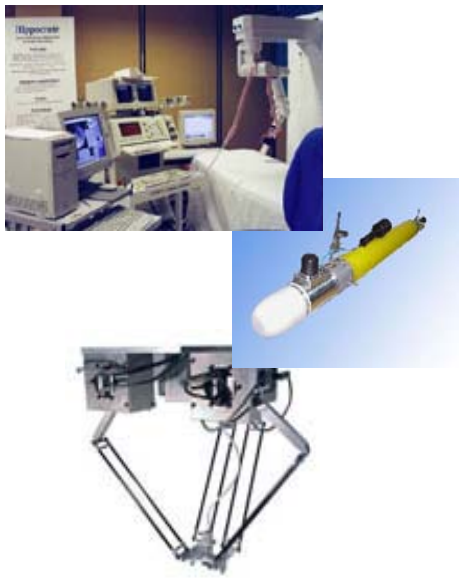
Visual servoing for the beating heart: use of texture information



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- Graduate « Ingenieur », M.E., 2004.
- M.S., Automatic Control, Université Lille 1, 2004.

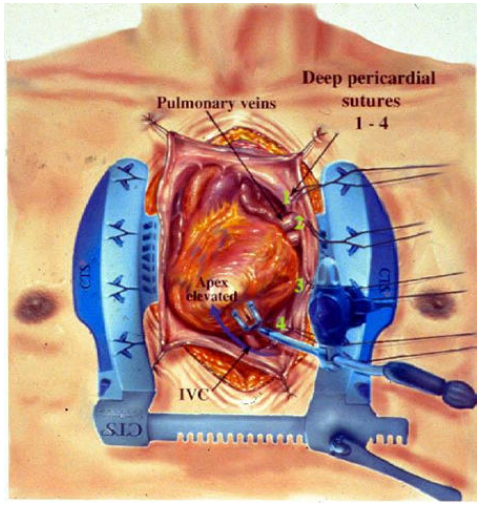
PhD Studies

- Started PhD studies since 2004 at LIRMM in Robotics Department.
- Tutors:
  - Jean Triboulet
  - Philippe Poignet

Objectives

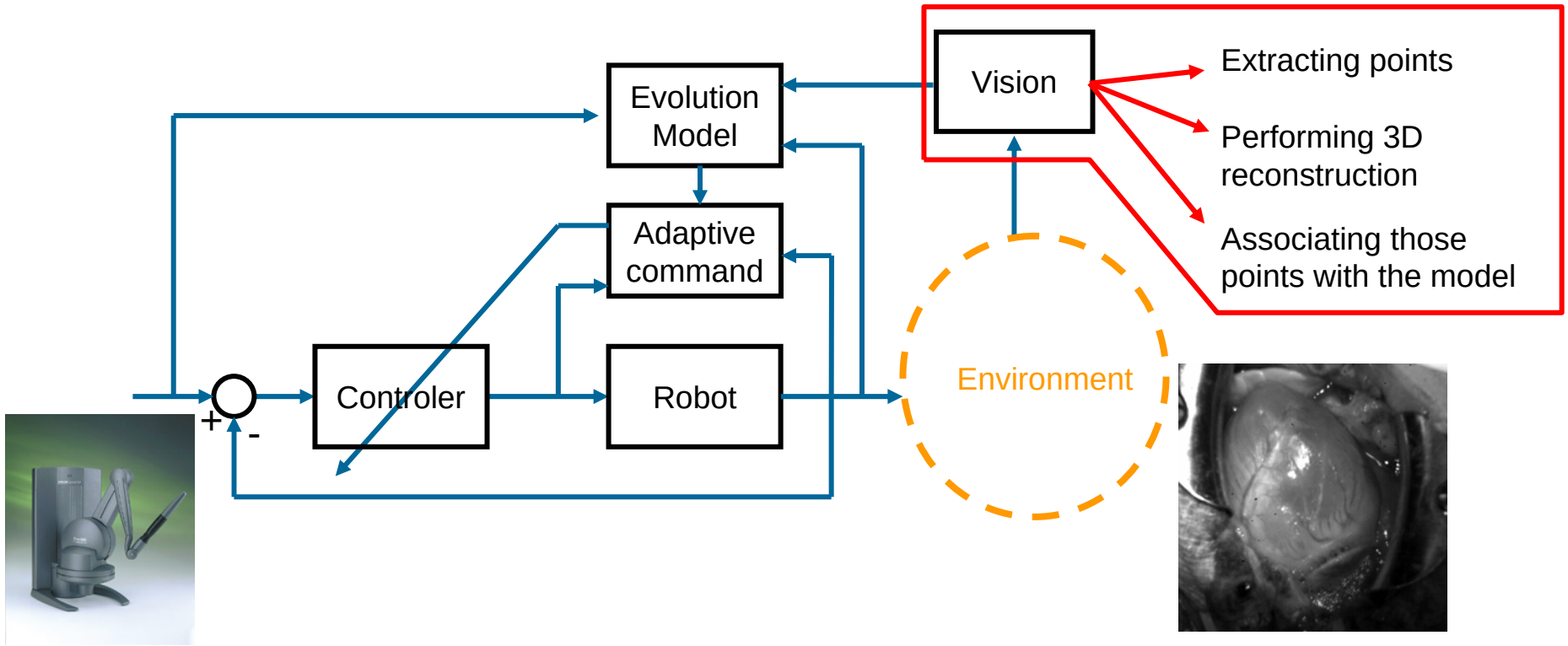
- Coronary bypass operation is risky for the patients, that usually endure lung, brain and kidney problem. Medical robotics are expected to solve most of thoses problems by enabling the surgeons to process directly on the beating heart:

  - To minimize the great deal of risk and trauma associated with the classical procedure: sternotomy, ECC.
  - To fasten the recovery time.
  - For aesthetic considerations.



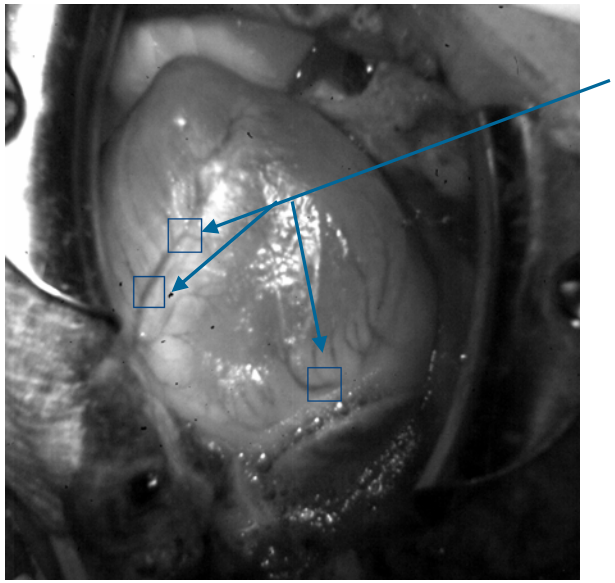
Objectives

- Build a framework for Mini Invasive Surgery on the beating heart. This includes a full command architecture, with a vision as a main component of the control loop.



Tracking the beating heart

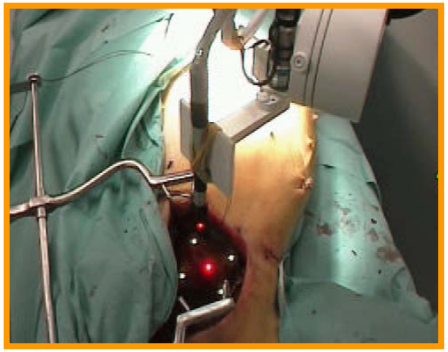
- Extract the position of the heart's surface



Points on the surface

Experiment on a pig's heart

- ***Avoid the use of external markers***



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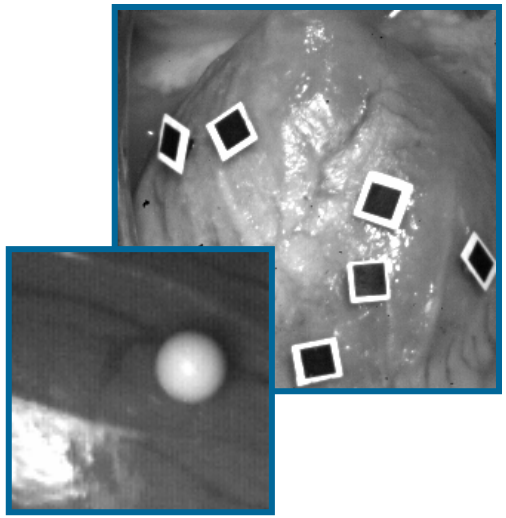
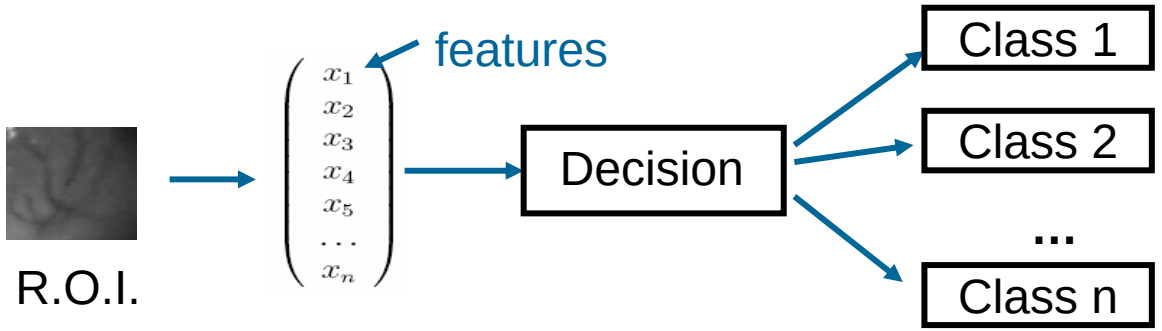


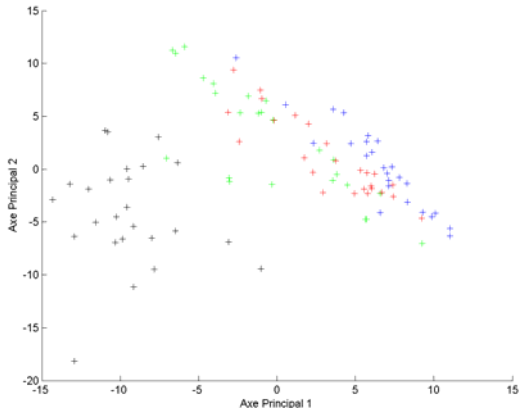
Texture Features

- Texture attributes can give a statistical characterisation of a texture.



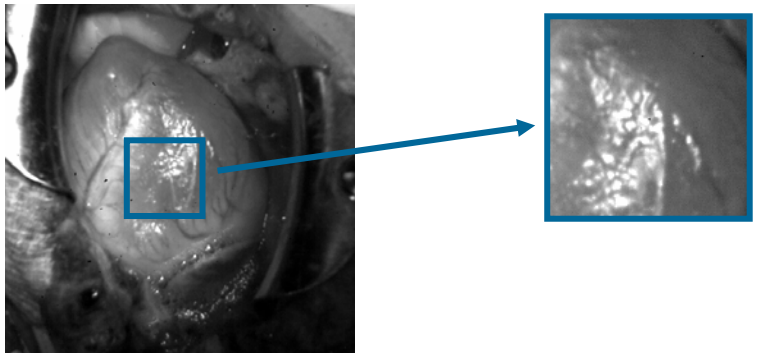
- Many possible texture features: in our study, we had 117 variables, so we had to reduce the number of features.

Principal Component Analysis



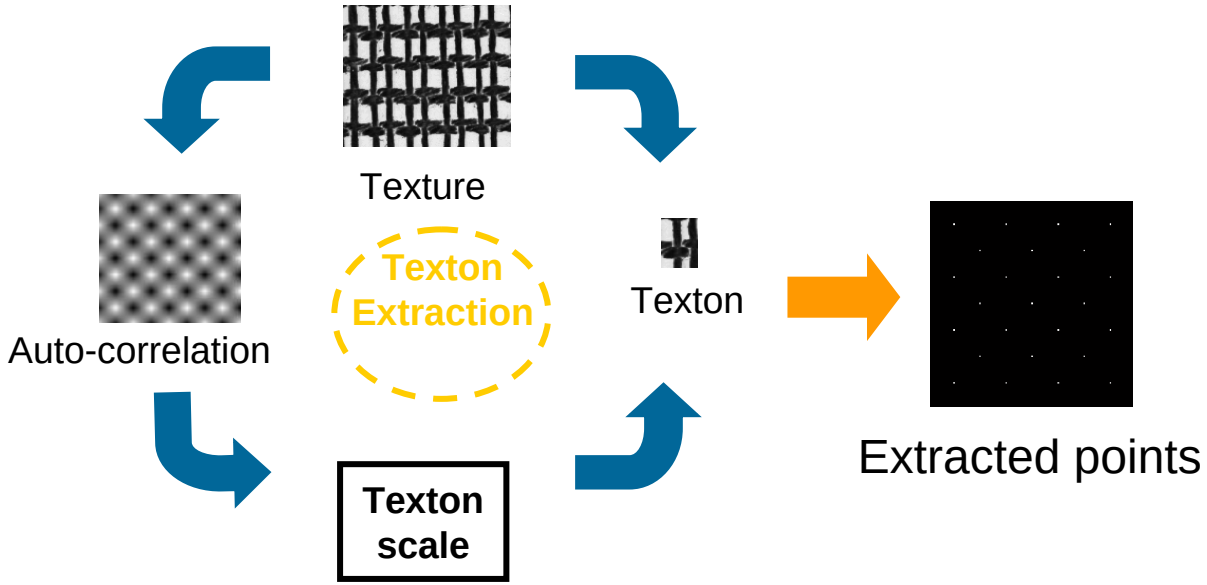
Texture decomposition

- **Problem: How to deal with less textured parts of the heart ?**



Problem: homogeneity of the region makes tracking more difficult

We propose to extract points on the surface using geometric texture decomposition



Questions

- Any questions ?