Abstract
A virtual reality application is designed for the Division of Pediatric Cardiology at UTSW. It is designed to aid doctors, surgeons, and medical professionals in 3D interactions with models of the heart in an effective manner. The VR Heart Simulation uses the HTC Vive to enter the 3D space and is programmed in Unity. In phase 2 we are implementing advanced functionalities, specifically scaling - the ability to zoom in and zoom out, flying - dynamically moving around the 3D space, and drawing - outlining subsections of the heart to design surgical stents and patches. By viewing the heart models through VR, physicians, parents, and trainees can interact immersively with heart models in truly innovative ways, allowing for improved surgical planning and teaching. Our long-term goal is to integrate this program into the daily clinical workflow to improve outcomes while saving time and money for each patient.

Architecture
- Platform:
  - Unity
- IDE:
  - Visual Studio
  - MonoDevelop
- Language:
  - C#

Results
Controller A:
- Import and Export XML/STL
- Magnification
- Ungroup Models
- Color aspects in Model
- Delete
- DICOM

Controller B:
- Group Models
- Drawing in VR
- Flying
- Measure distances using drop points
- Labeling using virtual keyboard
- Slice-planes

Metrics:
- Main Form: Sponsor Feedback
- Stable Features: Magnification, Flying, Drawing on the heart
- Unfinished Features: Exporting drawing objects and Slice-planes.

Summary
The Surgical Planning in Virtual Reality Project, funded by the UTSW Pediatric Center, provides medical professionals with Virtual Reality tools that will enhance their understanding and interactions with the heart. This program provides educational benefits for anatomy and biomedical engineering. Developed in Unity, this project displays heart models in 3D space and allows the user to navigate the interior of the heart, magnify the scale, and design cardiovascular patches. Further prospects of this project include designing and exporting stents, calculating surface area of drawing objects, and creating interactive cross-sectional areas.

Impact
This project aims to incorporate technology and medicine to make surgical planning easier and time efficient. Viewing heart models through virtual reality gives a holistic picture of what each heart entails in any view possible. The integration of this program will save time and money for the patients.

Medical Development
- This project will allow medical professionals to strengthen their knowledge of patient’s heart diagrams by interacting with them in 3D. It will also allow for more efficient and accurate designing of stents, meshes and valves.

Academic Purposes
- Students, patients and guardians will get a “hands on” experience with the anatomy of the cardiovascular system and gain more knowledge of the project as a whole.