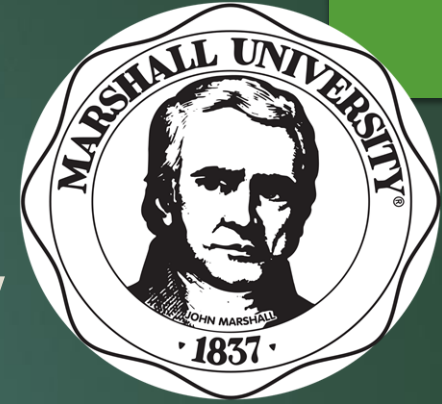


# Augmented Reality in Computer Science Education



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# Outline:



- ▶ Introduction
- ▶ Design Process
- ▶ System Features
- ▶ Examples
- ▶ Conclusion

# Problem:



- ▶ The concept of data structures in computer science is quite challenging to visualize. Thus, computer science students often have difficulty understanding the subject.

# Previous Solutions:

- ▶ Open DSA
- ▶ JGRASP Visualization
- ▶ Visualgo
- ▶ Many more based on Visual and Practice

## Limitations:

- ▶ Not embed real-life even if they visualize the data structures.

# Our Approach:



- ▶ The project is centered on an augmented reality program which allows students to visualize the aforementioned data structures
- ▶ ARCSE (Augmented Reality Computer Science Education)
  - ▶ Display multiple different data structures
  - ▶ Provide simple explanations to aid in learning

# Design Process:



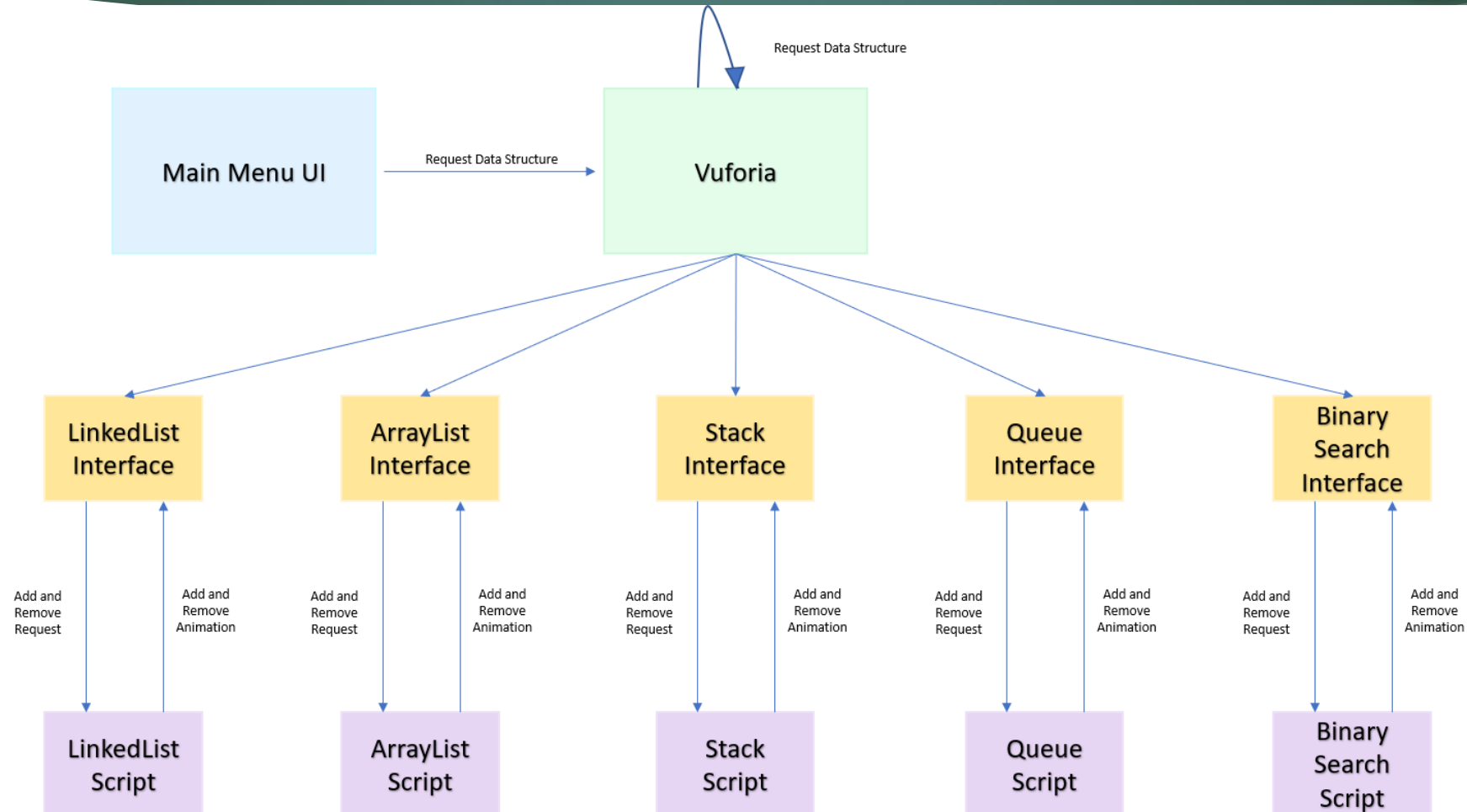
- ▶ Menu controls are easy to provide an easier experience for the user
- ▶ The overall appearance of the application should be informative and engage students.

# Software Utilized:





# System Diagram:



# System Features:



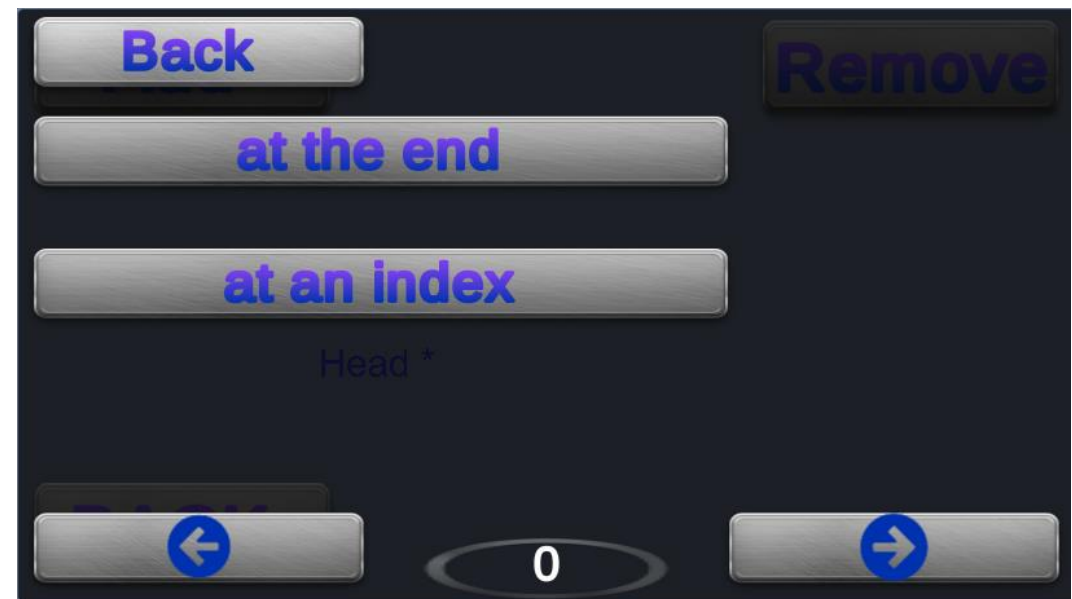
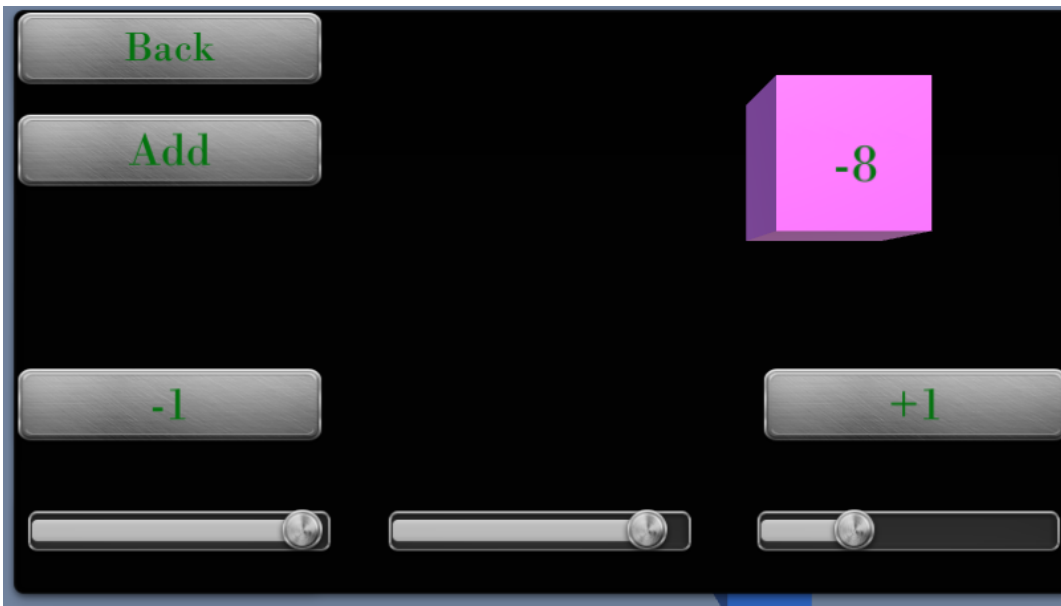
## ► Data Structures Included:

- Stack
- Array List
- Linked List
- Queue
- Binary Search

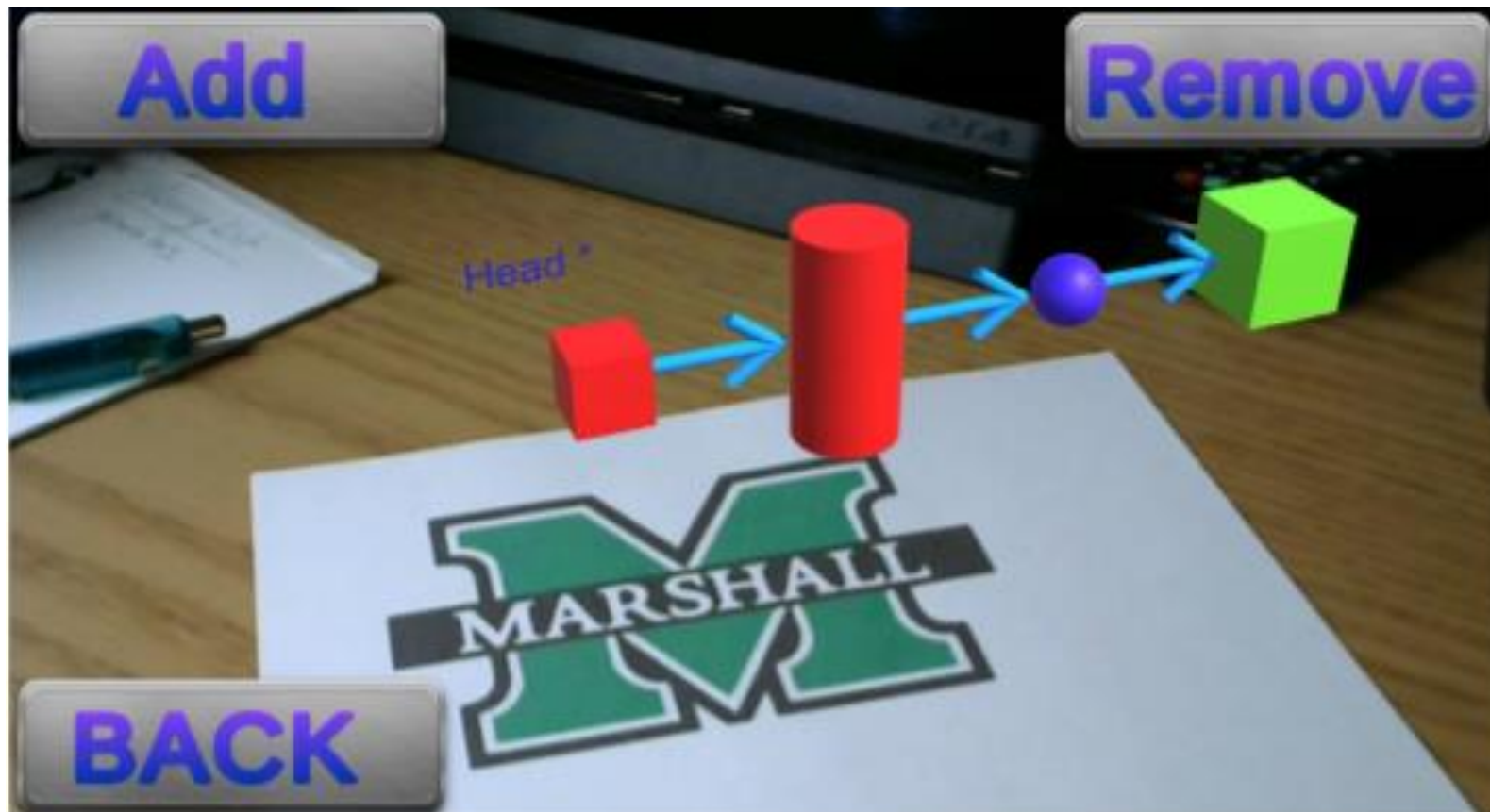
## ► Learn by doing:

- Adding
- Removing
- Indexing
- Object

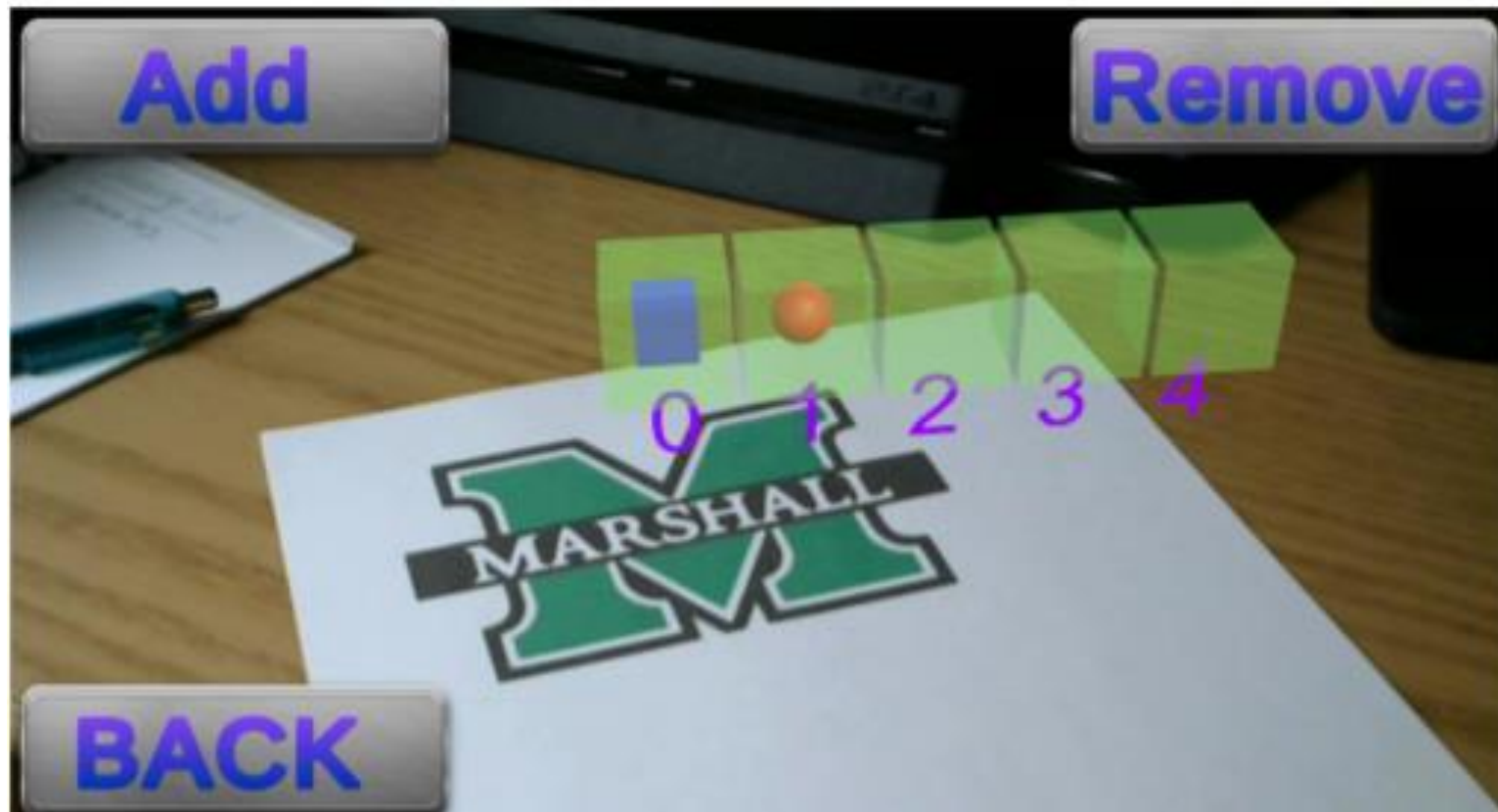
# System Features: Adding /Removing



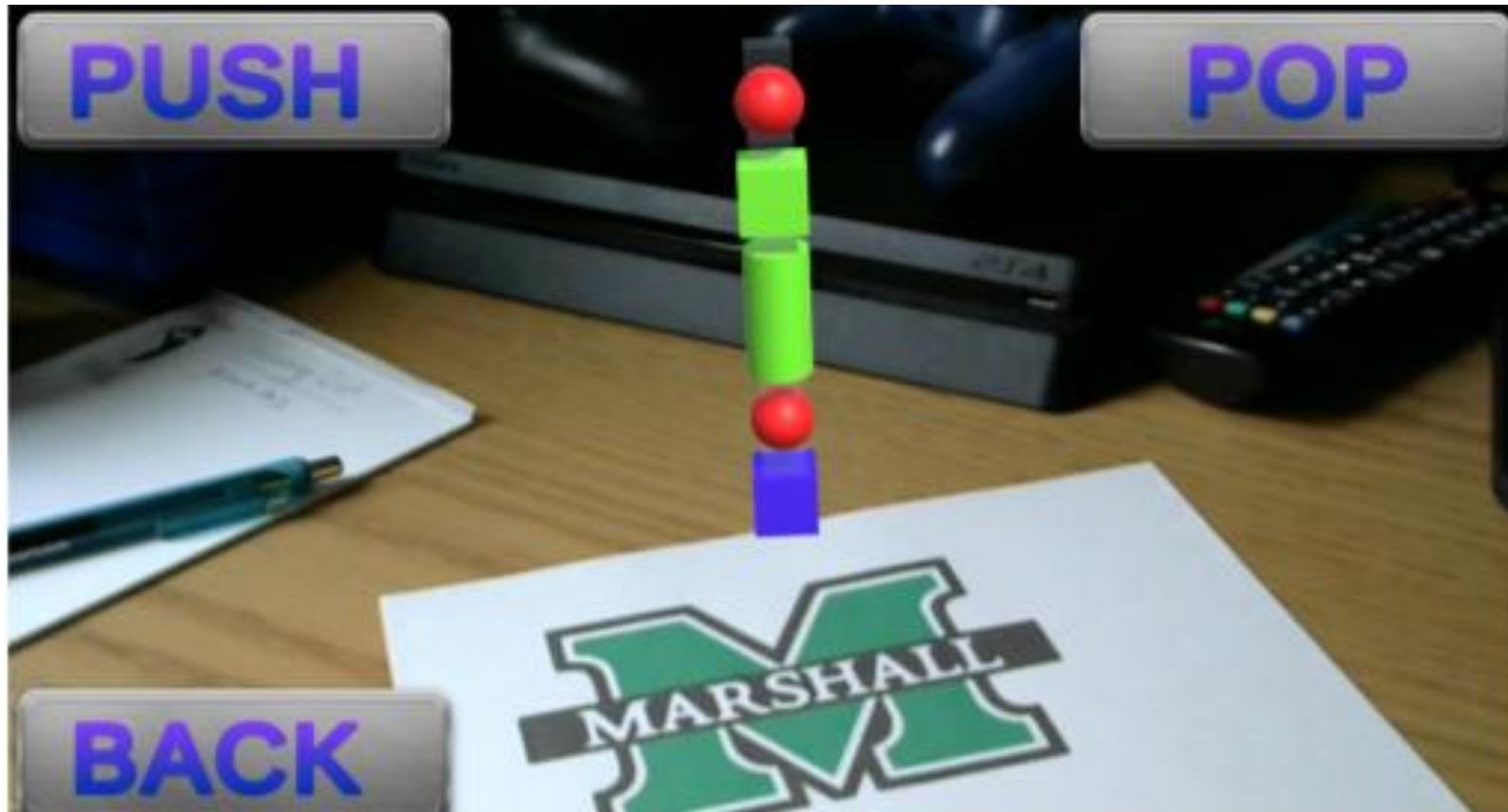
# System Features: Linked List



# System Features: Array List

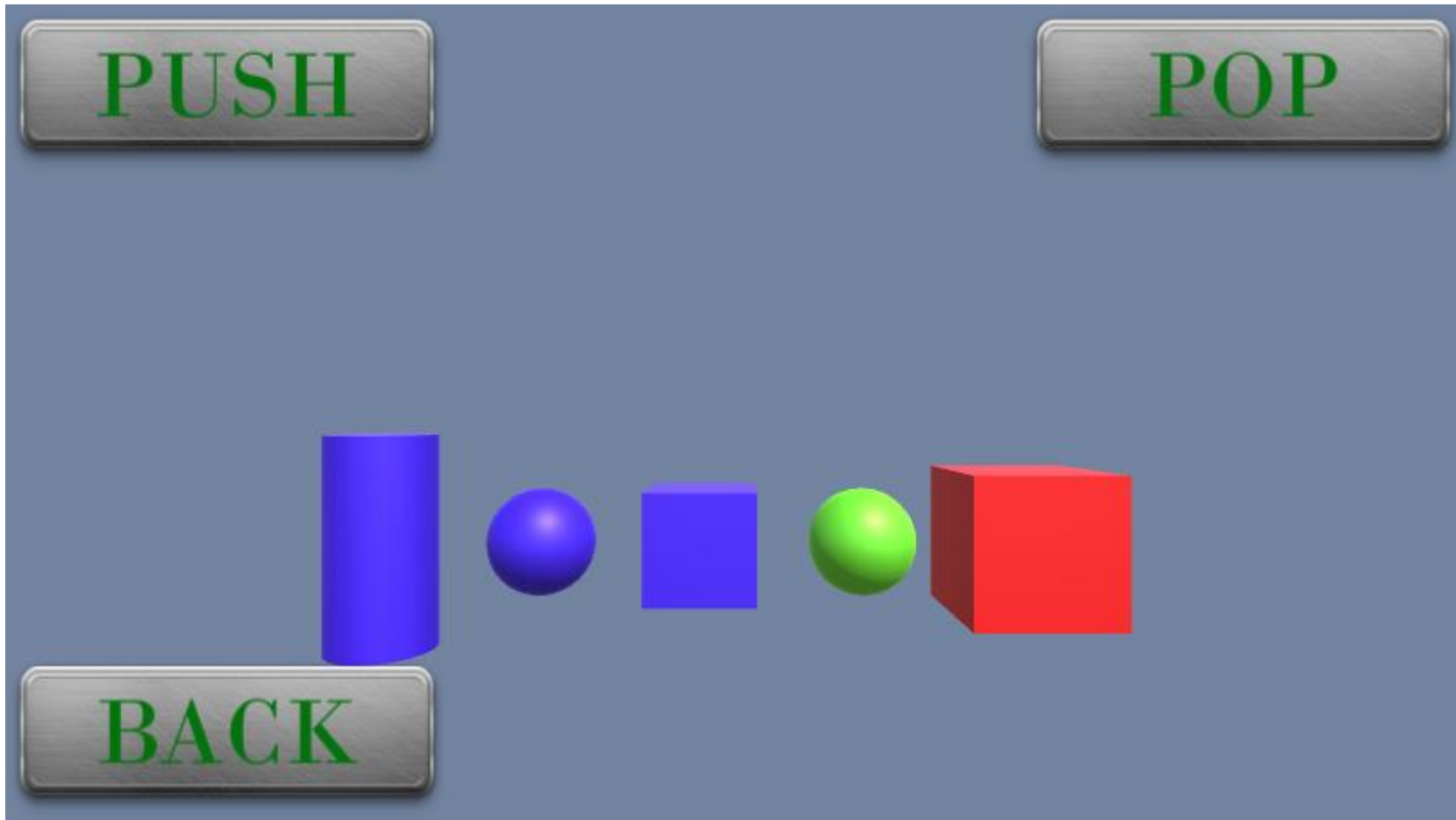


# System Features: Stack

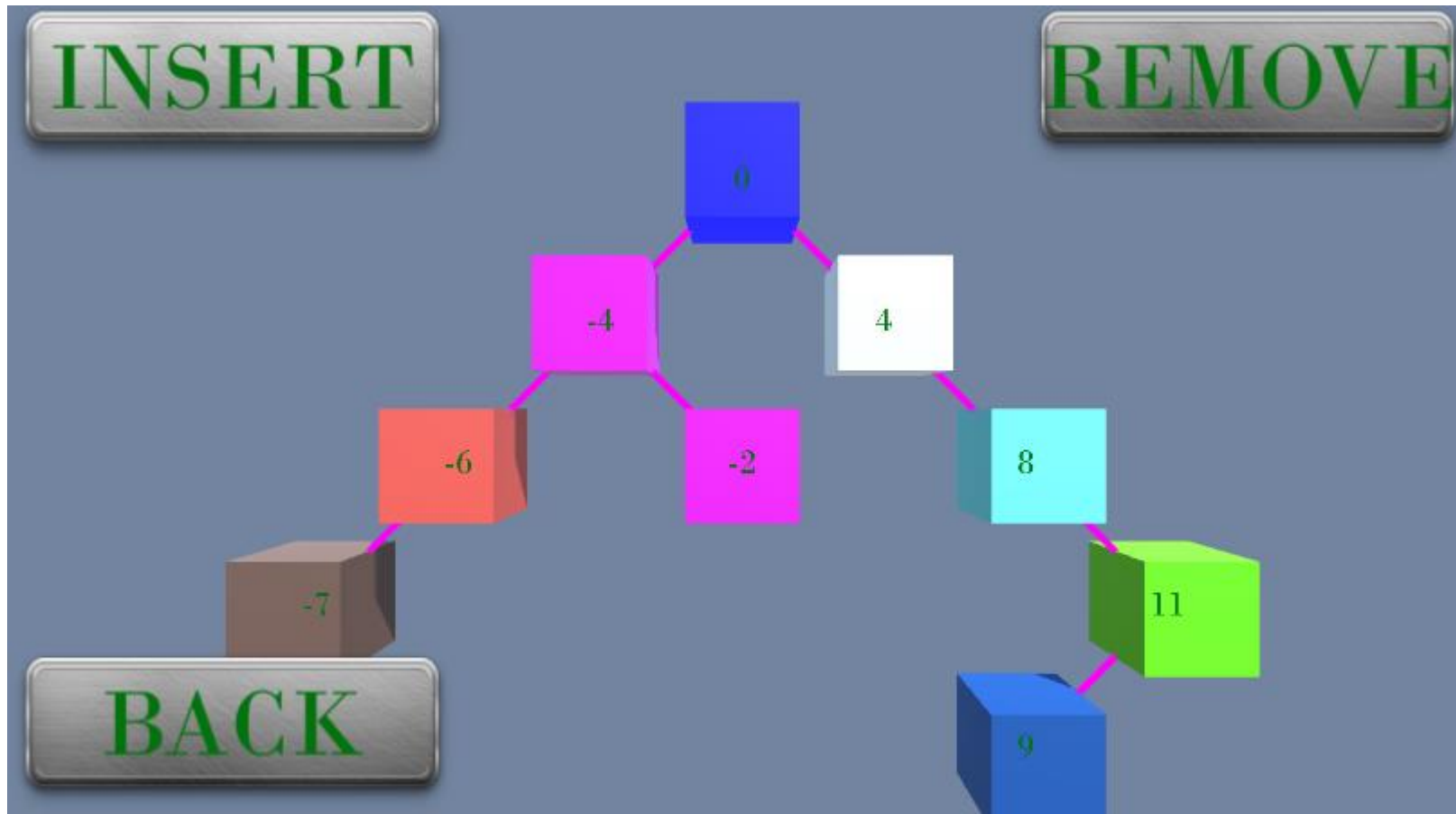




# System Features : Queue



# System Features: Binary Search Tree





# Results:



- ▶ Multiple studies were conducted to view the effect of AR learning on a student's understanding of a topic.
- ▶ Actual classes with students were split and groups were given different methods of learning data structures.

# Results (cont.)



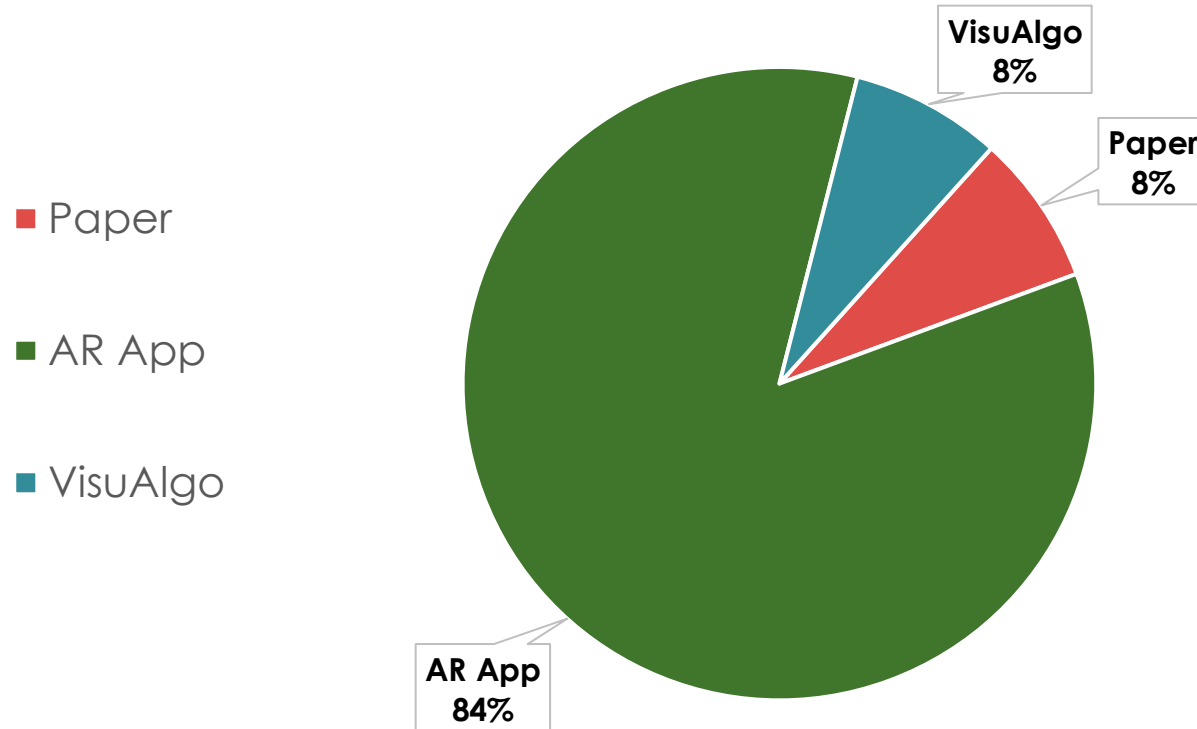
- ▶ Students split into three groups, each utilizing a different teaching method: AR App, VisuAlgo, and Paper
- ▶ Each teaching method was used for 15 minutes

13 Students	Linked List (15 mins)	Array List (15 mins)	Stack (15 mins)
Group 1	AR App	VisuAlgo	Paper
Group 2	VisuAlgo	Paper	AR App
Group 3	Paper	AR App	VisuAlgo

# Results (cont.)



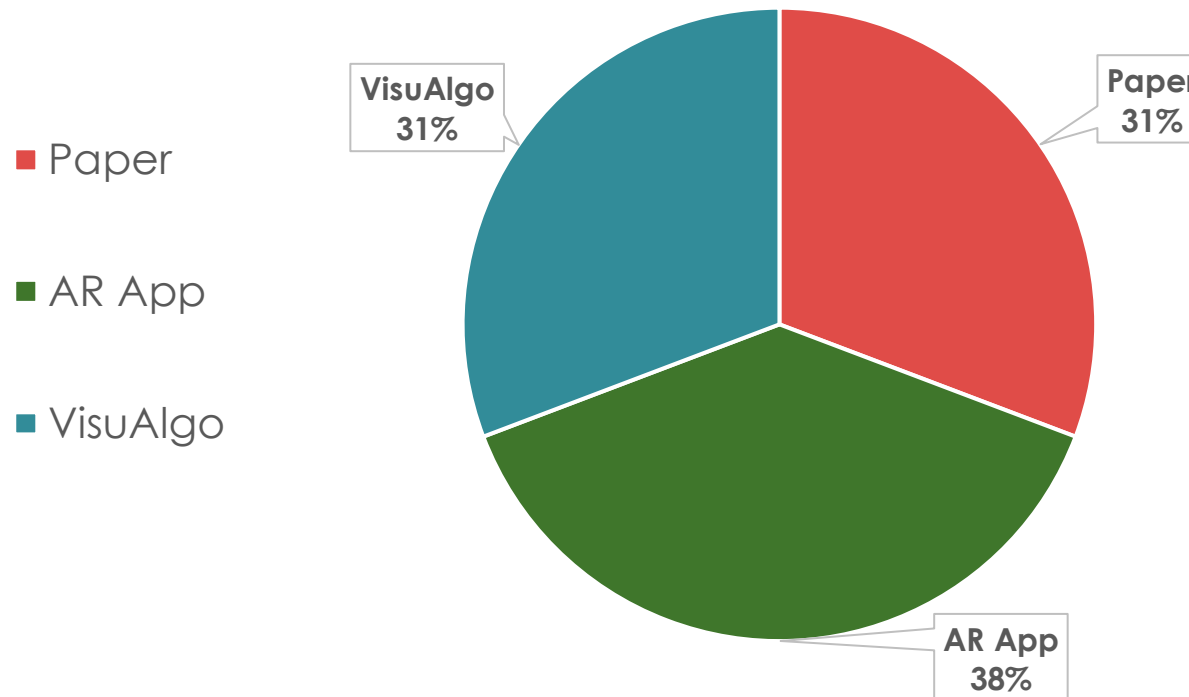
## Most engaging teaching method



# Results (cont.)



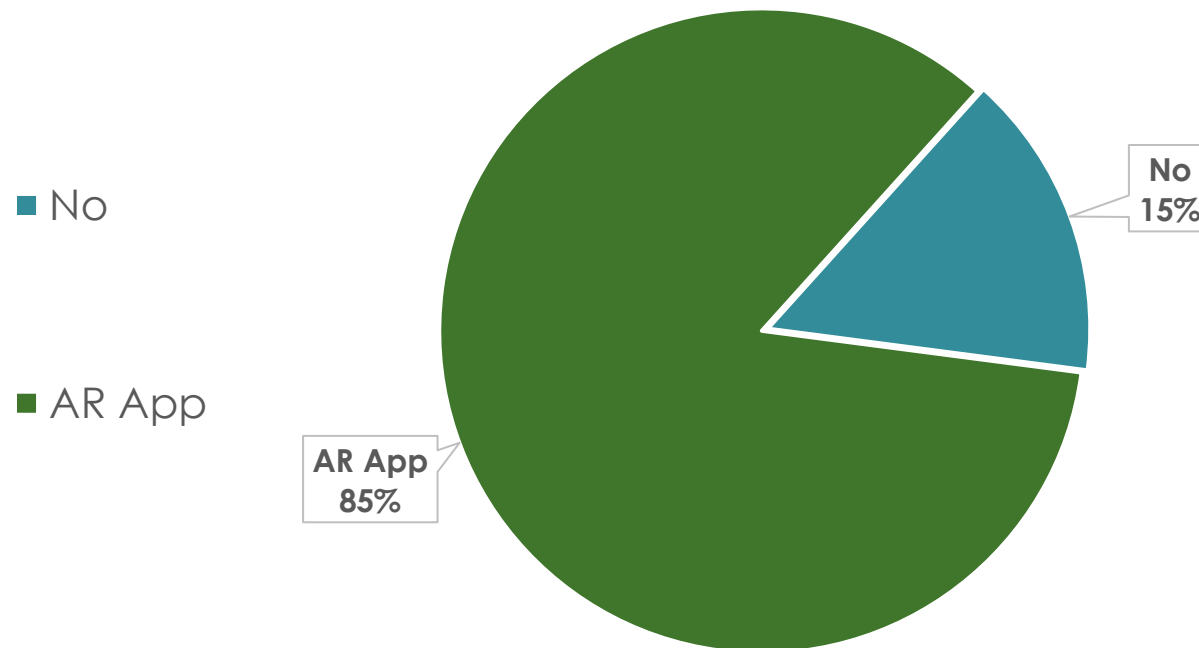
Which tool best helps understanding?



# Results (cont.)



Should AR/VR be integrated into classes?



# Conclusions / Final Thoughts:



- ▶ Integrating Augmented Reality into computer science education is a valuable tool and would greatly help the field
- ▶ Through ARCSE, students can comprehend highly difficult problems in a more engaging manner
- ▶ Students, teachers, and anyone interested in computer science would all benefit from ARCSE

# Demo:

- ▶ Now, it is demo of the application to show how it works.

# Questions?



## Welcome to ARCSE

The ARCSE Project is a project started at Marshall University that is focused on increasing education in the computer science field. ARCSE stands for Augmented Reality Computer Science Education. Augmented reality is a rapidly growing technology that combines real and virtual words to provide an interactive experience for the user.

Marshall University students Cameron Berry, Alex Canfield, Logan Carpenter, Jeremy Giese, Neil Loftus, and Bella Schrader created the program, and it is advised by Dr. Husnu Narman.

Array List

Queue

Linked List

Stack

Binary Search



Exit

