VR Lab for Enhanced Learning

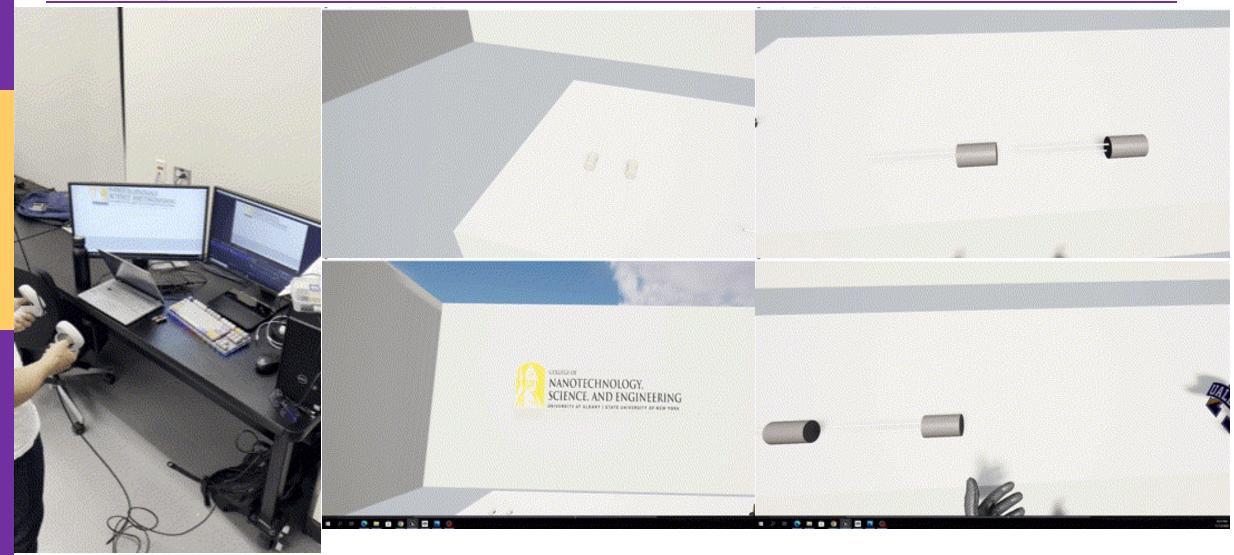
Engineering Design Review

Prof. Aveek Dutta, Department of Electrical & Computer Engineering

Joren Cruz, Diego Tapia, Daniel Wang



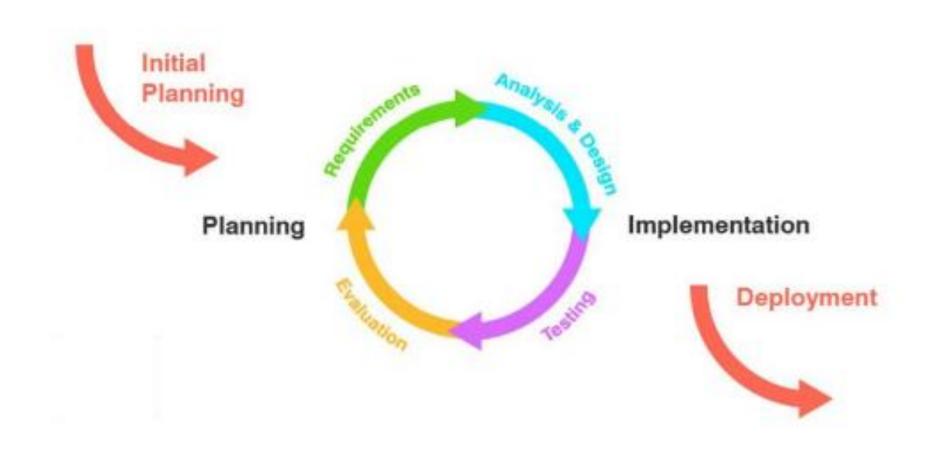
Recap



Agenda

- Iterative Design Process: Analysis & Design
- QoL Improvements
- Blueprint Visual Scripting (BPs)
 - User Interface Menus
 - User and Object Interaction
- Spice Application/Implementation
- Near Future Design

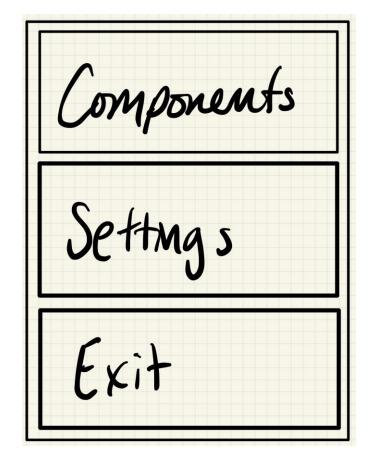
Iterative Design Process: Analysis & Design

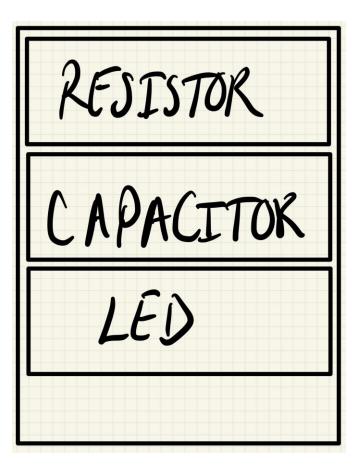


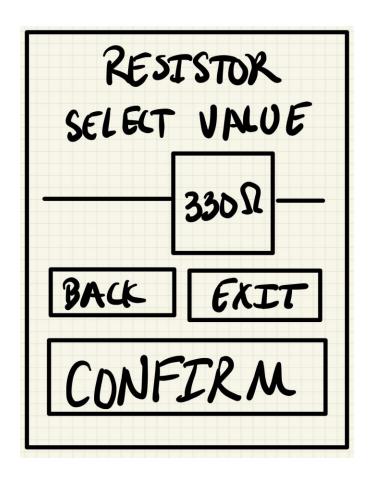
QoL Improvements

- Projects have been moved to GitHub for ease of access.
 - Access to files and projects locally through GitHub Desktop
- Device inputs expanded to support other VR hardware
 - Our program is no longer bound to only the Meta Quest.
 - Additions include the HTC Vive, and most devices supported by SteamVR

User Interface

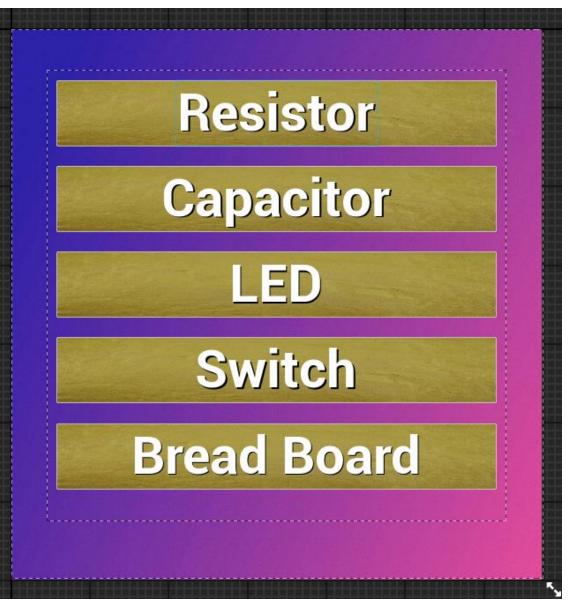






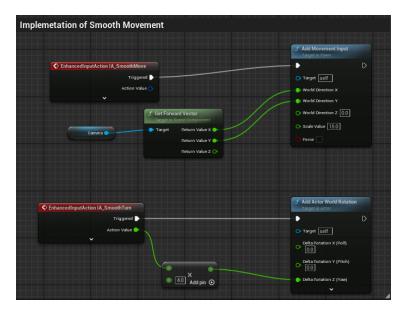
User Interface (cont.)





User and Object Interaction

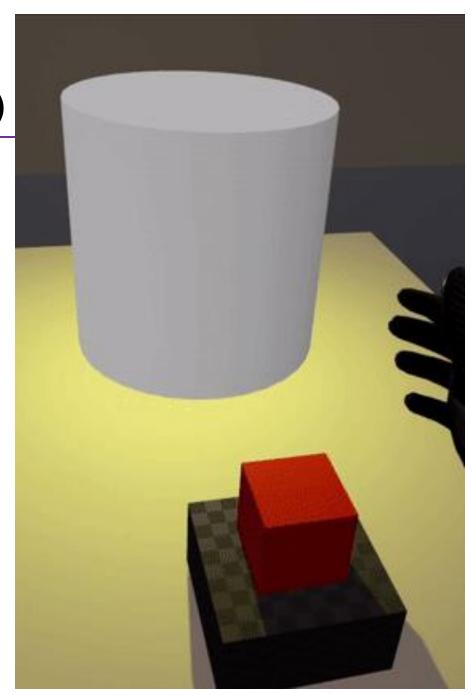
- Fluid Movement
 - Implemented smooth, linear movement to character perspective.



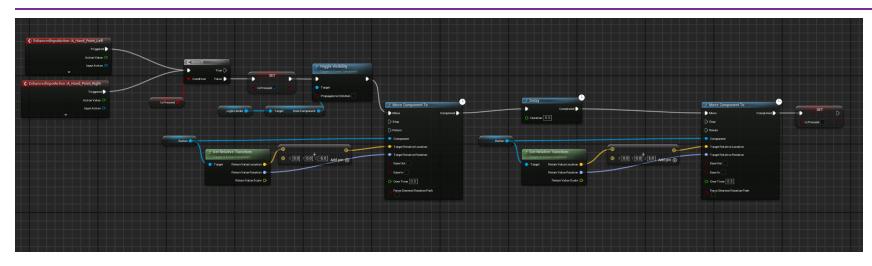


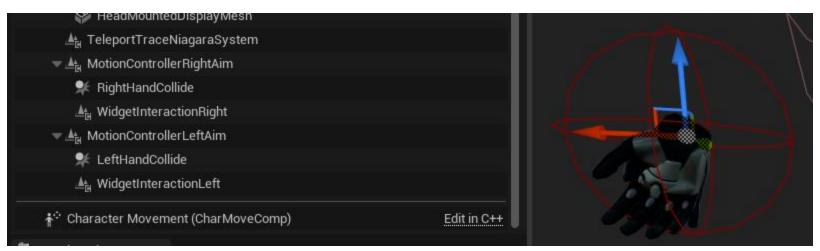
User and Object Interaction (cont.)

- Hand Collision
 - Created a new instance of user hands, allows for collision with objects without the need to grab them.
- Object Interaction
 - Developed a togglable button that behaves like a switch.
- Action-Based Functionality
 - Implemented variables and parameters, allowing button presses to affect other objects.



User and Object Interaction (cont.)





- In creating our button, we utilized collision to actuate
- For proper interaction, the user's hands also require to have collision spheres developed
- Issues arose with these collision spheres, which included being able to pick up surrounding circuit devices
- This was resolved with the creation of a custom collision preset

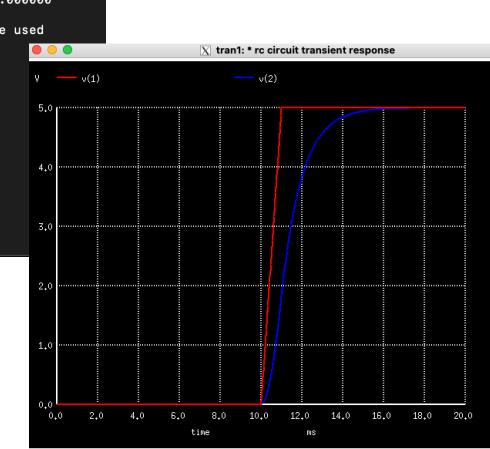
SPICE Application

NGSpice Netlist

```
Circuit: * rc circuit transient response
* RC Circuit Transient Response
                                             Doing analysis at TEMP = 27.000000 and TNOM = 27.000000
*resistor connected between node 1 & 2
                                             Warning: vin: no DC value, transient time 0 value used
R1 1 2 1k
                                              Initial Transient Solution
*capacitor connected between nodes 2 & 0
C1 2 0 1u
                                                                                      Voltage
                                              Node
*piecewise linear input voltage
vin 1 0 pwl (0 0 10ms 0 11ms 5v 20ms 5v)
*transient analysis for 20ms, step size 0.02ms
                                             vin#branch
.tran 0.02ms 20ms
*define run-time control functions
                                             No. of Data Rows: 1018
.control
                                             binary raw file "output.csv"
run
                                             ngspice 2 ->
*plotting I/O voltages
plot v(1) v(2)
write output.csv V(1)
endc
∎end
```

[ngspice 1 -> RC

No compatibility mode selected!



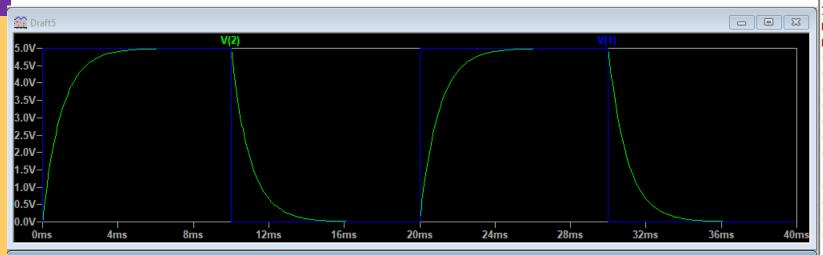
SPICE Application (cont.)

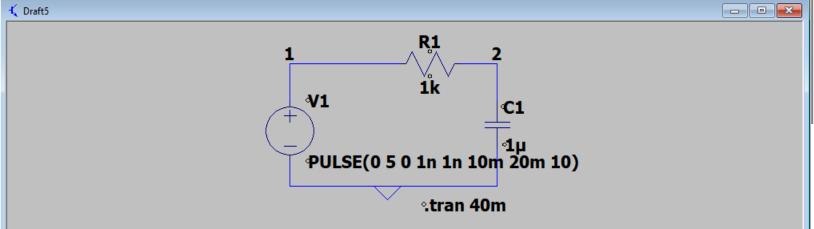
CSV file gathered from NGSpice after simulation

•		•							
Title: * rc circuit transient response	:								
Date: Wed Feb 21 15:43:08 2024									
Plotname: Transient Analysis									
Flags: real									
No. Variables: 2									
No. Points: 1018									
Variables:									
0timetime									
1v(1)voltage									
Binary:									
JغöÚ◊ä>JغöÚ◊ö>JغöÚ◊™>Jغö	Ú�ʃ>JغöÚ� >JغöÚ�/>JغöÚ�Í>	JغöÚ◊˙>–TË?K‡ kW2?áʃYÕÑp?vî	í/≤Æ?Ä∑»ov ?û\$zÜ#?ºë+ù¥	%?⁄ _. :‹≥S(?⁻kWç Ú*?Ÿs>·ë	-?#»~{0?©YVPh1?8ꉮ	∑2?«Δr4?V″Z©V5?Â3è≤4¶	6?tj¿17?°´cKE9?í09º÷î:?!»b%	.₀;?∞DVmÌ3=??{‰≈xÉ>?Œ±	tr"??/tĪGë@?۱
9A?ø™"‡A?ΔU¿òàB?O·úl^0C?ó¸"\$ÿ	⁄C?fl+≈È®D?'3rqØ'E?oNπuœE?∑i :	wF?`ÑGvG?G†é"ΔΔG?èª′ŒãnH?¢	÷{QI?Úc'æI?g						
′″‹eJ?Ø(Ú冗¢									
K?~C9 hμK??_Äÿ-]L?áz«ÑÛN	//?œï1π¨M?±U>~TN?_ÃúâD,N?ßÁ	"5							
§O?wÅÒÁ%I X?{Vé∕WX?‰±∞Ò™X	?vq'Ü',X?g`~\ <u>\</u> RY?ç3ö¶Y?Ø@}'Y`	^º S®cfl_NZ?~5áµB¢Z?õv™ã%^Z??Q	ŒaJ[?"fiÒ7Îù[?álŒÒ[?+˙8‰	∞E\?œá\ʃìô\?sÄêvÌ\?££f\	/A]?º0«<<ï]?_æſÈ]?LÈ=^:	?ߟ1ø‰ê^?KgU韛^?ÔÙx	k™8_?ìÇúAçå_?7¿p‡_?ÌŒÒv)	`?øï,D`?ë\Mn`?c#'∏″ó`?5ĺ8	#Ô¡`?±Jé‡Î`?Ÿw
<(@πb?fl ì1"b?±1 ₋ "									
c?ÉêCi7c?UV ë∞d?∑TıóÇ⁄d?âte?[,n									
* f ?R $$ [$$ S f ? $$] f 2 Ω f] Π 1, Ω f?è Π 4 $$ 0 Π 4 Π 1, Ω 6 Π 7 Π 1, Ω 6 Π 9 Π 1 Π 1, Ω 6 Π 1	f?am‹≈°f?34Ór∂%g?°`›ßOg?◊¡lô›	/g?©à#¥ä£g?{O5 Õg?MGäm~g?x	Xı^!h?Ò£j`PKh?√j ÀAuh?ï1é6	53üh?g⁻ü°\$…h?9ø±Ûh?Ü√\	wi?›Ľ',⁻Fi?ØÁMĺpi?Å∕⁻∏:	€öi?S°			
. ,	k?″ı o?7g\›Vo?–x ní′cq?°~GŒxq?								
Û⊡″Δçq?s÷≥ â¢^q?ÄGμ>õr?È*>Ùì ı	r?R«©å5r?ªÒO_ÖJr?\$′ÿ~_r?ç∏a	/tr?^õĺī⁄oâr̞?_īs5hûr?»b¸ĺ`≥r?1FÖ†	Y»r?ö)VR›r?						
óKÚr?līgiCs?′51s?ßö∫Fs? t?ìC%d÷	•								
7œ«kt?ŒÌøÑ¿Ät?7—H:πït?†¥—Ô±		t?≠%~{çu?1Ü(u?®ièÊ~=u?ËœúwR	u?Q≥°Qpgu?∫ñ*i u?#z≥ºaëu	?å] <rz¶u?ı@≈'sªu?^\$n›k-< td=""><td>−u?«¢íDÂu?0Î_H=`u?ôŒË</td><td>″5v?≤q≥.\$v?kï h'9v?'xÉ Nv?</td><td>=\'cv?¶?ïâxv?#?</td><td></td><td></td></rz¶u?ı@≈'sªu?^\$n›k-<>	−u?«¢íDÂu?0Î_H=`u?ôŒË	″5v?≤q≥.\$v?kï h'9v?'xÉ Nv?	=\'cv?¶?ïâxv?#?		
çv?xßÙ¢v?·È/™°∂v?JÕ∏_ÙÀv?≥∞A									
w?ÓZ<5◊w?\ §≤w?6v#,ú«\ y?òs√•A									
RflËy?Irìÿ″y?≤UΩ−z?9•r'z?Ñ.(¬ <z< td=""><td></td><td></td><td>i‰z?5ॄâġz?ûॄÜ?y{?,ıq#{?p=</td><td>≈ò™j8{?Ÿ®!`cM{?Bå™?´</td><td>o3ÀTw{?SºÄMå{?}6E6F°</td><td>?ÊŒî>ð{?O″V°7À{?∏‡flV0</td><td>‡{?!fh)ı{?äßÒ¡!</td><td></td><td></td></z<>			i‰z?5ॄâġz?ûॄÜ?y{?,ıq#{?p=	≈ò™j8{?Ÿ®!`cM{?Bå™?´	o3ÀTw{?SºÄMå{?}6E6F°	?ÊŒî>ð{?O″V°7À{?∏‡flV0	‡{?!fh)ı{?äßÒ¡!		
?Ûäzw ?\n-4 ?≈Qå,I ?.5ò^ ?óûN									
m"é—団 ?vP ¶à¬}?ê2μ[Å◊}?ˇ>zΪ}?t			iΩ?î~?™s8©~?⁻ñ(1æ~? €fi)′	'~?Âæ®ì"Ë~?N¢1I″~?∑Ö∫ͺ[ฃ? iC¥'ฃ?âLÃi<ฃ?Ú/U。Pฃ	?[fi'^e@?f^fäÔz@?-⁄Ô?Ëè@?f	ίΩxı‡§@?`†´Ÿπ@?hÑä`"Œ@?—	-gÀ"᠒?:KúÀ√⁻᠒?Qóí@fiÄ?W	√õZÄ?πz^÷Ä?mÏ
z'6zÄ?¡Î«Å≤ÑÄ?u]å‹.èÄ?)œP7´ôÄ?	₀@í'§Ä?ë≤ŸÏ£ÆÄ?E\$ûG πÄ?`ĭb¢ứ	/Ä?≠'″ŒÄ?ayÎWïÿÄ?ÎØ≤"Ä?\t							
éÌÄ?}Œ8h									
⁻Ä?1@″¬ÜÅ?±¡									
Å?ô#ÜxͲÅ?NÅ?μx"àÙ6Å? †´Ç?yÃͲ									
gÇ?ÕÀÿ+áqÇ?Å=ùÜ Ç?5Øa∙®ÜÇ?È	&<_êÇ?ùíĺñxõÇ?QØÒÙ•Ç?vsLq∞Ç	?πÁ7ßÌſÇ?mY¸j≈Ç?!À¿\ÊœÇ?'<Ö∑l	b/Ç?âÆlfl‰Ç?= m[ÔÇ?Òë"«¢	>°Ç?∙ó"TÉ?Yu[}–É?					
ÁÿLÉ?¡X‰2#É?u °çE.É?) <më¡8é?< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></më¡8é?<>									
<u>Ñ?ÌàäZ</u> ıÑ?°ΩιιαÑ?HsÓ\ <u>Ñ?Âδii4Ñ?(</u>	<u>)Λη≂૬>⋈ઽΨ», ϤͶͻ%·%૧ધ૮Ϧͻ点, Ε</u>	<u>^Ñ?ℯÆ⋂ӱℎÑ?∆èrãTѕÑ?≀ÆG₊ァÑ?⋂Ċ</u>	<u>ἡ∩ὰ ₹Ñ?Πν5ϊΙὰΡ?ၐ™6"Չ{Ñ?Λ</u>	<u>ͺͺͼͺϲϒͿϽΗϥϯϧϯϧϯϧϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯϯ</u>	<u>ŧ*lÑ?fiˈfRälâ?<ËúG<}Ñ?</u>	ËKX'Á?R^I ₪Ñ?\7> ⋅₪•?\}	<u>໓∙ΈÑʔΔίζ(hu?*Mïð</u> 2åÑ <u>ʔ81+k</u>	<u>ˈË#≈ʔfiæ∞ØññÑʔश~ å7¯–ʔíΩ</u> ı	<u>۵۰۰ ناناتگ۲۵،۳۰۴ اس</u>

SPICE Application (cont.)

LTSpice Netlist



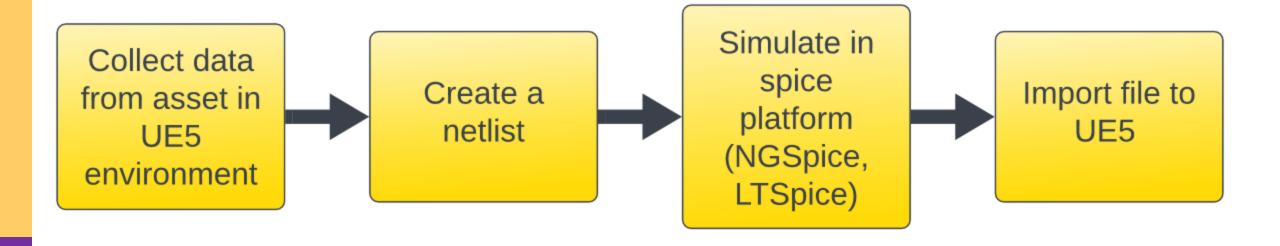


ExpressPCB Netlist: C:\Users\15184\OneDrive\Documents\LTspiceXVII\RC.net

```
"LTspice XVII"
 "Part IDs Table"
"V1" "PULSE(0 5 0 1n 1n 10m 20m 10)" ""
"C1" "1u" ""
"R1" "1k" ""
 "Net Names Table"
"1" 1
"0" 3
"2" 5
 "Net Connections Table"
1 1 1 2
1 3 2 0
2 1 2 4
2 2 2 0
3 2 1 6
3 3 1 0
```

"ExpressPCB Netlist"

SPICE Application (cont.)



What's Planned: Connection

- Integration between hand collision/object interaction along with spice simulation
 - Working breadboard/circuit builder
- Raw data imported into UE5 Project will be converted into a readable graph

