Abstract (150 words):

The world of technology changes so quickly that it is difficult to prepare our students with the skills and applications they will use in the workplace. This is especially true in the field of computer science. One area of exceptionally rapid growth is virtual reality (VR). The Oculus Rift DK2 is a VR headset that is not yet sold as a consumer product, but can be purchased by developers. The Department of Computer Science recently purchased two Rifts for student development. The purpose of this grant is to financially support student research in the area of VR as they develop a virtual tour of Bolin Science Hall and to provide access to a graphics-capable laptop for student use and an updated model of the anticipated consumer version of the Rift when it becomes available in spring 2016.

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| **Amount Requested for Project** | |
| **Budget Items** | Amount |
| Undergraduate Wages ($7.25 X \_\_\_108\_\_\_ hours X \_\_3\_\_# students) | **$2,349** |
| Graduate Wages ($7.25 up to $10.75 X 108 hours X \_1\_\_ # students) | **$1,161** |
| Supplies & equipment< than $500 (from university research funds) | **$ 450** |
| Equipment greater > $500 (from restricted research/must meet HEAF) | **$1,465** |
| Travel (may support research or dissemination of funded research) | **$1,000** |
| Publication |  |
| Other (Miscellaneous expenses) | **$ 100** |
| **Total Request** | **$6,525** |

1. Purpose/aims of the project (1 page):

Providing students with rigorous education in the professions with an opportunity for students to engage in research with faculty is an integral part of the mission statement of Midwestern State University. This project is closely aligned with MSU's mission by allowing students to work with faculty in an area of their profession that is both rigorous and leading edge. Working together, our team will develop a three-dimensional virtual tour through Bolin Science Hall. This will differ from a two-dimensional video tour in that users will have full control of the tour, including which rooms to visit, which direction to look, etc. It will be an immersive, interactive experience, rather than a passive video. The specific aims of this project directly support several MSU Strategic Goals as described below.

**Aim 1:** Provide undergraduate students an opportunity to work with a graduate student and faculty on a project that is exciting and cutting edge. Goal 1 of MSU's Strategic and Action Plan is to Increase Enrollment and Retention and Enhance the Student Experience. The Virtually Bolin project will clearly enhance the student experience. Students working on the project will have the opportunity to work in a team environment on a software product that will eventually be used to recruit new students. Not only will this enhance their experience as a student at MSU, but it will also improve their chances for employment once they graduate.

**Aim 2:** Develop interest in a new research area within the Department of Computer Science. Goal 2 of MSU's Strategic and Action Plan is to Strengthen Academic Quality and Reputation. Because virtual reality is at the forefront of technology, research in this area will enhance and strengthen the academic quality of our program. The results will be disseminated through one or more professional conferences, providing opportunities to promote the reputation of MSU as a leader in undergraduate and graduate academic research.

**Aim 3:** Create a software product that can be used for recruitment and retention in the Department of Computer Science. Goal 1 of MSU's Strategic and Action Plan is to Increase Enrollment and Retention and Enhance the Student Experience. Mustangs Rally is an event in which prospective students, parents, and guests visit MSU and learn more about the campus and individual departments. In the Department of Computer Science, we take this opportunity to showcase past and current research projects. The addition of a virtual tour of Bolin using the Rift headset will be a great addition to use at Mustangs Rally and other recruitment events.

1. Research question(s) and/or hypothesis(es) and/or creative endeavor outcome:

The outcome of our project will be a software program that will run on the Oculus Rift headset. The goal is to create a virtual tour of Bolin Science Hall. Users wearing the headset will be able to virtually walk through the building making decisions regarding which rooms to enter and which way to look. The scene will change based on real-time decisions of the user.

1. Justification of the important of the project, including (i) alignment with MSU goals and (ii) support for the faculty member’s research trajectory:

The Oculus Rift headset is currently sold for development purposes only, but is expected to be available commercially in early 2016. When the headset becomes available commercially, we anticipate that many companies will hire developers to create VR software to promote their product and/or service. Moreover, the software development experience in a team, along with modeling and simulation skills, will smoothly transfer to students' future development work or graduate studies.

As faculty members in the Department of Computer Science, we have an obligation to keep up-to-date with advances in our field. Virtual reality is an area that will continue to grow as hardware capabilities become faster and less expensive. This project will support faculty expertise in VR, which will in turn benefit our students.

Please see section III above for alignment with MSU goals.

1. Literature review for research projects or description of artistic/creative precedence within the context of your field:

In 1965, Ivan Sutherland described "The Ultimate Display" in which he envisioned a display connected to a computer that would "serve as a looking-glass into a mathematical wonderland constructed in computer memory" [1]. Sutherland's vision is quickly becoming a reality. Virtual reality currently has practical applications in a multitude of areas, including therapy, education, training, gaming, and entertainment [2] [3] [4]. We are only beginning to realize the role that VR will soon play in our daily lives.

The future of VR is very promising, and this is particularly true for the Oculus Rift. The Rift was recognized as one of the top inventions by CNN and Time in 2013. In March, 2014, Facebook purchased Oculus for $2 billion. Mark Zuckerberg, co-founder of Facebook, is quoted as saying, "This is really a new communication platform. By feeling truly present, you can share unbounded spaces and experiences with people in your life. Imagine sharing not just moments with your friends online, but entire experiences and adventures" [5].

There are many exciting aspects to this project. Students and faculty will work together to produce a product that is based in science, but is also an artistic endeavor. When students first learn to program, they are given assignments that allow users to interact with a small black DOS screen on a computer monitor. The tasks are important for learning the fundamentals of programming, but in truth, are not very exciting. Imagine using that knowledge from the classroom and the many hours of tedious programming to work on a project that will actually allow users to interact in a virtual world with the details of programming hidden in the background. This will be an experience that will last a lifetime, for both students and faculty.

# Works Cited

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| [1] | I. E. Sutherland, "The Ultimate Display," in *Proceedings of IFIP Congress*, Washington, D.C., 1965. |
| [2] | T. Mazuryk and M. Gervautz, "Virtual Reality History, Applications, Technology and Future," Institute of Computer Graphics, Vienna, 1002. |
| [3] | H. G. Hoffman, "Virtual-Reality Therapy," *Scientific American,* pp. 58-65, August, 2004. |
| [4] | F. P. Brooks Jr., "What's Real About Virtual Reality," in *IEEE Computer Graphics and Applications*, 1999. |
| [5] | B. Griggs, "CNN," 26 March 2014. [Online]. Available: http://www.cnn.com/2014/03/26/tech/gaming-gadgets/oculus-vr-explainer/index.html. |
| [6] | J. G. Vasquez II. and S. Rabin. United States Patent US 20150130790A1, 14 May 2015. |
| [7] | The Associated Press, "Facebook to buy Oculus virtual reality firm for $2B," 26 March 2014. [Online]. Available: http://www.cbc.ca/news/technology/facebook-to-buy-oculus-virtual-reality-firm-for-2b-1.2586318. |

1. Research or creative design and methods:

Students and faculty will initially create a formal plan for the final project and discuss features, such as number of rooms to include, sound options, etc. A Dropbox account has already been created as a collaborative resource repository. Students will be assigned various aspects of the project based on preference and strengths. Students and faculty will meet on a regular basis throughout the semester and will likely reserve some weekend days for "a day of coding." As the project progresses, faculty will work with students on finding venues for disseminating the results (see section XI).

1. Protection of human subject/animals (if applicable to the project):

Not Applicable

1. Budget justification: Explain how each category on the budget sheet’s subtotal was determined and why/how it is necessary to achieve the project aims. Also be sure to list the date by which each expenditure should occur (not later than August 31, 2015). Note: The budget subtotals must be submitted separately using the Excel budget spread sheet.

Part 1. Student Wages (undergraduate students are paid $7.25. Graduate students must be paid $7.25, and may be paid up to $10.75):

Students are expected to be the project creators. They will likely work more than the anticipated hours below. Funding for students was the primary motivation for submitting this grant.

3 undergraduate students; 6 hours a week each; 18 weeks (6 in fall; 12 in spring) @ $7.25 per hour: Total $2,349

1 graduate student; 6 hours a week; 18 weeks (6 in fall; 12 in spring) @ $10.75 per hour: Total $1,161

Part 2. Equipment (Includes all material with a cost of $500 or more):

Because this technology is still in the development phase, Rift demos that work on some computers do not always work on others, depending on installed graphics hardware and software drivers. We are requesting a primary laptop with sufficient hardware to use on this project.

Graphics compatible laptop (official estimate attached): $1465

Part 3. Supplies (Includes all material costing less than $500):

An exact date for the commercial Rift has not been published, but the company expects to release sometime in spring 2016.

Commercial version of Oculus Rift; estimated cost: $450.00

Part 4. Travel (current travel rates):

Hotel, travel expenses, conference registration fees; estimated cost: $1,000

Part 5: Miscellaneous:

Unanticipated miscellaneous expenses (possible expenses for things such as sound clips): $100

1. Timeline for the project, by month, with completion of the project not later than August 31, 2015:

September - October 2015: Project design; formal plan; software research; laptop purchase

November – December 2015: Virtual tour of Bolin Room 120, computer science lab

January – March 2016: Inclusion of hallways and additional rooms in Bolin; inclusion of additional features, such as sound

March – August 2016: Continued project refinement; project report finalization; conference submissions; dissemination of results.

1. Specific plans for dissemination of the findings of the project, including the Spring 2016 Celebration of Scholarship:

**Student/faculty poster and/or presentation:**

Spring 2016 Celebration of Scholarship

**Student Project Presentation and/or Student Poster Presentation**:

Consortium for Computing Sciences in Colleges: South Central Region (CCSC:SC), Austin, TX, April 2016

**Paper submission possibilities include:**

International Conference on Computer Applications in Industry and Engineering (CAINE)

ACM Special Interest Group on Computer Science Education (SIGCSE)