UNIVERSITY OF LOUISIANA AT LAFAYETTE

STEP Committee

Technology Fee Application

Equipment for the CACS Virtual Reality (VR) Lab
Title

Dr. Christoph Borst and Dr. Arun K. Kulshreshth
Name of Submitters

School of Computing and informatics
Organization

Title: Equipment for the CACS Virtual Reality (VR) Lab **Date:** 07/16/2018

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ABSTRACT:

Virtual reality is a booming technology and a popular course choice for the computer science undergraduate students. Due to recent advancements in graphics and virtual reality technology, there are many new job opportunities available for students trained in this area. The Virtual reality (VR) laboratory, established in 2003 by Borst, is the main laboratory used by our students for virtual reality related courses and projects. UL has offered VR courses since 2004; However, our school of Computing and Informatics (CMIX) provides no VR equipment for the classes, limiting classes and enrollments. Undergraduate enrollment in the VR class has been purposely limited to 20, with additional students requesting overrides to get into this class. The instructor has only managed to support the class projects through occasional access to research stations borrowed from sponsored research projects (and a display from a 10-year-old STEP grant reaching the end of its lifetime). Students have asked for increased access to VR equipment through both their instructor evaluations and in-person comments. This request is for the basic equipment to provide dedicated VR stations for students who take virtual reality related courses (CMPS 499 / CSCE 615; CMPS 452), computer graphic (CMPS 415 / CSCE 515), a new proposed human-computer interactions class, and students who need high performance machines for capstone projects and other guided work. Specifically, we request five computers equipped with virtual reality devices. If funded, these enhancements will allow students to develop both knowledge and experience, making them more competitive in the job market, and will help us to continue attracting more students in our program. The VR lab also plays the largest role of any CMIX group in outreach and recruiting activities by demonstrating virtual reality projects during events including Career Connections, Science Day, preview days, etc. Thus, the requested equipment will also greatly enhance outreach and recruiting efforts.

Proposal Description

A) Purpose of grant and impact to student body as a whole

Becoming a computer scientist and working software developer requires computer science majors to work toward developing their knowledge, skills and experience. The purpose of this grant is to assist these students in their development by enhancing the Virtual reality (VR) laboratory in the School of Computing and Informatics (CMIX). This includes purchasing and setting up five computers with virtual reality headsets and trackers (to track objects in the virtual world). These computers will be used for the classes in the area of virtual reality and video game design.

Dr. Borst established the CACS Virtual Reality Lab at UL in 2003 and began teaching a full course on VR in 2004. Only about 3% of universities worldwide offered such courses at the time, and Borst's course at UL was the only one of its kind in Louisiana, according to a major global survey (G. Burdea). The course is currently taught as "Game Development and Virtual Reality" at both the undergraduate and graduate levels in UL's School of Computing and Informatics. Purchasing and installing the additional machines would greatly enhance this lab by supporting the class and allowing higher enrollments. Currently, the enrollment limit is set to 20 and usually more students are interested in this class. The current lack of any dedicated class equipment negatively affects the learning in this class. These students comment about the limited available equipment in the SEI evaluations and in in-person comments to the instructor. Dr. Kulshreshth is also proposing a course "Human-computer interaction for virtual reality and video games" which will utilize this VR laboratory for student projects.

The department has about 125 students who could use this lab equipment. In addition, the VR lab also plays a main role in outreach and recruiting activities by demonstrating virtual reality projects during events including Career Connections, Science Day, preview days, etc.

The equipment that will be purchased through the STEP funding will support and boost undergraduate and graduate work in the area of virtual reality and can be used for interdisciplinary collaborations with other departments and schools within UL Lafayette. Previous VR work in CMIX resulted in new collaborations with faculty in Geology, Civil Engineering, and Mechanical Engineering, and students trained in the VR course have gone on to advanced projects in several departments.

Impact to the student body

Based on the provided justification, we expect the following impacts on the student body:

- Improving computer science student's abilities and expertise in the area of virtual reality, video game design, and computer graphics.
- Enabling the Computer Science program to enrich current concentrations (e.g. video game) by allowing new possible virtual reality projects (utilizing this new equipment) for students. This will attract more students to the Computer Science and will increase the number of enrollments in the program.
- Enabling more students to enroll in virtual reality related classes by providing equipment support for their projects.

B) Projected lifetime of enhancement

We estimate the initial lifetime of at least 5 years. After that period, we can possibly upgrade components in the computers and make them usable for another 3-5 years (total 8 to 10 years, e.g., with upgraded graphics cards). The virtual reality headset and tracking hardware would last at least five years.

C) Person(s) responsible for

a. Implementation

Implementation will be carried out with the help of the program technical operations director (Dr. Robert Minvielle), Dr. Christoph Borst, and Dr. Arun K. Kulshreshth, and their undergraduate and graduate students. Borst has been maintaining a virtual reality course and lab for 15 years already.

b. Installation

Installation will be carried out with the help of the program technical operations director (Dr. Robert Minvielle), Dr. Christoph Borst, and Dr. Arun K. Kulshreshth, and their undergraduate and graduate students.

c. Maintenance

Maintenance will be carried out with the help of the program technical operations director (Dr. Robert Minvielle), Dr. Christoph Borst, and Dr. Arun K. Kulshreshth, and their undergraduate and graduate students.

d. Operation

Operation will be carried out with the help of the program technical operations director (Dr. Robert Minvielle), Dr. Christoph Borst, and Dr. Arun K. Kulshreshth, and their research lab students which includes both undergraduate as well as graduate students.

e. Training (with qualifications)

Dr. Christoph Borst, Dr. Arun K. Kulshreshth, and their research team members that will include undergraduate and graduate students. Also, a general training document will be prepared to teach others on how to access and work with the system.

D) Grant proposal and justification

Our intention in requesting funding to purchase five computers, equipped with virtual reality hardware, is to equip a VR laboratory with dedicated technology and provide necessary equipment to support VR related classes. This equipment would be used by undergraduate and graduate students, primarily for class projects and additionally in working with researchers in the School of Computing and Informatics to gain experience with applications in several broad areas including virtual reality, human-computer interaction, video games and computer graphics. If funded, this grant request will allow students in the School of Computing and Informatics to gain valuable experience directly related to success after graduation.

Budget Proposal

1. **Equipment** **$21,150**

5 computers with high-end CPU and VR Graphics	Total: $12,500.00
5 Virtual reality headsets (HTC Vive Pro).	Total: $4,000.00
10 HTC Vive Trackers	Total: $1,000.00
10 HTC Vive Track Straps	Total: $400.00
5 Depth cameras	Total: 1,250.00
Other Misc. tracking devices and controllers	Total: 2,000.00

2. **Software** **$0.00**

3. **Supplies** **$0.00**

4. **Maintenance** **$0.00**

5. **Personnel** **$0.00**

6. **Other** **$0.00**

TOTAL: **$21,150**

Previously funded STEP projects:

$47,985 STEP Grant (Fall 2009) **Dr. Christoph** Borst and Dr. Gary Kinsland. Interactive 3D Projection room. This was the prior grant that provided equipment for the VR class, mainly focused on a projection-based VR display and computer. The equipment was used for nearly 10 years by the computer graphics classes in Fall and the VR classes in Spring. Dramatic changes in the VR market, and a major increase in interest in VR courses, now calls for a different type of VR setup.

$9,500 STEP Grant (Spring 2018 Cycle) **Dr. Arun Kulshreshth** and Dr. Ashok Kumar. Equipment for the Video Game Design and Development (VGDD) Lab. Two projectors, one computer and several wireless game controllers will be purchased (under process) with support from this STEP grant.