

# SimPooch

Canine Medical Acupuncture Training & Simulation System  
Project Continuation Report

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SimPooch is currently in its 3<sup>rd</sup> year of development, and much of the work that lies ahead is outlined in this continuation report. There are five areas that need work done: Physical/Virtual Synchronization, Usability, and Physical/Virtual Expansion.

**Physical Synchronization** will be one of the final steps in assimilating all of the pieces together in a coherent prototype. We have to first mount the haptics device to the base unit. This can be accomplished with dowels attached to the bottom of the haptics and holes drilled into the base unit so the haptics device can be pegged in, and would also be removable. The position of the mount would have to be located such that the stylus could reach the ~70 points on the head.

**Virtual Synchronization** is a necessary aspect to join our virtual model with our physical model. We will implement this in the H3D files by modifying the viewpoint and scaling parameters. The head need to be scaled slightly larger so that it contacts simultaneously with the physical model. This brings us to the marriage of these ideas and the final design obstacle: calibration. We will need to make physical and virtual calibration points, fixed points that will align the physical and virtual model. This can be done by constructing a physical stop for the rotation of the dog's head, at the same time programming an initial rotation value. We will need to do the same for the needle position; however the physical calibration point is built into the haptics device.

**Usability** will eventually become important as the prototype is used and tested by users not on the SimPooch team. We would like to start the entire process with the executable H3DLoad.exe and have all of the required operational files be loaded in a batch sequence. A graphical user interface would be programmed to function with all of our modules and in python. Currently pyGTK looks promising as it is compatible with the python language. The GUI would output

colored markers to show the points touched while the simulation is running, and when the simulation is completed would show the teacher points and calculate grading based on the voronoi algorithm. See the “UI Considerations Report” for a more in-depth discussion on the graphical user interface, grading, and the voronoi algorithm.

**Physical Expansion** would be accomplished with the assistance of a mechanical engineer. We would like to experiment with a spring loaded needle tip to the haptics stylus. This would more accurately replicate the acupuncture needles used in the field. This spring tip and the physical mounting system and calibration device could more precisely be fabricated in the mechanical engineering workshops.

**Virtual Expansion** includes a number of future modifications that could be completed with the assistance of Dr. Narda and the Vet school. The physical model would be more accurately replicated in the virtual one, with nuances such as the force required to penetrate flesh; the location of bones, tissue, and muscle; and the precise location of acupuncture points in a three-dimensional environment. We would expand the grading process to include application of the proper force, angle of the needle with respect to the skin, depth of the needle, and movement of the needle after it has been inserted. All of these properties will have to be defined by Dr. Narda.

These goals presented offer plenty of opportunity to work in different areas of research, from the physical construction in the workshops, to the python programming, to the mathematical topology of the voronoi grading system. New team members joining the project will be able to choose what they wish to work on and we will work as a functional team to accomplish these goals outlined above.