TEXAS STATE UNIVERSITY
Ingram School of Engineering

Group M2.04 – Anylogic Simulation

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Sponsor: Ingram Hall Makerspace
Instructor: Dr. Bahram Asiabanpour

Ingram Hall Makerspace EST. 2019

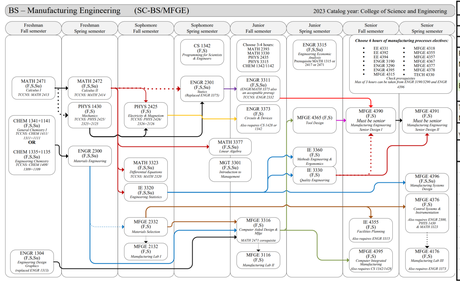
Project Description

- Develop a hybrid discrete event and agent-based simulation model of the Ingram Hall Makerspace using Anylogic software
- Agent based modeling allows for students to make individual decisions regardless of the discrete events that take place
- Discrete event-based software allows for events to drive a process, such as using a machine, or moving through a space
- Using a hybrid agent & discrete event-based software allows the attributes of an agent to cause occurrences of specific discrete events based on the logic imposed on the interaction between the agent and events

Background & Data Collection

- 4000+ Engineering Students expected in coming years
- Historical data from Classes, Organizations, Machines, and other Student resources is used for decision making in agent and process modeling blocks

Simulation



Student Course Flowchart

Manufacturing Engineering

Freshman				Sophomore				Junior				Senior			
Fall	Hrs	Spring	Hrs	Fall	Hrs	Spring	Hrs	Fall	Hrs	Spring	Hrs	Fall	Hrs	Spring	Hrs
MATH 2471	4	MATH 2472	4	PHYS 2326	3	CS 1342	3	PHYS 2335	4	ENGR 3315	3	MFGE 4390	3	MFGE 4391	3
CHEM 1335	4	PHYS 2325	4	MATH 3323	3	ENGR 2301	3	ENGR 3311	3	MFGE 4365	3	IE 4355	3	MFGE 4396	3
ENGR 1304	3	ENGR2300		IE 3320	3	MATH 3377	3	ENGR 3373	3	IE 3330	3	MFGE 4395	3	MFGE 4378	3
				MFGE 2332	4	MGT 3301	3	MFGE 3316	4	MFGE 4376	4				
Total:	11	Total:	11	Total:	13	Total:	12	Total:	14	Total:	13	Total:	9	Total:	9
Makespace:		Makespace:	3	Makespace:	4	Makespace:	6	Makespace:	4	Makespace:	7	Makespace:	6	Makespace:	6
Yearly															
Total:	22			Total:	25			Total:	27			Total:	18		
Makespace:	6			Makespace:	4			Makespace:	11			Makespace:	12		

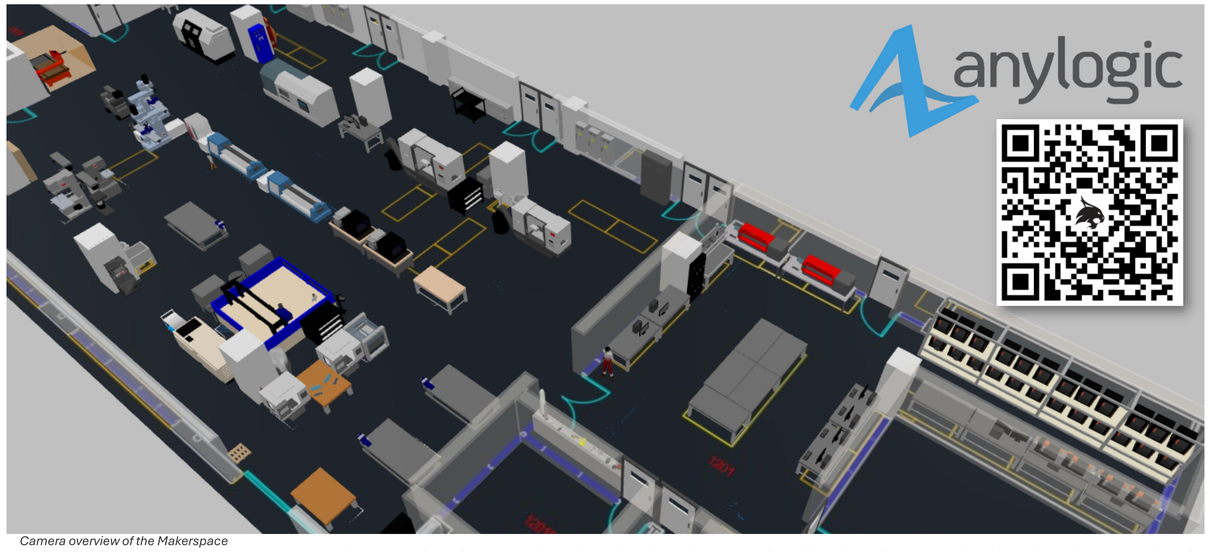
Numbers						Percentages					
	Freshman	Sophomore	Junior	Senior	Totals		Freshman	Sophomore	Junior	Senior	Totals
Electrical Engineering	178	172	249	344	943	Electrical Engineering	19%	18%	26%	36%	100%
Civil Engineering	254	164	155	226	799	Civil Engineering	32%	21%	19%	28%	100%
Mechanical Engineering	403	384	222	166	1175	Mechanical Engineering	34%	33%	19%	14%	100%
Industrial Engineering	45	28	45	83	201	Industrial Engineering	22%	14%	22%	41%	100%
Manufacturing Engineering	17	19	24	52	112	Manufacturing Engineering	15%	17%	21%	46%	100%

3D Printers	3		7	6
HASS 3 Axis			4	6
HASS 5 Axis			4	6
HASS Lathe	3	4	4	6
Laser Cutters	3		4	7
Workshop Equipment	3	4	4	7

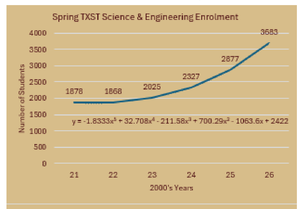
3D Printers	3		7	12
HASS 3 Axis			4	12
HASS 5 Axis			4	12
HASS Lathe	3	4	4	12
Laser Cutters	3		11	12
Workshop Equipment	3	4	11	12
Total Hours	12	8	41	73

3D Printers	25.00%		17.07%	16.67%
HASS 3 Axis			9.76%	16.67%
HASS 5 Axis			9.76%	16.67%
HASS Lathe	25.00%	50.00%	9.76%	16.67%
Laser Cutters	25.00%		26.83%	16.67%
Workshop Equipment	25.00%	50.00%	26.83%	16.67%

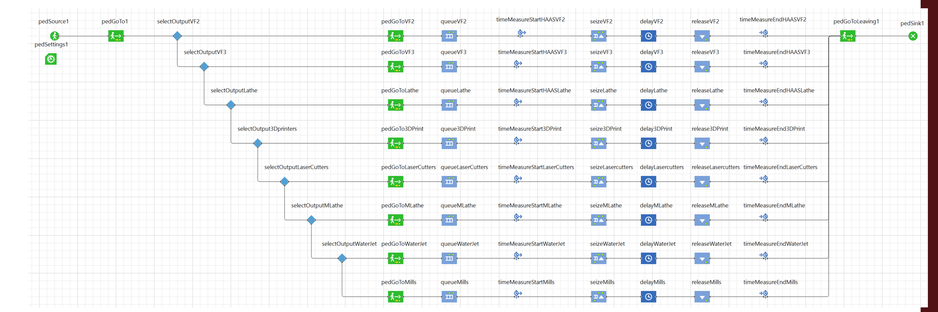
Course Analysis and data refinement



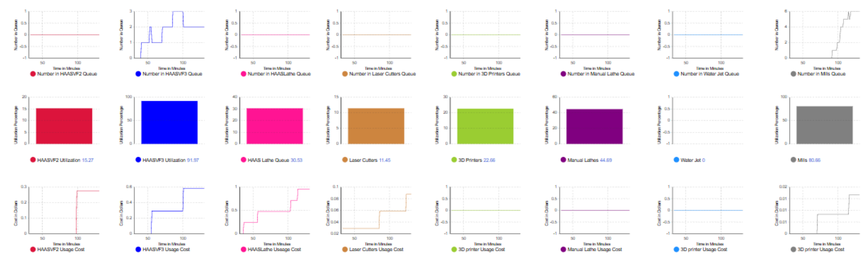
Camera overview of the Makerspace



Student Enrolment Growth Charts



Anylogic Pedestrian & Process modeling flow chart



Anylogic Data Tracking Charts

Output & Analysis

- Key Metrics tracked: Students queued for a machine, machine utilization, and cost of machine run time
- Using our key metrics, We can determine bottlenecks in our system where students are held in queues for extended times, machine utilization is low, or cost of running machines is too high
- The simulation holds the capability to provide justifications for new resource allocation

Future Steps

- Create user interface control modules within simulation
- Optimize new floor layouts
- Accommodate for changes in student needs and additional Makerspace resources

Meet the Team

Junior Segura *Noah Richardson*