BLUE WATERS

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

Blue Waters Education Allocations Final Report

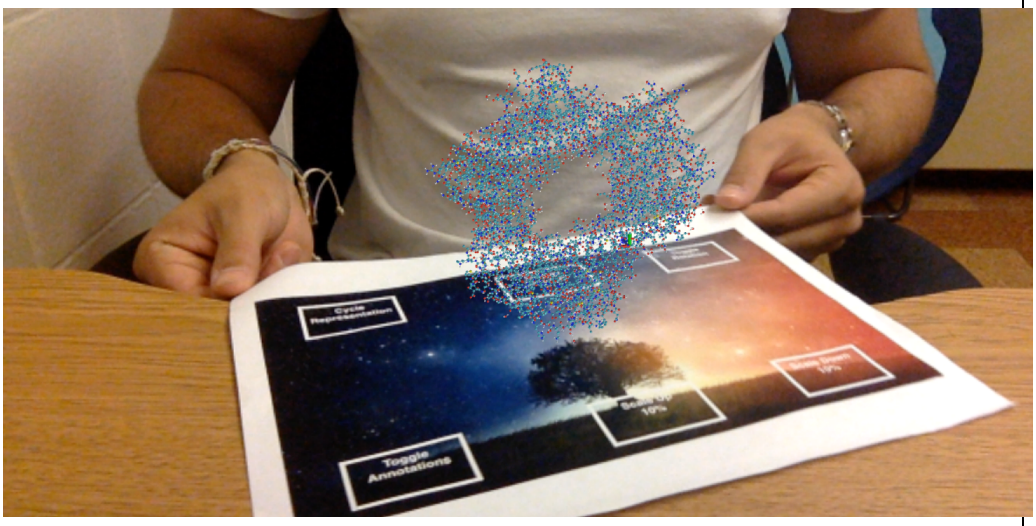
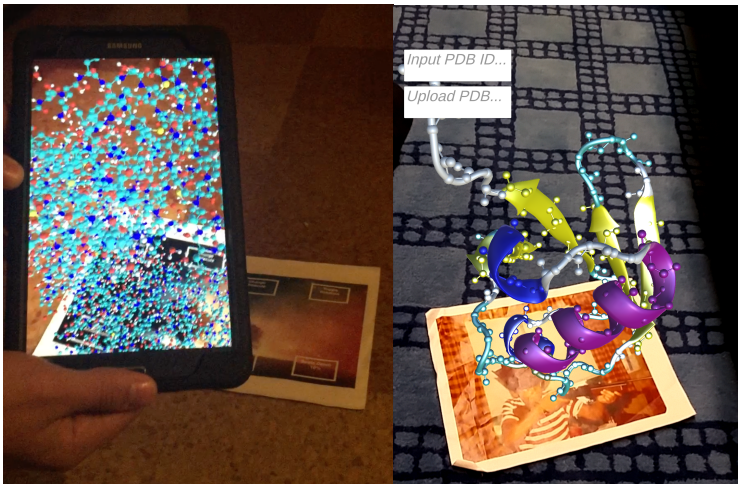
As a component of your application for a Blue Waters education allocation, you agreed to provide a report at the end of your project. Now that your project is complete, we would appreciate your submission of the following information within two weeks. Please send this report, and any supporting documents, to Scott Lathrop, lathrop@illinois.edu.

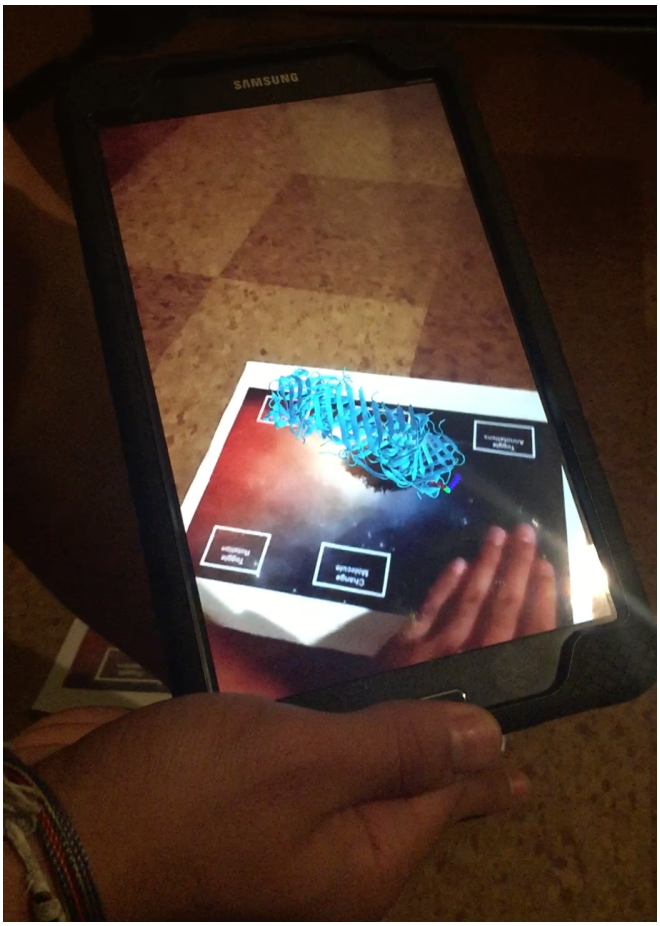
This information will be shared with the Blue Waters team and the National Science Foundation. Portions of the report (we will omit names of participants) will be posted on the Blue Waters portal for public access.

Project Information

Project Name	Augmented Reality Visualization of BW Data
Names of project staff (instructors, TAs, etc) and their department and institutions	Alan B. Craig, PhD – Mentor Max Collins – Student Intern
URL for the project	N/A

Provide links to or attach materials made available to participants (e.g. slides, articles, exercises, etc.) that may be made publicly available	N/A

Provide links to or attach any photos (with captions to describe activities)	 The above photo shows the AR Molecular Visualization app in action. A 3D representation of the desired molecule appears to hover above the target image. The person viewing can change their visual perspective on the model by moving the target image, or by moving themselves physically around the molecule. The application uses the "magic lens" technique in augmented reality to allow the person viewing the molecule to see the molecule superimposed on the real world as they look through the camera on a smartphone or tablet.  The image on the left shows how a tablet is used to see the visualization of the molecule in registration with the real world. The image on the right shows an early interface that was created that allows the user to input the desired molecule to the visualization app.



This image shows how “virtual buttons” in the real world (printed on the target image) can be used to control the visualization of the molecule. By covering one of the “buttons” on the target image the user can control the representation displayed, scale the molecule up or down, and control other aspects of the visualization. We experimented both with buttons on the device and buttons in the real world. Each had advantages and disadvantages. Buttons on the device (smartphone or tablet screen) provided a more reliable interface, but when devices like Microsoft’s Hololens become more prevalent, there will need to be interfaces that don’t rely on having a handheld device. Hence we are preparing for the future by experimenting with virtual buttons in the real world.

Start date	May 25, 2015
Completion date	May 31, 2016 ← The official internship ended then, but we are continuing to work together on the project on our own. We have written and submitted an article for potential publication and we are continuing to refine the app that we developed with intent to release it for ios and android when it is ready.

Information about the Participants

# Participants	# Faculty or staff	# students	# other (e.g. industry)	# under-represented (e.g. women, minorities)	# institutions represented by participants
2	1	1	0	1	1

Please describe the scope and purpose of this project. Also, please indicate if there were any changes implemented from the original proposed plan, and briefly describe why they were made.

The purpose of this project was for Blue Waters Student Intern Max Collins to learn about parallel processing, visualization, and human computer interaction. He learned about Blue Waters and parallel processing via the two-week training program held at NCSA during the summer of 2015. He learned about visualization and human computer interaction by working with his mentor Alan Craig to develop an augmented reality visualization application (app) that allows a user to see and manipulate molecular representations from the protein databank as though they are physical models in the real world.

Please describe the learning outcomes of the participants. How did this project enhance the learning of the participants? What did the participants learn as a result of the use of Blue Waters system that they could not have learned using other systems?

Max successfully completed the two-week workshop on Blue Waters and parallel processing. He has created a working app that visualizes molecules in augmented reality. By being exposed to a variety of experts in the field, and his mentor, Max learned about a wide variety of science and technical topics. He also gained hands-on development skills for visualization and human computer interaction. Something he learned from using Blue Waters that he could not have learned otherwise is that it is possible to compute molecules that are too large and complex to visualize both from a technical and perceptual perspective. However, he learned a lot of techniques that can be used to visualize very complex molecules.

Max has reported that he feels more confident in his schoolwork, namely the course he is currently taking with professor Steve LaValle regarding virtual reality (CS 498). While this course does move quickly, Max said that he feels confident and even ahead of the curve completely due to his time working with me on the BWSIP project.

Please describe lessons learned from the project. What would you do differently next time?

One lesson learned was that it would have been beneficial to have even more training than the two week workshop offered before beginning the projects.

Max, the student intern stated that some of the things he learned included:

"A LOT"
"documentation throughout a project, report styles, Unity skills, what AR is and how it is useful, basic command line tips and procedures, how to basically interact with a server, etc."

What I would do differently next time would simply to provide more background information up front. I think one of the most beneficial things that worked well was meeting a lot of experts in a variety of fields.

What would you recommend that the Blue Waters team do to enhance the success of education projects in the future?

As much training as possible.

In addition, allowing as much time as possible to allow students to begin working on their individual projects during the institute while facilitators are present to help them get started, move along, or troubleshoot.

Please provide a summary of any surveys or evaluations you conducted of the participants. Feel free to attach any related documents.

N/A

Please provide any anecdotal stories we may share with NSF and the public.

How would you rank the overall experience?

	Excellent	Very Good	Good	Fair	Poor	N/A
Education allocations process	**X**					
Blue Waters support	**X**					
Blue Waters computing system	**X**					
Blue Waters documentation	**X**					
Blue Waters training	**X**					

Do you plan to request an education allocation for other future events that will use BW?
Please describe the plans for future events, including the frequency (each semester, yearly, etc.).

I don't anticipate requesting another educational allocation again unless I am asked to be a mentor for another similar program in the future.

Please provide any other comments or suggestions.

This internship program was an awesome experience for both student and mentor.