EDU: QuaSim: A Virtual Interactive Quantum Cryptography Educator- A Project-based Gamified Educational Paradigm

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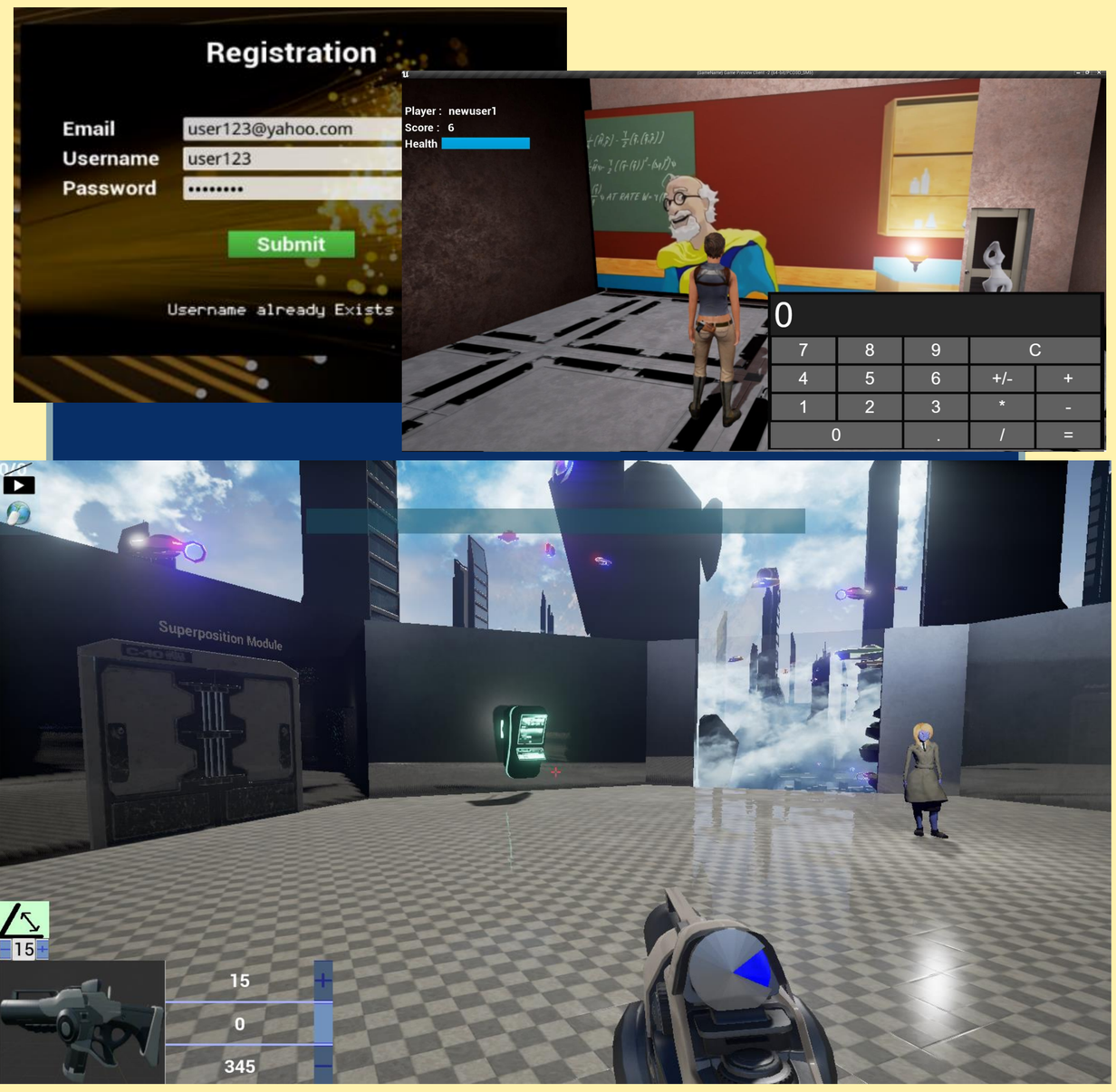
Project website: http://faculty.ist.unomaha.edu/aparakh/quasim

The objective of this project is to transform traditional subject-based lectures in quantum cryptography into a project-based virtual environment where students can interactively learn the subject matter.



- Traditional lectures have shortcomings: Linear and fragmented teaching, no holistic learning
- Mathematical complexity of Quantum Crypto makes it a lecture based topic in most cases where it is taught
- Expensive Quantum Crypto equipment makes hands-on learning out of reach

- Our research places students directly in the full context of running a computer network through computer-generated virtual environments/serious games
- Knowledge components are codified in first-order logic with abductive reasoning
- We will develop and implement assessment methodology and tools

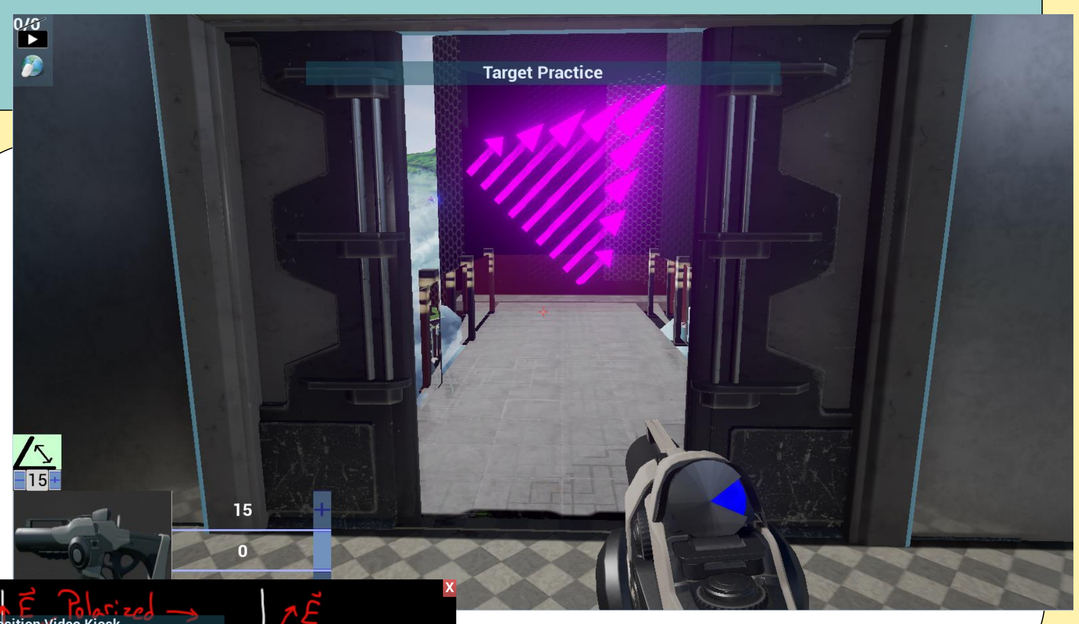
Approach

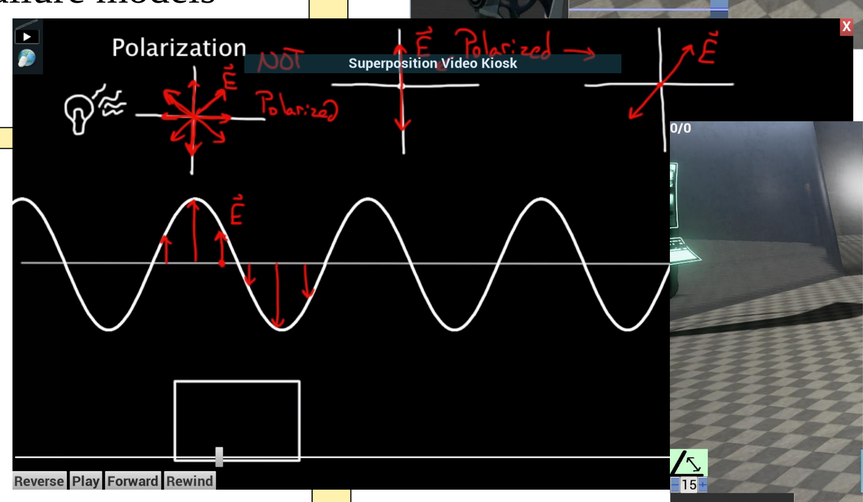
- Build an intelligent system that identifies student abilities and adapts to individual learner abilities to create appropriate instructional profiles
- Build an adaptive framework that will generate customized scenarios and mine responses to measurably improve learning

- Build a project-based simulation system using modules (at three proficiency levels, beginning, intermediate and advanced) that assesses the effectiveness of solutions provided by students.

Progress so far

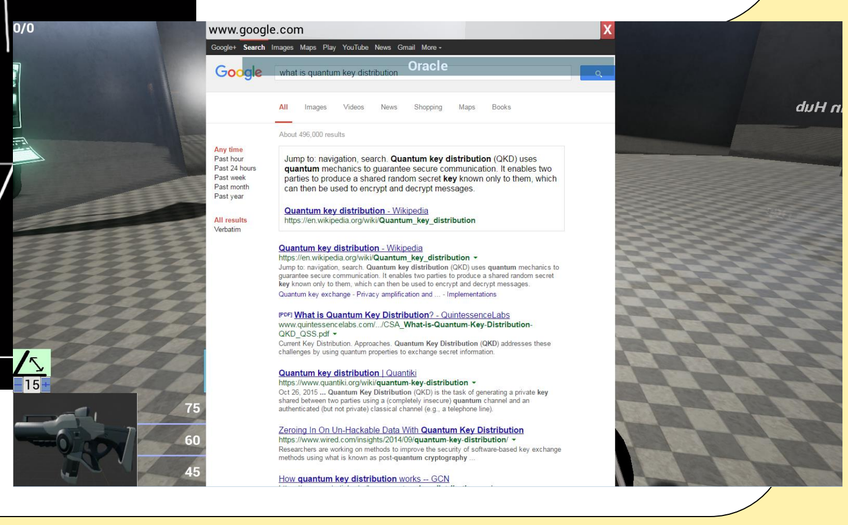
- Functional Unreal game platform with modules
  - Polarization, bases, superposition, measurement.
  - BB84 basic protocol
- Education Libraries and components
  - Lesson plans, outcomes. student, failure models
  - Adaptation for learning targets





What's next?

- Multi-player BB84 protocol
- Adaptation and hypothesis testing
- Deploy in Spring graduate classes
- Evaluation, summer deployment



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NSF Secure and Trustworthy Cyberspace Principal Investigator Meeting
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University of Nebraska Omaha