



# Remote Interaction with Medical Data Based Holograms

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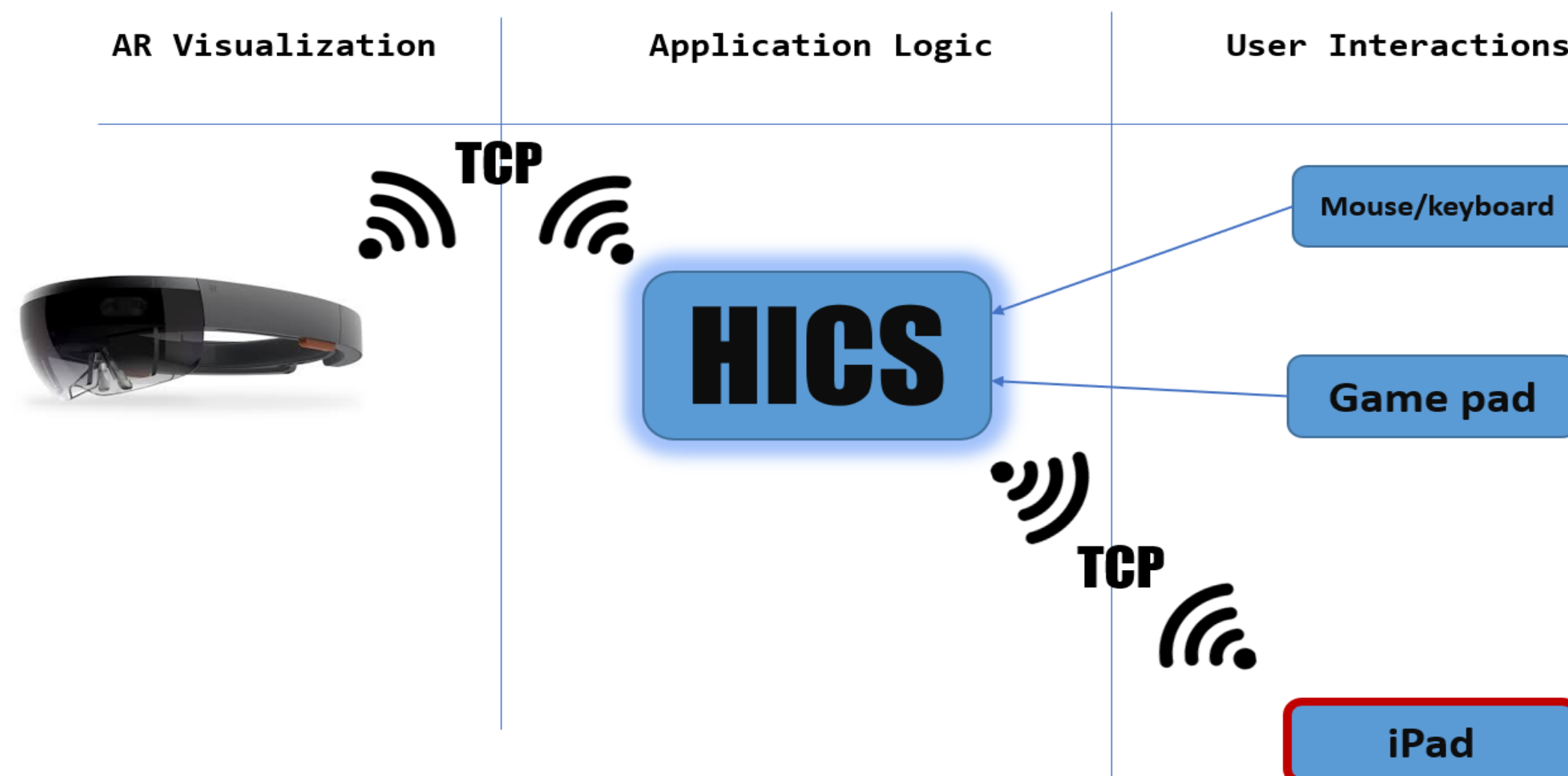
Dr. Tsekos, University of Houston



## Background

Holographic Imaging Control System (HICS) provides:

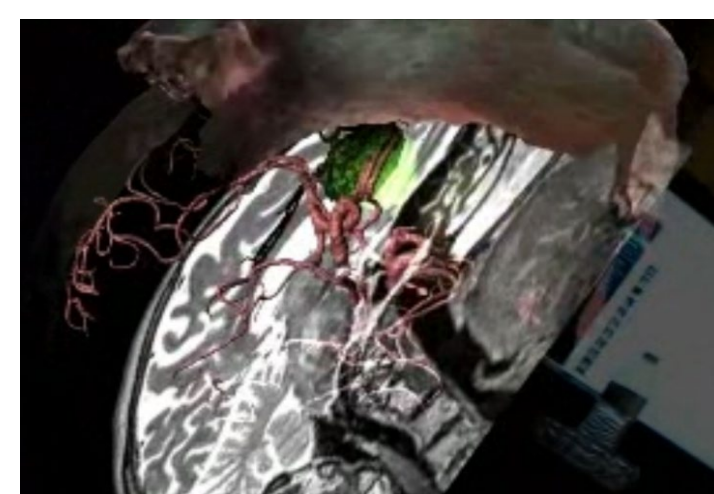
- Remote manipulation of holographic augmented reality (HAR)
- A modular platform used for various medical scenarios
- A user interface to control imaging devices
- A set of tools for medical data processing and analysis



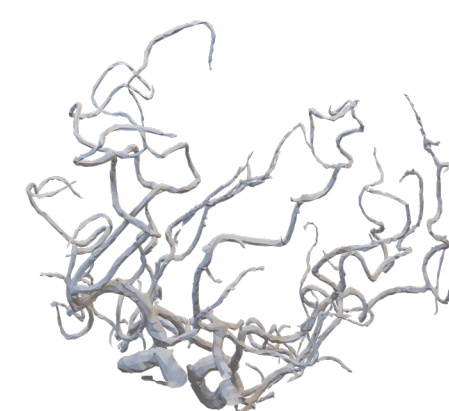
## Objective

Provide remote control HICS via a handheld device to

- Control application parameters
- Remotely control holograms
- Provide intuitive interface to system users
- Determine better ways of (HAR) user interaction



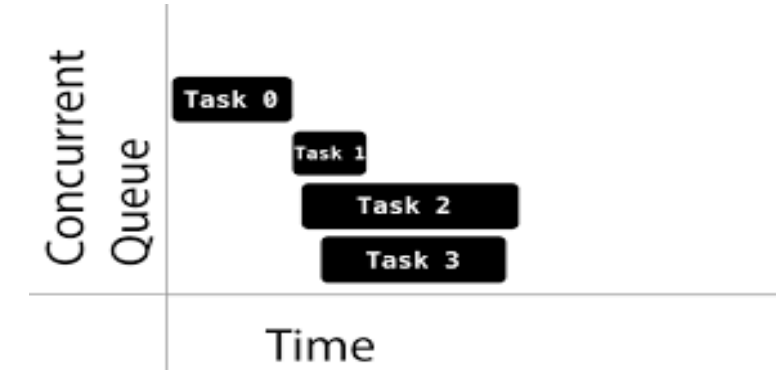
Brain imaging data, vessels, tumor, and skin visualization - University of Houston MRI Lab



Segmented Vessels-University of Houston MRI Lab

## Methods

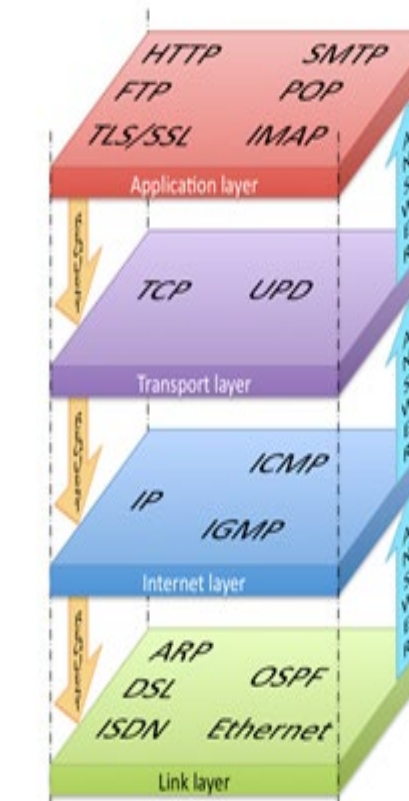
- Development of a mobile application which establishes communication with HICS to handle requests and responses through the Transfer Control Protocol (TCP).
- Utilize a publicly available technology which ensures thread safety and concurrency efficiency throughout the communication session.
- Dispatch queues handles thread creation and management.
- Concurrency efficiency is direct result of the Grand Central Dispatch.
- Asynchronous task dispatching is a sound approach for networking tasks.



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

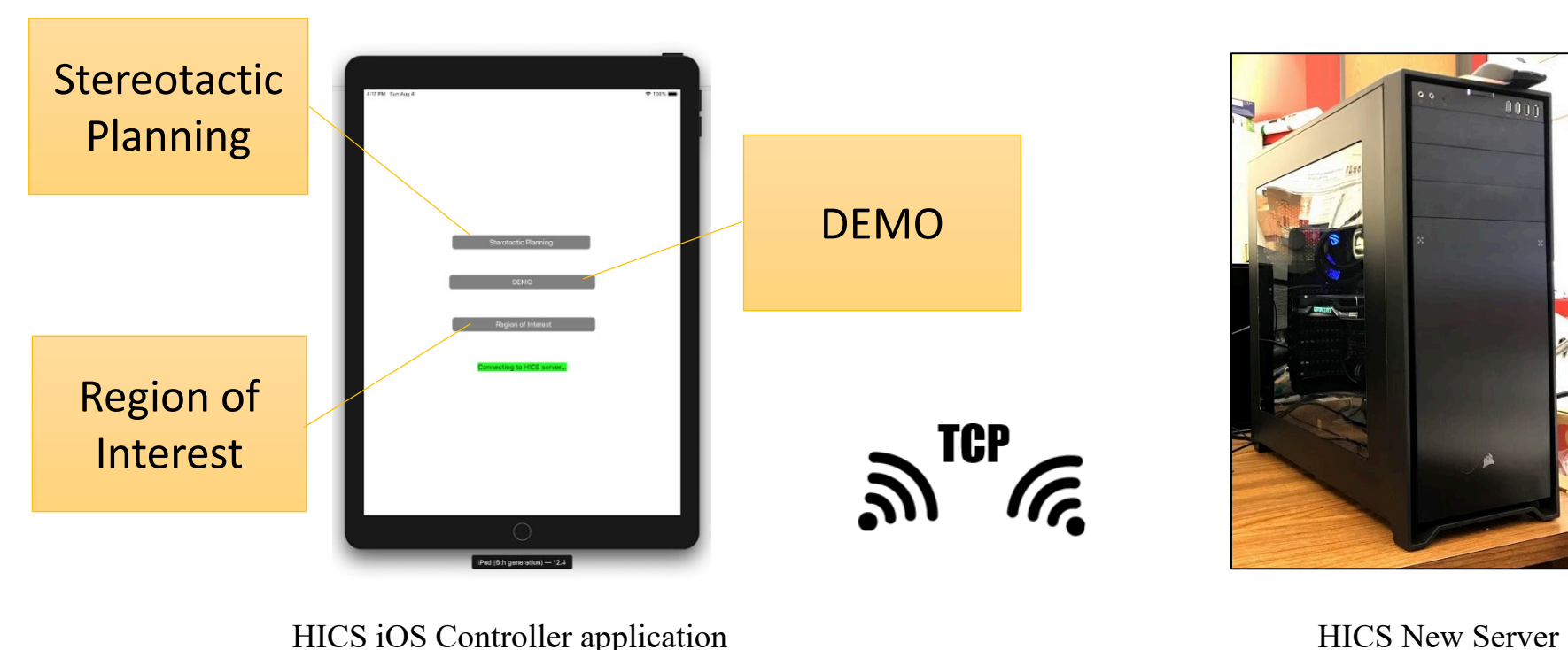


<https://www.microsoft.com/en-us/hololens>



<https://buildingautomationmonthly.com/what-is-the-tcp-ip-stack/>

## Results



HICS iOS Controller application

HICS New Server

## Discussion

- Mobile devices can aid in medical applications including data analysis.
- The Model-View-Controller architecture, with its separation of concerns, provides a sound approach to data fetching and data-centric operations.
- In mobile operating systems, the View-Controller Lifecycle is determined by the system kernel.
- Network programming can be useful for remotely controlled systems, but data encryption is required for security of the transfer.
- Asynchronous Programming provides an efficient method for activities requiring heavy data transfers.
- Reflect on possible future scenarios and whether a certain approach will get “the job done”.

## Future Work

- Expand the task-set for image annotations and selections
- Multiple dynamic menus per application scenario
- User studies to compare the input devices available for optimal holographic AR interaction



<https://spinalnewsinternational.com/world-first-microsoft-hololens-augmented-reality-discectomy-takes-place-in-usa/>

## Acknowledgements

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