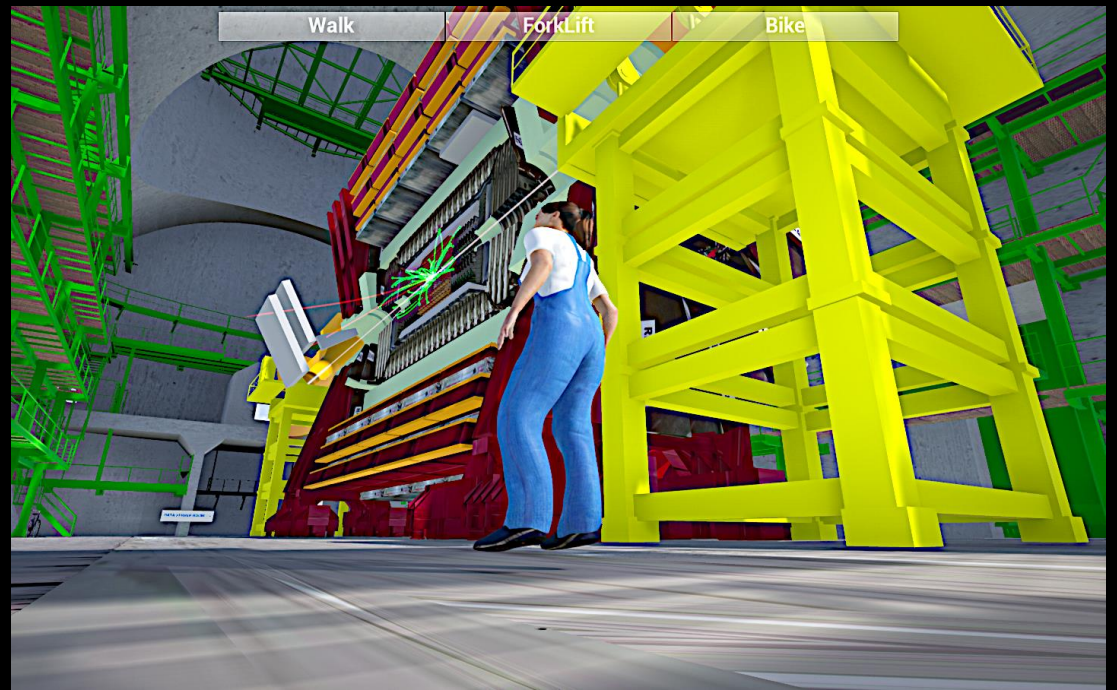
4 lepton event in ispy webgl

4 lepton event animated in our VR world

STEP III : CAVERN

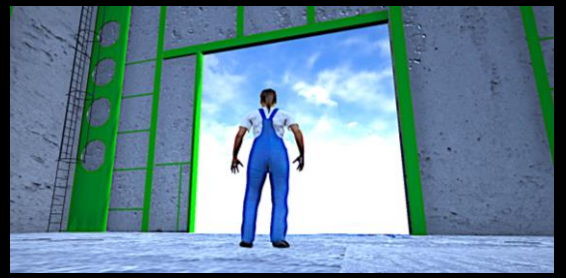
- From CMS safety files to *Unreal Engine*
  - Easily import the geometry
  - Define interactions with the character/avatar

Image produced with CMS safety files
of Lukas Ausserladscheider

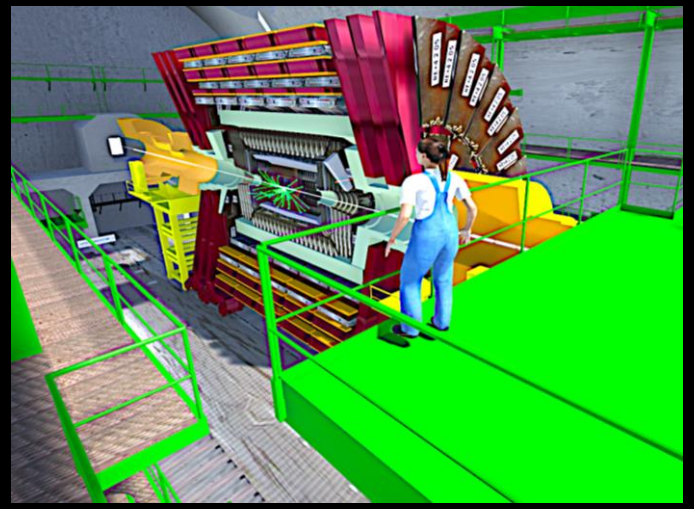


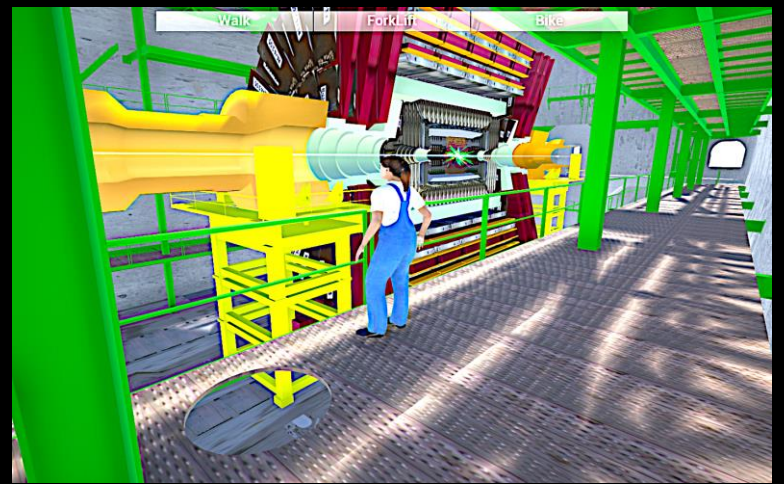
EXPLORING

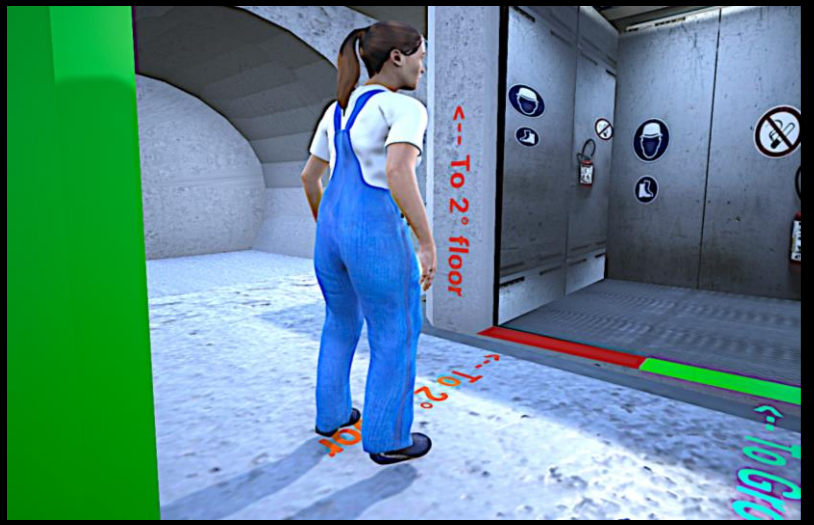
https://vimeo.com/440636855



EXPLORING





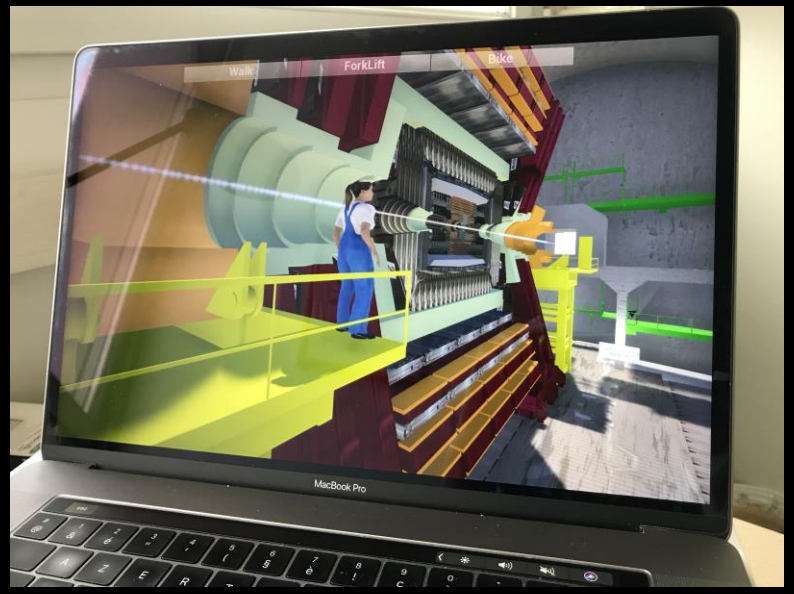


FUTURE EXTENSIONS

- Improve scientific information
- Implement game scenario
- Prepare for CMS upgrade
- Add pedagogical posters

COVID-19 EFFECT

- Headset version postponed
- Smartphones and computer versions reinforced
- Software availability delayed



STATUS AND AVAILABILITY

- Preliminary headset version used with visitors, students
- Desktop version foreseen for exposition room
- Sharing of first beta version delayed
  - Hopefully ready by end of the year
- For more information, please contact vanhove(AT)in2p3.fr

GOING FORWARD

- Seeking new collaboration
  - with computer scientist schools,
  - game developer
  - Education science
- Foresee several tests
  - masterclasses
  - Phd students
- Use of acquired expertise to develop
  - Interaction with objects designed in CAD before realisation
  - Practical tutorials for detector assembly

THANK YOU FOR YOUR ATTENTION !