

Grid Computing for Biomechanical Markers Extraction

prof. A. Juozapavičius

R. Markauskas

[ramunas.markauskas@mif.vu.lt]

VILNIUS UNIVERSITY

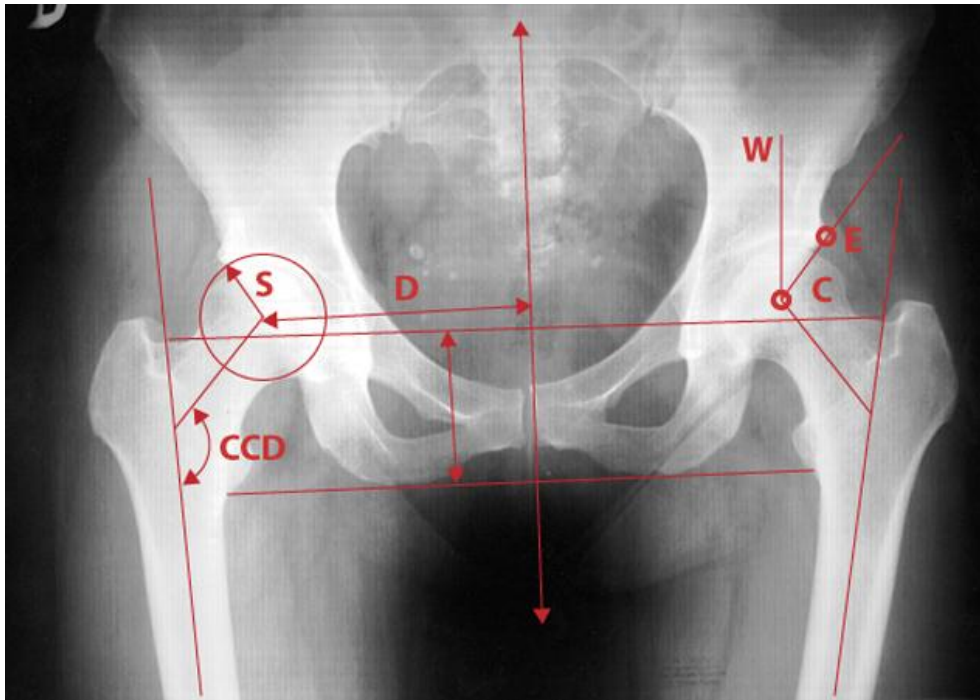


- Hip joint case (dysplasia, arthrosis, dislocation or fracture...):
 1. Pain diagnostics;
 2. Anamnesis;
 3. Patient examination (temperature, visual changes, palpation, pace, stand, movement extent);
 4. **Radiology test and extraction of biomechanical parameters (can take up to 8 hours);**
 5. Additional diagnostic methods, if necessary.

- Image types:
 - X-ray;
 - MRI;
 - Ultrasound;
 - Microscope;
 - ...
- Medical domains:
 - Orthopedic traumatology;
 - Cancer diagnosis;
 - Heart diseases;
 - Odontology;
 - ...

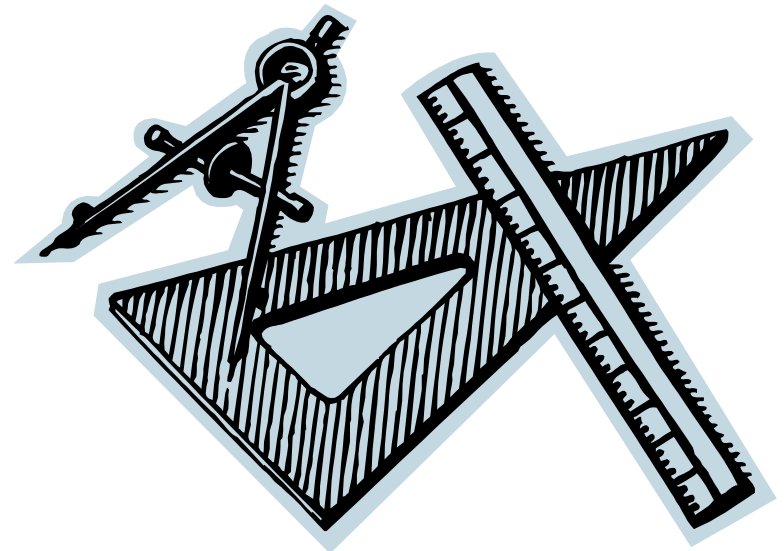
- Full joint replacement:
 - Elbow;
 - Knee;
 - Hip;
 - ...
- Bone fracture;
- Straightening of the (vertebral column) spine.

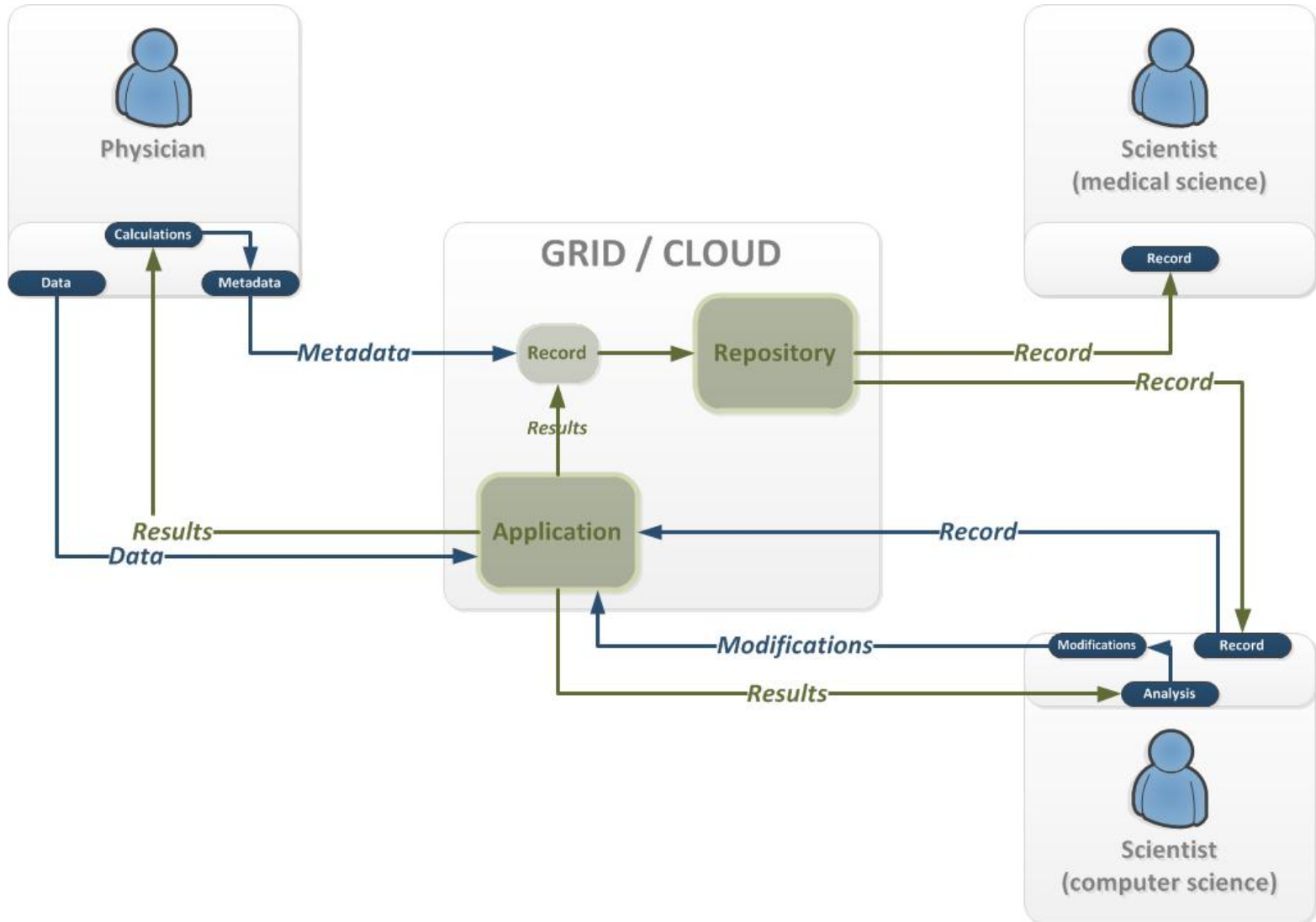
- Present case:
 - Diagnosing (remember the process?);
 - Choosing treatment methods / medicine;
 - Preparing for surgery (choosing the right replacement options, implant parameters);
 - Monitoring after-surgery status / recover process.



- Point E – upper acetabular edge; point C – centre of a femoral head; distance
- D – distance between the vertical body axis and centre of a femoral head; distance S –
- radius of a femoral head; angle CCD – angle between femoral neck and diaphysis

- Biomechanical markers (parameters) are extracted using:
 - A ruler
 - A little bit more sophisticated ruler (applications)





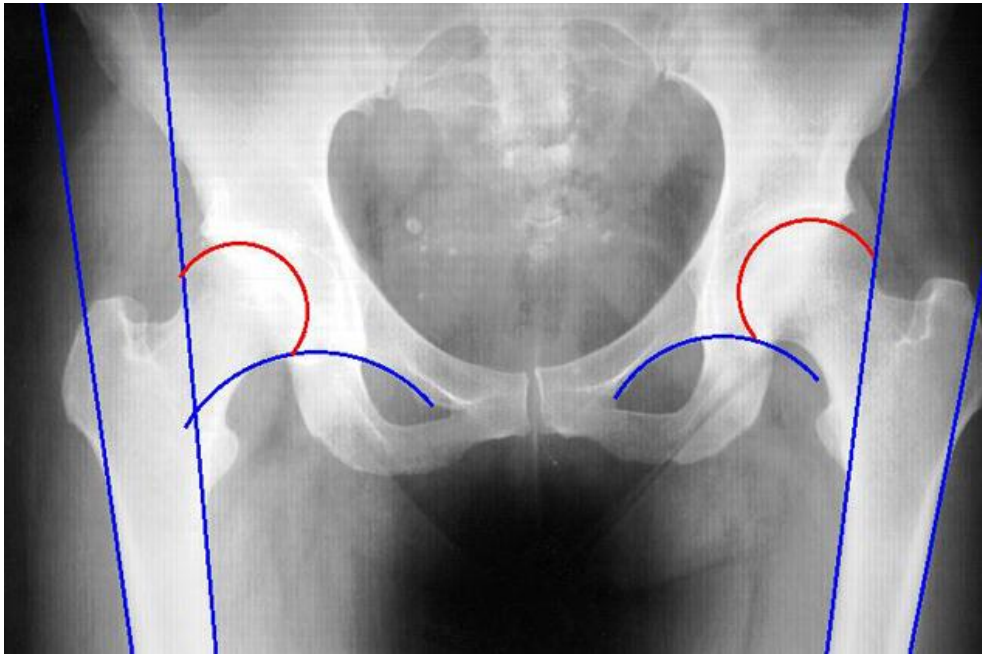
1. User: Upload data (x-ray, MRI image);
2. System: Do calculations and return result (biomechanical markers);
3. User: Create metadata (medical case descriptors: anamnesis, diagnosis, methods of treatment...)
4. System: Form full case record (metadata + image).

1. User: Get full record;
2. User: Do case analysis for learning purposes;
3. User: Do case analysis for medical methods improvement / creation.

1. User: Get full record;
2. User: Upload image from the record for analysis;
3. System: Do image analysis and return results;
4. User: Analyze results and compare with metadata;
5. User: Do system (algorithm) modifications;
6. User: Create additional functionality.

- Scientific archive case:
 - Diagnosing;
 - Choosing treatment methods / medicine;
 - Preparing for surgery (choosing the right replacement options, implant parameters);
 - Monitoring after-surgery status / recover process.
- The same as in archive-less case, but:
 - Tasks are done faster;
 - Tasks can be done remotely;
 - Tasks can be done with easy cooperation;
 - Knowledge base is accessible for a lot more of specialists / students.

- The National Biomedical Imaging Archive (NBIA) – orientated to cancer research;
- PhysioNet – orientated to biomedical time series signal processing;
- The BioImage Database Project – orientated to microscopic image processing.



- Separated objects in original x-ray image