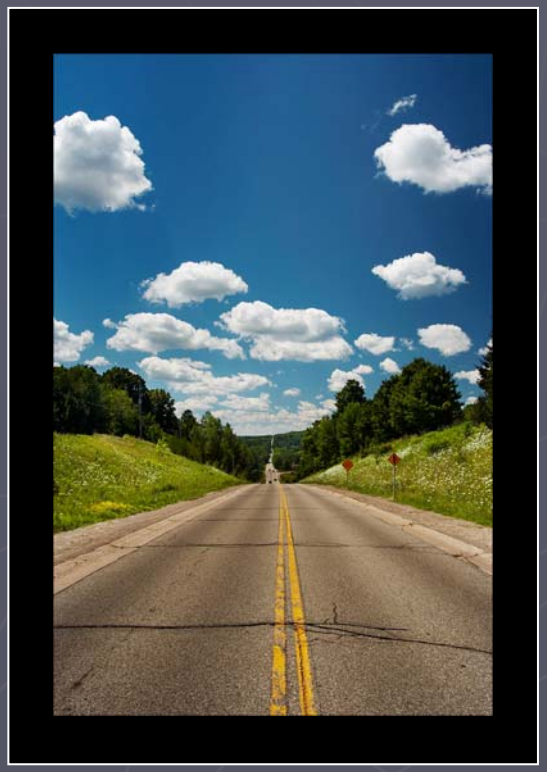
Road Infrastructure video-logs and virtual globes

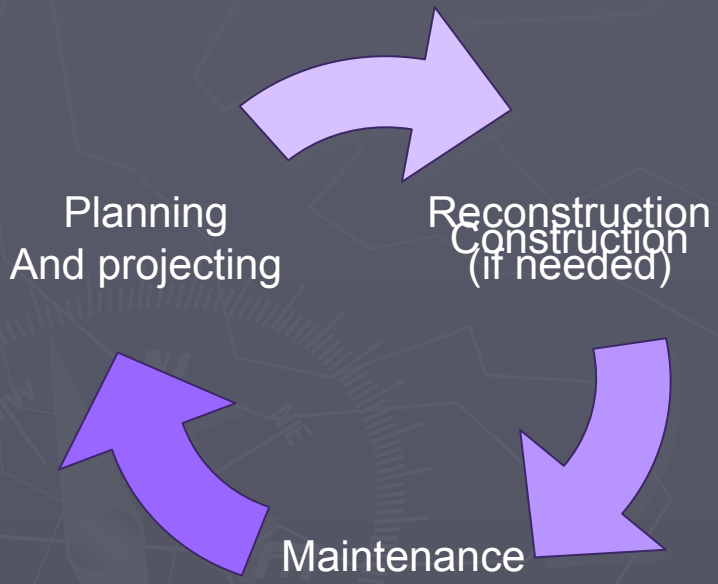
+



Pedro Yarza
(AEPO – Spain)

Road infrastructures management

- Lifecycle



- Big tasks
  - Planning
  - Construction
- Important task
  - Maintenance
    - It improves infrastructure life time
    - Knowledge of the road allows to decide when and how to act
    - It is continuous during the life of a road (year by year)

Road maintenance related data collection

- What are the steps

Obtain data from the road current status

⬇

Process / Analysis

⬇

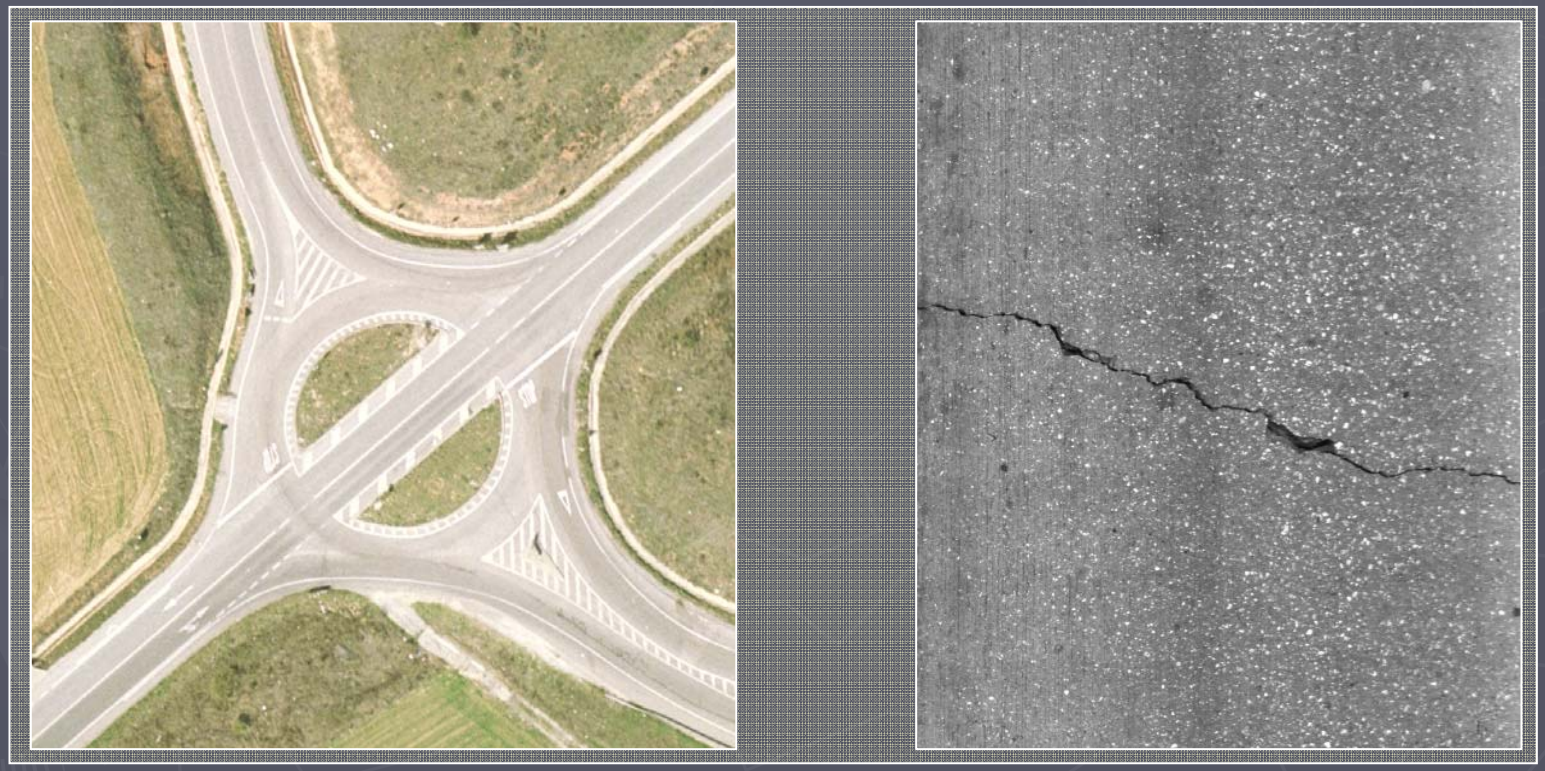
Provide information to help decision makers (DOTs) on how to act

Evolution of the collected data

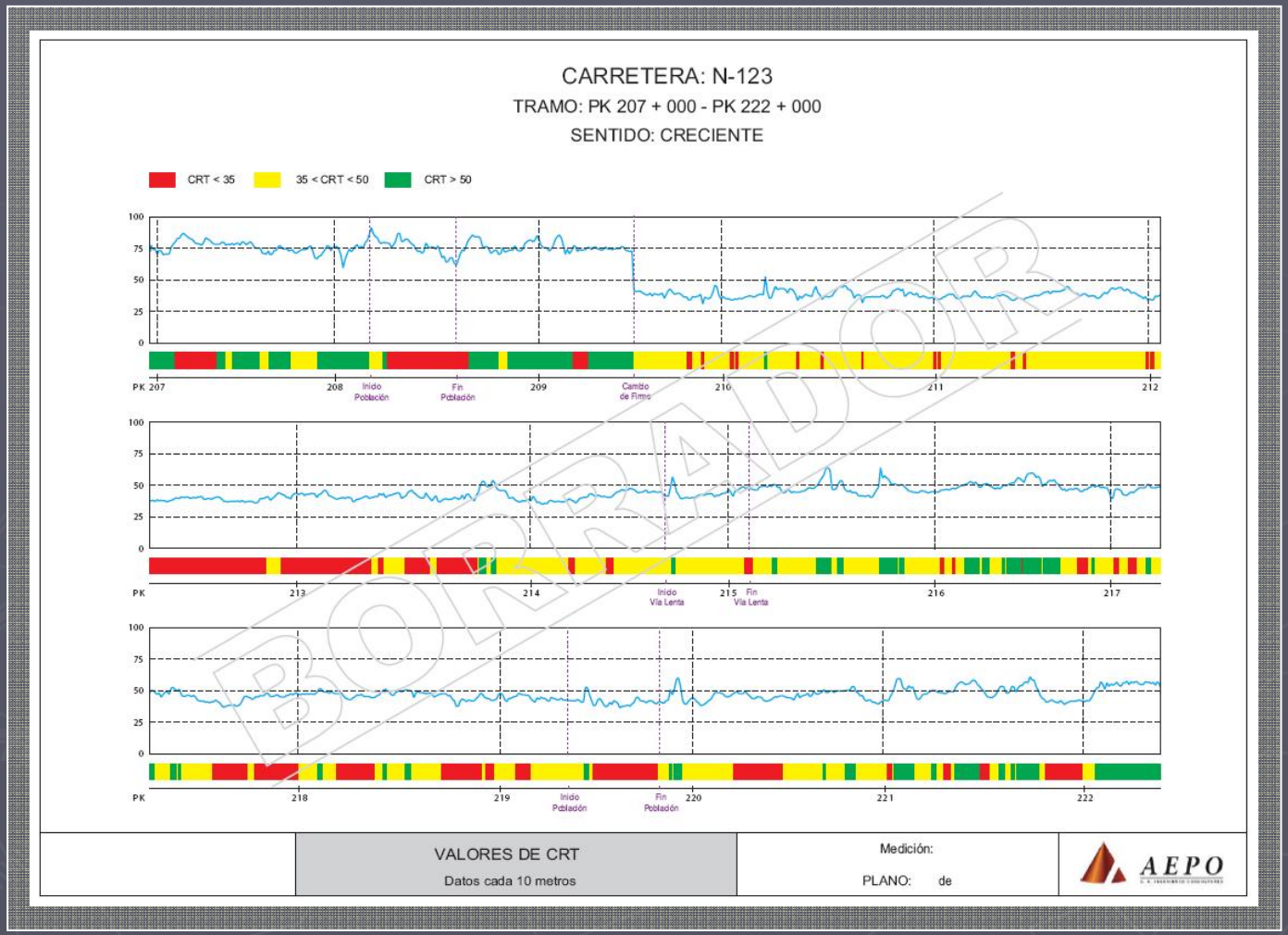
- Past & Now
  - Pavement indicators
  - Video logs made from small size analog video front images
- Now & Future
  - Sets of high resolution panoramic images
  - Rear and/or side view custom images
  - Stereo pair images
  - Immersive images
  - Pavement images
  - Virtual globes
    - Broader knowledge of the surroundings than conventional video logs

Level of detail that can be achieved

- From the general view
  (orthoimages)
  1-5 cm/pixel to 5-100 m/pixel
- To the detail view
  (pavement cracking image)
  1-2 millimeters/pixel

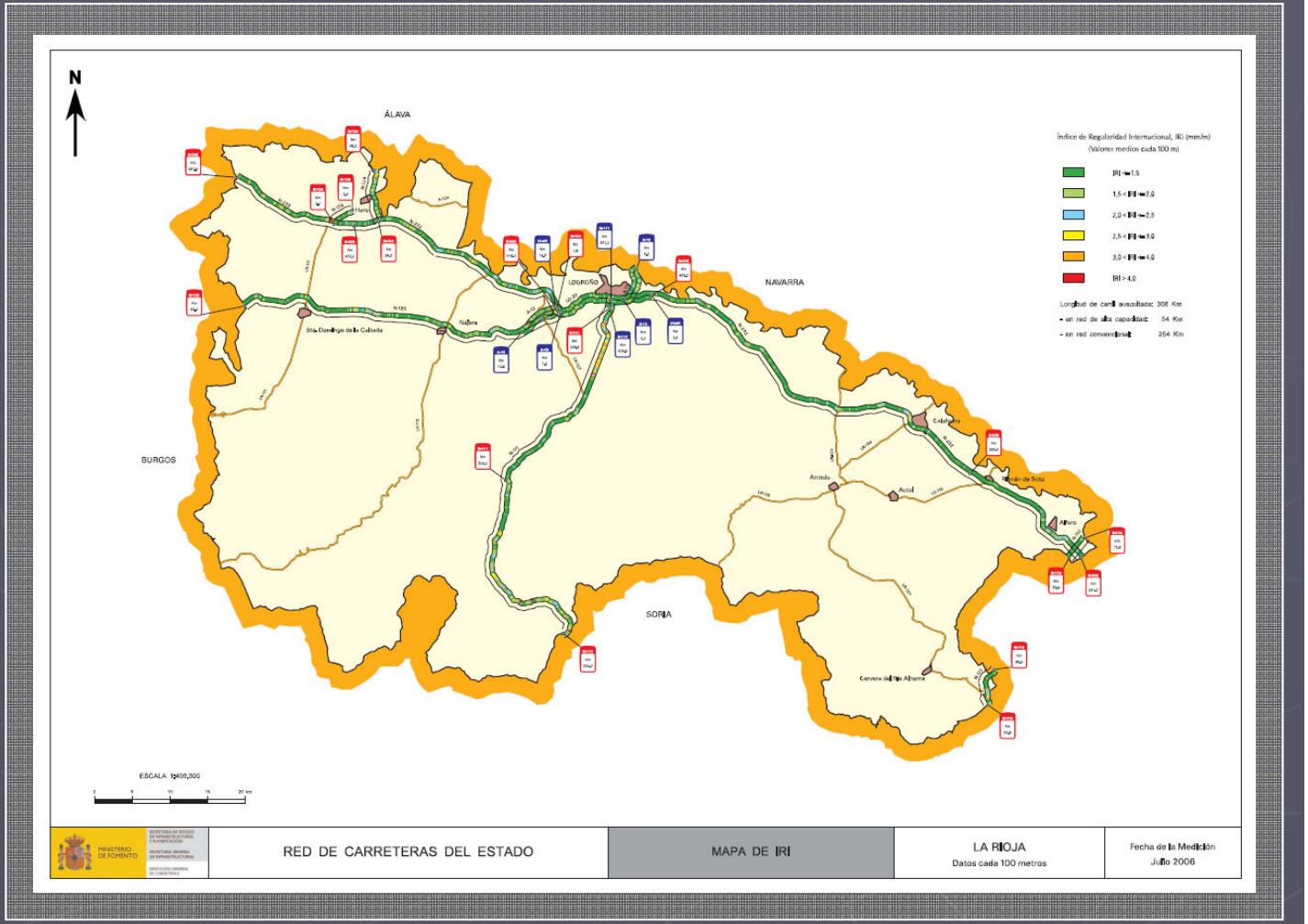


Sample graph reports



Sample GIS road network map

- Pavement indicator shown different color ramps to identify:
  - Distress
  - Traffic
  - Pavement type
  - Etc.



Road Videologs
+
Virtual Globes

Conventional video logs. Equipment

Conventional video logs. Results

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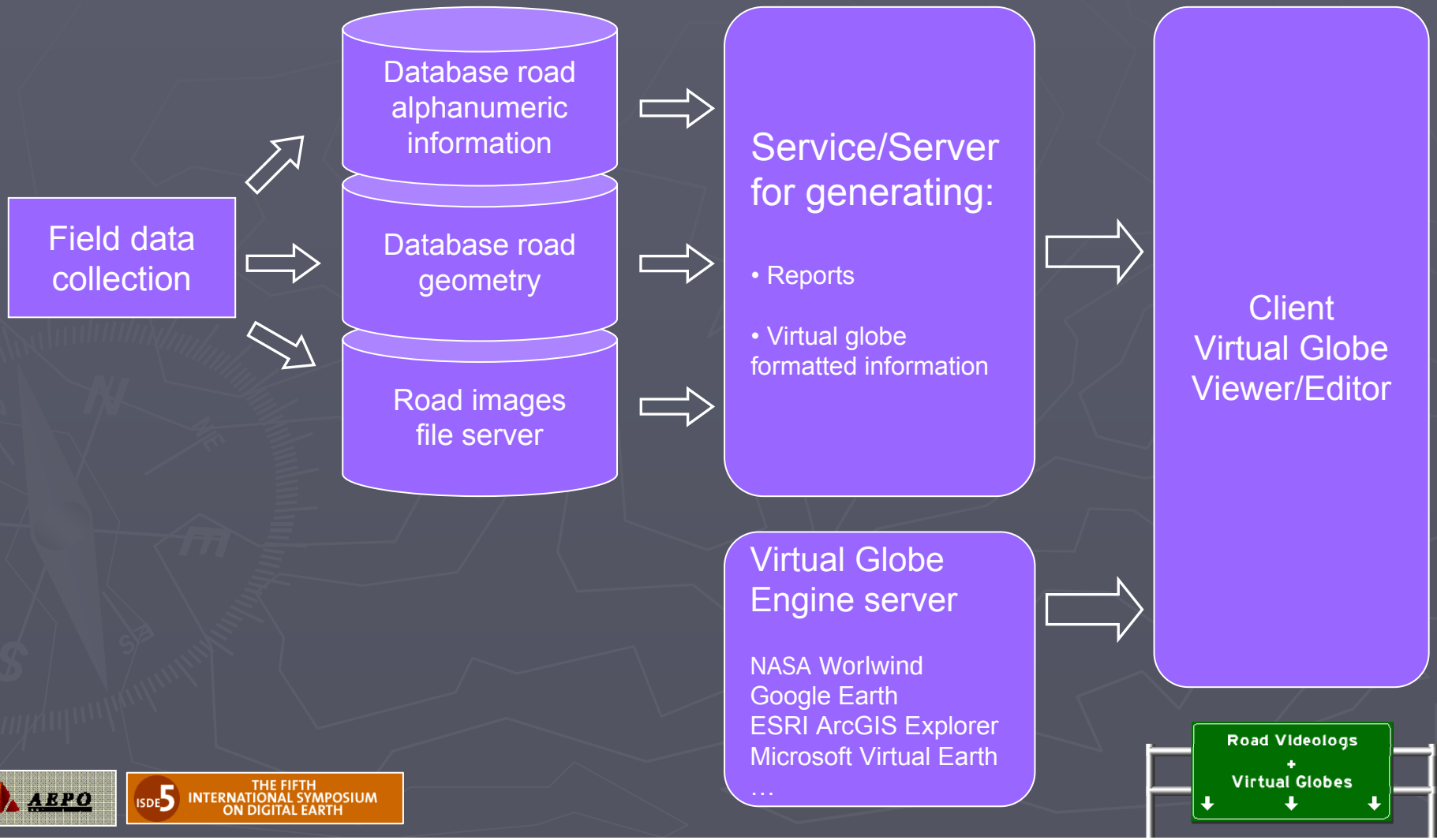
Road Videologs
+
Virtual Globes

Evolution of the information anlysis methods

- Tabular reports
- Graphs
- GIS Maps
- Video logging applications
  - Integrate information from multiple sources
- Virtual globes
  - One step above conventional GIS outputs and/or video logs

Typical dataflow from the road to the virtual globe



Integration of video logs and road information in Virtual Globes

- How to incorporate that information using Virtual Globes
- Options
  - Get the video log as the master and add a “virtual globe” module through an API
  - Make the Virtual globe the nucleus of the visualization environment, and the primary entry point for the system

Samples. Inside the Virtual Globe

- Incorporation of the information inside virtual globe environment

Samples. Inside the VG

- Report generation from the virtual globe

Those samples

- Regular functionalities from a VG
- It is somehow:

Panoramio images

or

flickr geotaged images

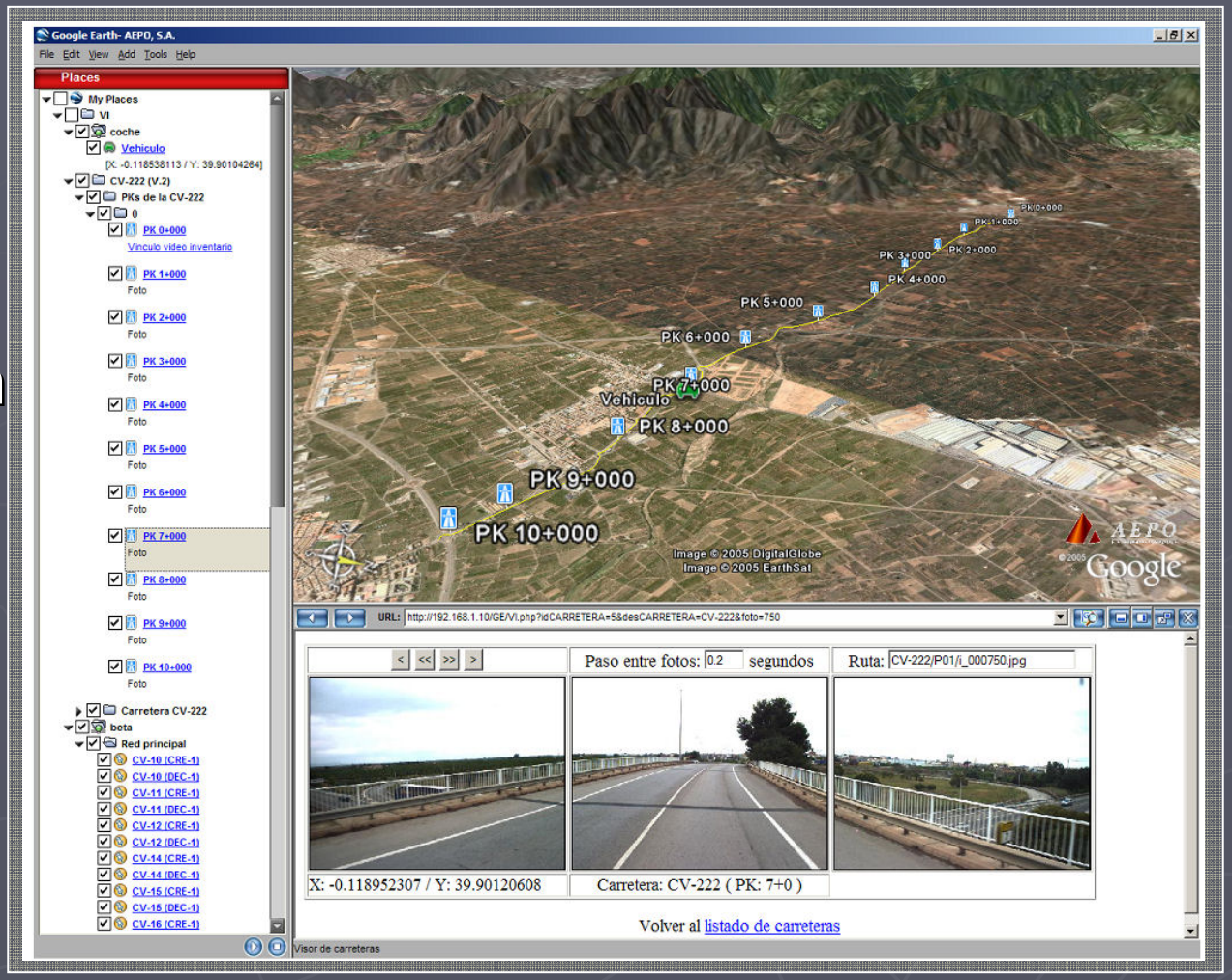
...

But using:

Database with road data and images

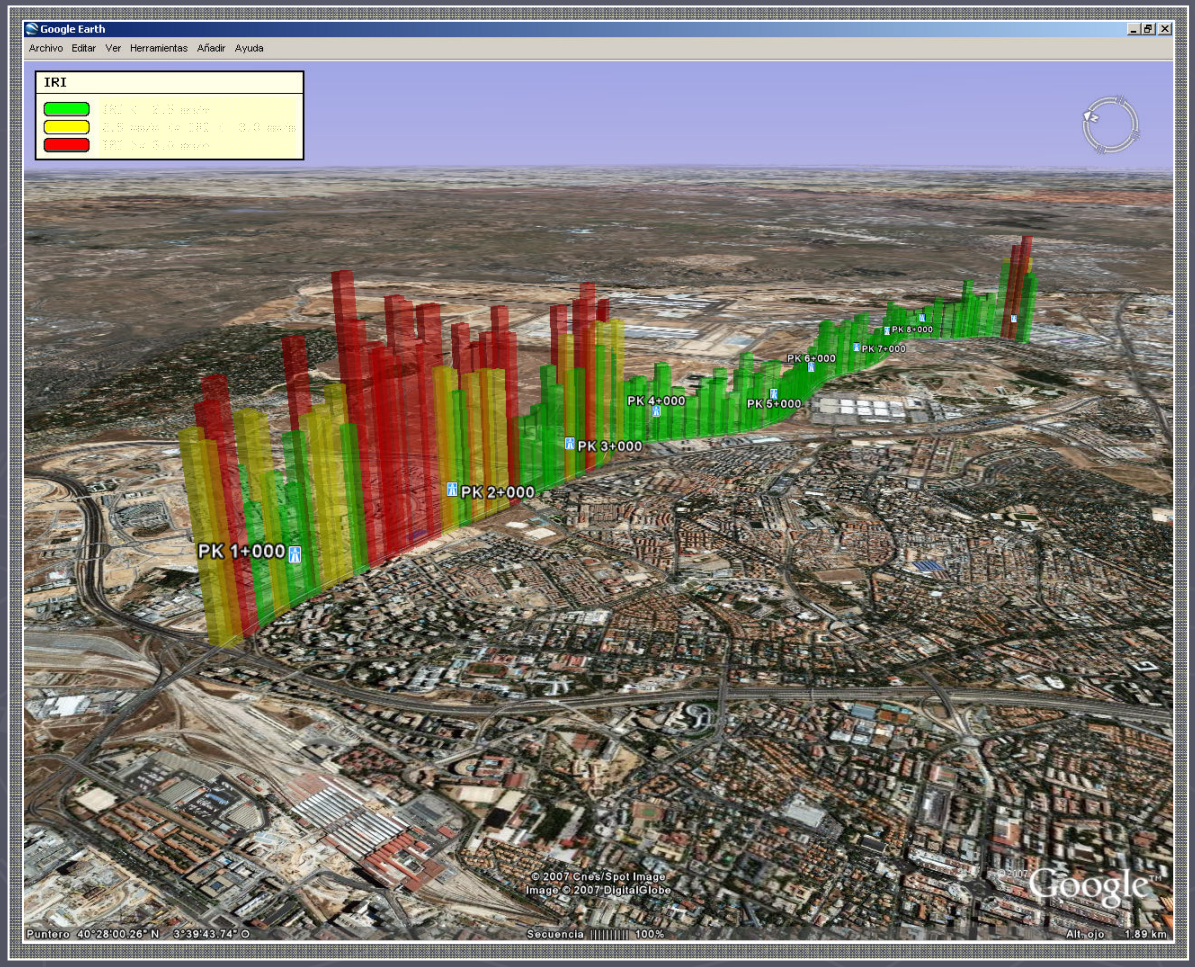
Samples. Video log in a side window

- Video like buttons to move back and forward
- Representation of the user location in a *conventional* map or globe



Samples. Inside the VG

- 3D graphical representation of the information



Sample Video (00:39)

Sample Video (00:50)

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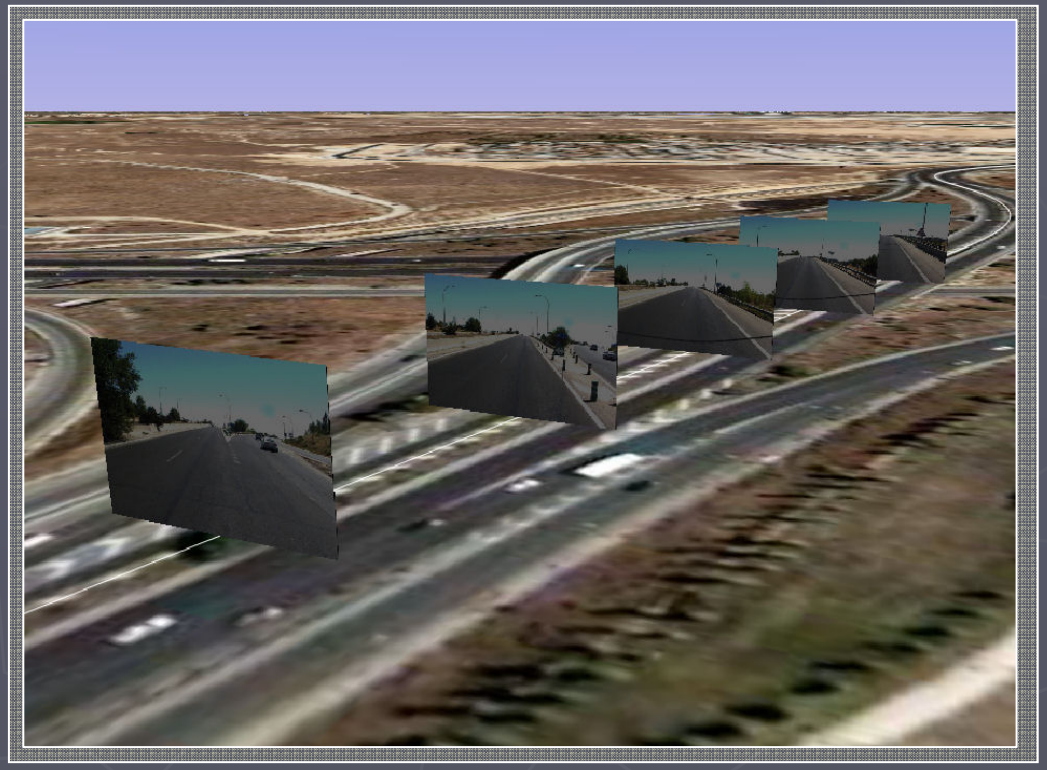
Road VIdeologs + Virtual Globes

Samples completely inside

- Video images georeferenced and located **inside** the VG
  - 1 Image / 50 meters
    - Effect of viewing just the images
  - 1 Image / 10 meters
    - Same effect as a video



Sample Video (02:49)

Sample Video (00:52)

Comments

- Information INSIDE:
  - Not trigering an external application / baloon / pop-up window...
  - Samples show the information inside virtual globe as a part of it:
    - 3d graphs
    - Video log images
- When you increase your level of detail
  - Implies better georeferencing
  - Not only GPS
  - Complement with inertial units

Technical issues

- How it works
  - Samples developed with:
    - Google Earth
    - Image fileserver with MJPEG files
    - MS ACCESS Database with road and georeferencing information
    - Apache web server with PHP for dynamically generating files:
      - KML
      - COLLADA (for the geoplaced billboards)
    - Use of techniques like of “Level Of Detail” definition to not overload the image server
  - This specifications be changed to use any other combination of *backstage* applications
- Pending issues
  - Smooth transitions for COLLADA models when appearing and disappearing from the defined “LOD” (mitigates flickering)
  - KML 2.2
    - Improve referencing of images from COLLADA models
    - Simplify the integration of the images inside the virtual globe

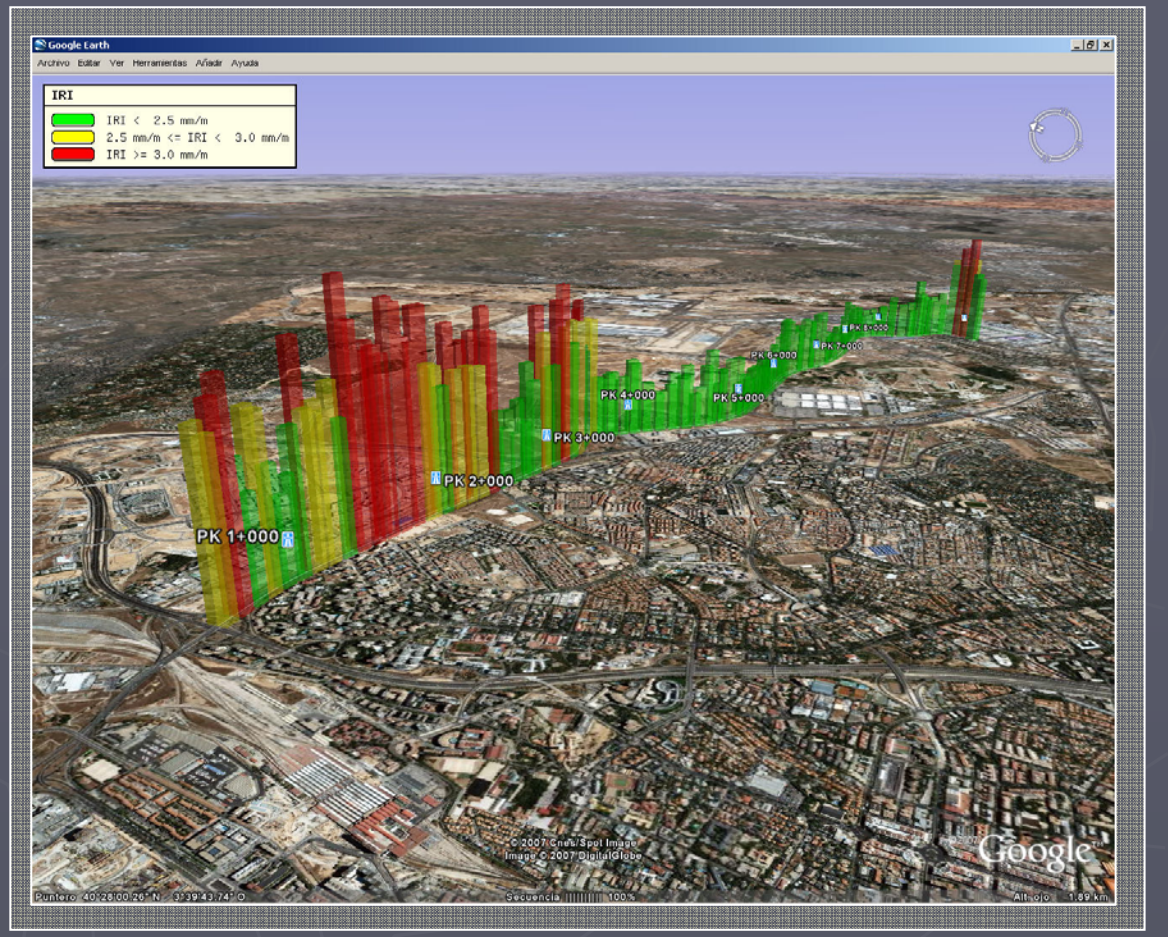
Future. What has to be done

- What to do now
  - More images
    - Panoramic
    - Immersive
    - Pavement images
    - Stereo images
      - 3D reconstruction inside the VG
- Other uses
  - Useful for any linear infrastructure
  - Railroad network
  - Power distribution network

    ...

Thank you!!!

- ¿Questions?
- ¿Suggestions?



- More information
  - http://isde5.pbwiki.com/SessionPage_64_PedroYarza
  - pyarza@aepo.es

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