Activity report, stage 1

"Studies to define a parallel robotic structure optimized for prostate biopsy. Studies to define a conceptual virtual reality software for biopsy."

This stage allowed the materialization of medical requirements and technical characteristics of the consortium members in the product specifications for a family of parallel robots for prostate biopsy. Three possible conceptual models were completed based on different parallel structure architectures, which may lead to a performant solution for the future development and patenting in the second stage of the project. A set of specifications have been defined, as well as a prostate biopsy procedure protocol and a robotic assisted prostate biopsy protocol. Also, three innovative robotic prostate biopsy structures and conceptual virtual reality software specifications were defined. An initial geometric and kinematics modeling for one of the parallel robot concept was performed, activity to be completed in the next stage in accordance with the project implementation plan. The 3D modeling of the internal structure of the pelvis (fig. 1) with markers and its integration into MR images (fig. 2) was also performed as planned in the next stage of the project. Depending on the type of approach, some parameters of the control system and its main components have been defined, opting for an open architecture solution (fig. 3). The stage will be completed according to the schedule in December with a meeting to which all partners will attend, where a synthesis and a critical stage results analysis will be made, and where the detailed tasks for each member for the next stage of the project will be defined.

Deliverables obtained in this stage are:

- Development of three possible conceptual robotic prostate biopsy structures;
- Defining an initial robotic assisted prostate biopsy protocol;
- Initial kinematic modeling of a possible parallel robot concept model for prostate biopsy;
- Conceptual virtual reality software architecture for biopsy;
- Initial 3D Modeling of the internal anatomical structures of the pelvis and its integration in TRUS images;
- A solution to control the robotic system for prostate biopsy.

Analyzing the achievement of proposed objectives in the first stage of the project implementation plan and deliverables obtained it can be said that all activities, goals and deliverables were completed 100%. Thus, there were not recorded any delays, irregularities or corrections to the originally defined activity plan.

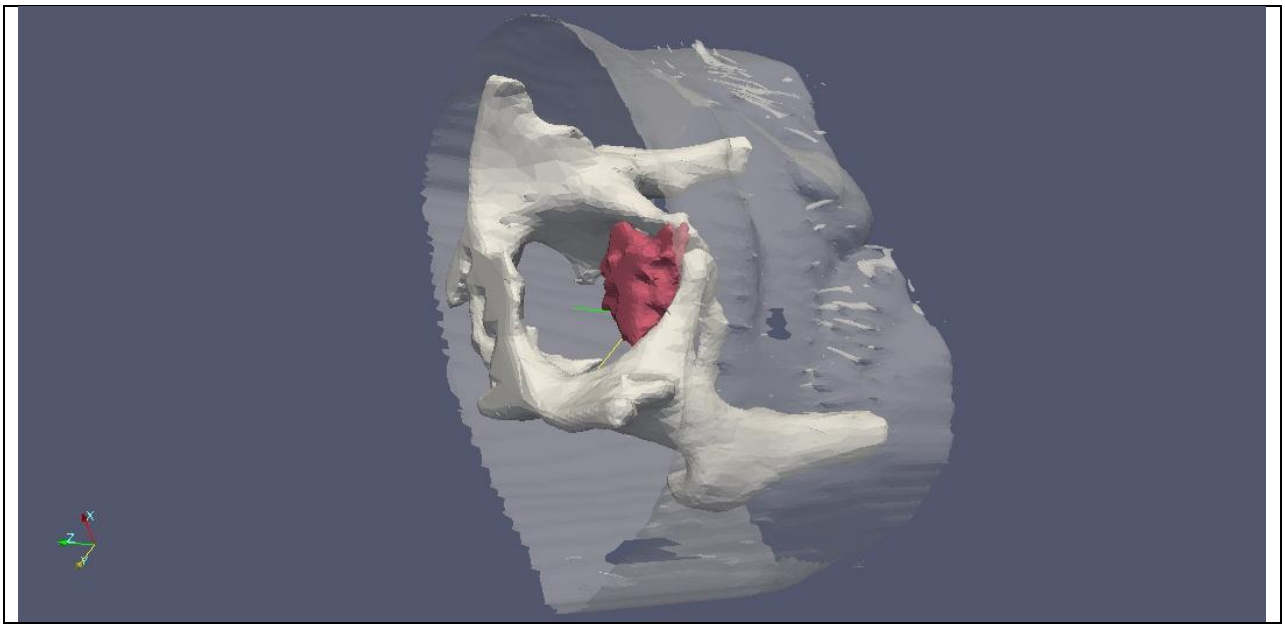

fig. 1. 3D modeling of the internal structure of the pelvis

fig. 2. Model integration in MR images.

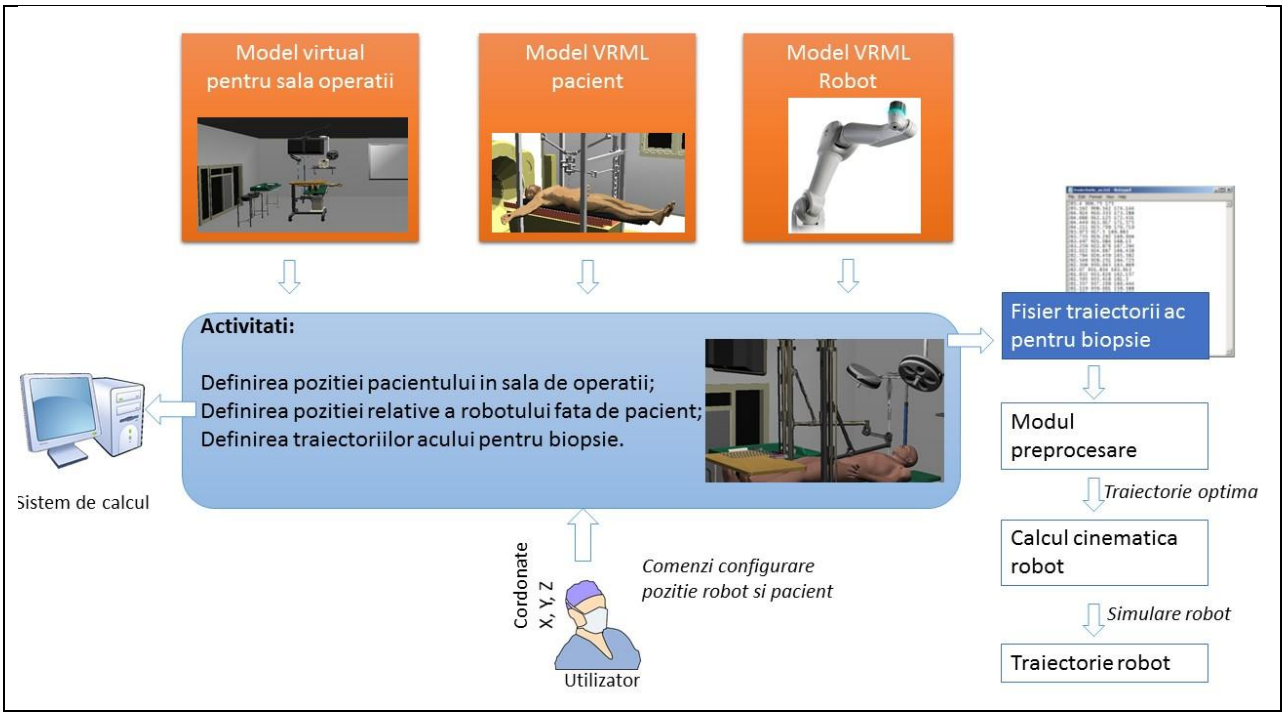

fig. 3. Control system.