# 2019 Research Experience for Undergraduates

# Remote Interaction with Medical Data Based Holograms

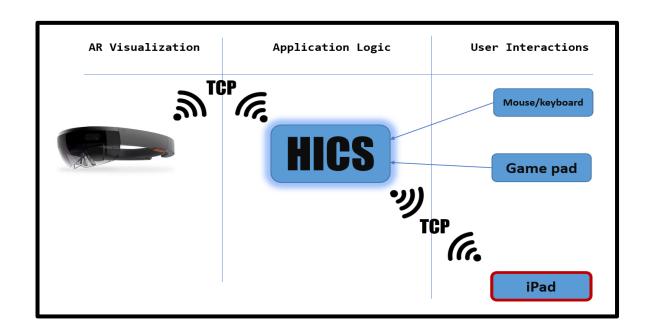
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Final Presentation August 9<sup>th</sup>, 2019

UNIVERSITY of HOUSTON

#### Goal

# Create a mobile app to control holograms remotely



#### **Objectives**

- 1. Create mobile app
- 2. Connect app to HICS
- 3. Read and write to sockets

#### **Objective 1: Tasks**

- Create iOS app
- Use Swift backend

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# **Objective 1: Accomplishments**

Working iOS application

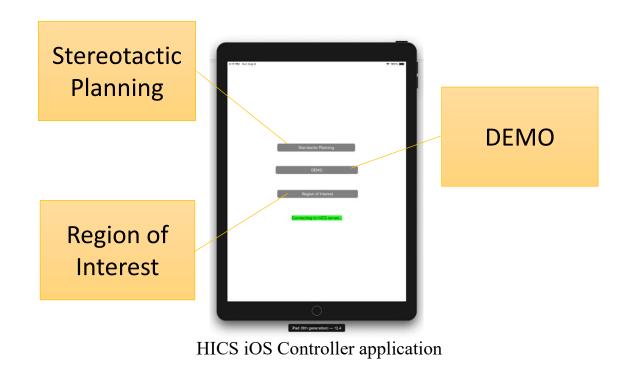
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# **Objective 1: Methodology**

- Read documentation (Swift)
- Swift/ mobile application books

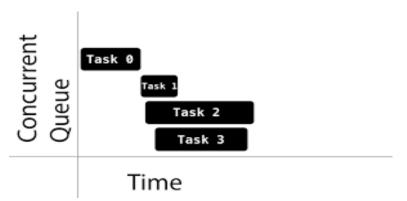
# **Objective 1: Results**

Initial HICS modules



#### **Objective 2: Tasks**

 Connect to Holographic Imaging and Control System

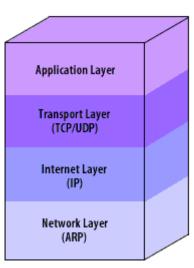


https://www.raywenderlich.com/5370-grand-central-dispatch-tutorial-for-swift-4-part-1-2

#### **Objective 2: Accomplishments**

#### TCP vs UDP

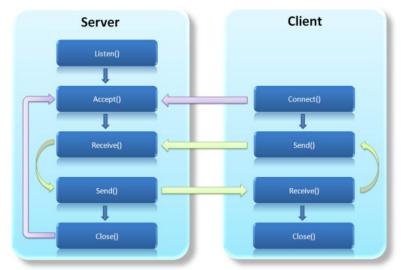
#### TCP/IP Protocol Layers



 $\frac{https://www.distributednetworks.com/network-security-firewalls/module4/tcp-ip-network-security.php}{}$ 

# **Objective 2: Methodology**

- Connect using sockets
  - What framework? Why?
  - Below HTTP requests
- Non blocking I/O



http://www.webtech360.com/detail/c-socket-programming-tcp-communication-client-server-3433.html

#### **Objective 2: Results**

Connection to HICS successful







HICS iOS Controller application



**HICS New Server** 

#### **Objective 3: Tasks**

- Read/ Write to sockets
  - Populate GUI dynamically

#### **Objective 3: Accomplishments**

- Protocol in progress
  - Use JSONDecoder
    - property matching

# **Objective 3: Methodology**

 Unwrap byte stream and decode messages sent via TCP

# **Objective 3: Results**

In progress

#### Deliverables

- Working mobile app
- New server
- Research log
  - Issues and fixes

#### Limitations

- Needs message encryption
  - TLS

#### **Future Work**

- Decode data packets from stream
- Delineate user tasks
  - Compare and contrast uses
  - Collect data



https://www.microsoft.com/enus/hololens

#### **Conclusions**

- Lessons learned
  - Focus on task by task
  - Use general purpose language on front end and back end

# Skills Acquired

- Git
- Cmake build engine
- iOS programming
- Socket programming
- Network protocols (layers)
- Swift
- Asynchronous approach
- Concurrency of threads
- MVC Architecture

# **Acknowledgements**

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