# Project Proposal

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For our final project, we would like to make a virtual turn wheel pottery/sculpting application in VR. The purpose of this application would be to allow artists to sculpt a block of virtual clay using their hands to control the medium. Since the interaction would occur in a virtual world, it would open up the potential for many interesting interactions. Users could utilize a variety of different tools to sculpt clay, or even rotate the clay around weird, arbitrary axis in order to create wild shapes. In addition, the application would also serve as an accessibility tool for non-artists. Sculpting clay can be very challenging to do properly, due to the minute, precise control one must have over the pressure they exert. Combined with rotational physics, and amateur artists will very, very, likely collapse their pot before completion. In our system, the sculpting would be much easier.



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In terms of implementation detail, a VR turn wheel sculpting application would present the opportunity for many different interaction types. Firstly, the user could setup/interact with their turn wheel using a bimanual interaction technique, ideally spindle + wheel. This would allow them to rotate about any 3D vector using Euler Angles and their hands. Secondly, it would allow us to develop pressure-based interaction techniques rather than motion-based interaction techniques. Currently, our discussion in class has primarily focused on how to manipulate objects in VR using hand motion, and there isn't much discussion into best practices for incorporating hand pressure / grip strength. This project would allow explore such methods, if they exist in literature, or develop our own technique.

Thirdly, the largest implementation detail to discuss is how to visualize and interact with the clay. To this end, we would represent the clay as an implicit solid model, where each clay voxel would contain a 1 or 0. Then, as the user removes clay, these voxels would change from 1 to 0. For visualization, we would use the Marching Cubes algorithm to extract the polygonised clay surface. We would then display this mesh normally using Unity. This approach does have 1 primary drawback, and that is the computational overhead. For a really fine mesh, marching cubes would take quite a long time to render, especially on the Oculus Quest. Therefore, we

would use Oculus Link to offload the work onto a more powerful computer for surface extraction and rendering.