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Augmented Library: A Vertically Integrated Project

Dr. Matthew Frenkel, New York University

Matthew Frenkel is the engineering librarian at NYU's Bern Dibner Library, and an adjunct faculty in Mechanical Engineering at NYU Tandon. He is a member of the ASEE Engineering librarian division (ELD). Matthew's background is in the experimental study of optical whispering gallery sensors, but his current research interests are in how undergraduate and graduate engineering students develop their professional skills.

Jada Forrester

Mr. Andrew Qu

Shinkyum (Kevin) Rho, New York University

Shinkyum (Kevin) Rho is an undergraduate student majoring in Computer Science and minoring in Mathematics at New York University. He has been part of the backend team throughout the 2020-2021 academic year and has contributed to the Interactive Flyers and AR Vision.

Sofia Rose Larson

Poster - Augmented Library: A Vertically Integrated Project

Abstract

The Augmented Library is an experiential learning class through New York University's Vertically Integrated Project program. Students participating in the course, work for three semesters towards the development of an app to enhance services and user experience within the library. The students are currently working in two sub-teams, one focused on user experience and frontend development and the second on building the backend architecture. The team aims to integrate augmented reality way finding, augmented reality posters, as well as additional features into the app. This poster presents the current progress towards the development of the app as well as future development plans.

Introduction

Technology has often been a tool that has shaped how libraries offer and deliver services. In the early part of the 20th century microfilm and microfiche brought up a new way to store and access information. In the second half of the twentieth century the computer would become a ubiquitous part of society and commonplace within libraries. The integration of computers into libraries for both public use and library staff lead to machine-readable library records, the addition of electronic resources to libraries collection, and new services such as printing, scanning and computer training workshops. By the end of the 20th century the internet would revolutionize how libraries interacted with their patrons. Today, there are a number of technologies libraries have been experimenting with including artificial intelligence, 3D Printing, the internet of things (IoT), and augmented and virtual reality [1]–[4]. In particular augmented reality (AR) is an exciting technology that has begun to be integrated by libraries recently. Libraries have used AR technology in information literacy instruction, in particular for online, international, and non-traditional students [5]; creating self-paced library tours [6]; and for the discovery of physical resources [7]. Though technologies have led to great advancements in libraries it is not always the case that libraries can be the first adapters of the newest developments. Libraries are often limited by budgets or the technical expertise of their staff.

At academic libraries, particularly engineering libraries, there is a student body that is both excited by new technological innovations and eagerly looking for opportunities to gain hands on experience in these emerging areas. This poster will outline a partnership between the New York University (NYU) Vertically Integrated Projects program and the library to implement a credit-bearing, experiential learning, course focused on integrating new technologies into the library. The poster will provide background information on both the Vertically Integrated Project program and the course hosted by the library, detail the current undertakings of students in the course, and discuss the future directions the project is aiming for.

Background - Vertically Integrated Projects

The Vertically Integrated Projects (VIP) program started in the early 2000's at Purdue University [8]. Since its beginnings VIP has grown into a global consortium with over 40 participating universities in nearly one dozen countries [9]. VIP programs at NYU consist of credit-bearing courses based around faculty research initiatives or other projects that are expected to last a minimum of 5 years. Courses are designed around an experiential learning pedagogy and not a lecture format.

At NYU there are roughly 40 VIP teams operating. Students join teams for three semesters. Each semester students enroll for one credit, and at the end of three semesters, with three credits earned, students are able to apply their participation in VIP as a technical elective towards their graduation. The three semester model creates an opportunity for students to move from beginners in their first semesters to team leaders in their last, replicating how they might grow in their future careers. It also means that VIP projects outlast any individual student's participation. Students enter the VIP program by applying to teams that interest them, and each team has its own standard for which, and how many, students they will accept. Students keep notebooks during the semester to document their work which are graded by the faculty advisors.

Background - Augmented Library

The Bern Dibner Library at NYU's Tandon School of Engineering has been implementing programs focused on both student engagement and library innovation since 2017 [10, 11]. These programs have taken the form of student competitions and ideas based on student submissions have been implemented within the library. One area of particular interest to the Bern Dibner library has been integrating augmented reality into the library for the purpose of discovery, access, and engagement, but to date no participants in the previous mentioned contests have explored this technology. As a result, the librarians began to look for other ways to get students involved with the development of augmented reality within the library.

One option that was considered was to recruit a graduate student in one of the computer science or technology based programs at the university to use the library as a setting for their thesis or dissertation. Though this path would have resulted in an experienced graduate student working with the library, it would have required support from a faculty member outside the library, and limited the number of students working on the project. Instead, the library hoped to pursue an avenue that could enable more undergraduate participation. As a result of a separate research initiative the library had built a strong relationship with the VIP program leadership and considered the VIP program an exciting opportunity to pursue this idea. During the fall of 2018 the library pitched our idea for an undergraduate experiential learning course to both the library and VIP leadership, as a result, in the spring of 2019 the Augmented Library team got started. In the first semester three students joined the team and began to lay the groundwork for future semesters. As of the spring of 2021 there are currently more than a dozen students, including three students returning as volunteers for a fourth semester of participation, and 2 graduate students volunteering out of interest in the project. An unexpected discovery of starting this VIP team was the excitement students had to work on innovations that would give back to the library. As part of the application process students are asked why they are

interested in joining the team they apply to. Students applying to the Augmented library team have often spoken directly to their positive experiences with libraries as a desire to join the team.

Since I was little, I preferred to stay in the library rather than on the playground. For me, library is a big maze waiting for exploration. Yet, some libraries are too big and it is hard to find the right path to the book I am looking for. During the VIP info session, I heard about this Augmented Library project and found this very intriguing. Exploring the library using augmented reality and using image recognition to find relevant materials will give people an easier access to the source they are looking for and will contribute a lot to their researches. I believe this project will not only enhance the library experience but also bring libraries to the frontier of the technology innovation.

As previously mentioned the Augmented Library team is focusing on bringing technology into the library, primarily through the development of a mobile app. Though augmented reality is a large part of that, the team is also working on ideas using other technologies such as IoT and web design. The team is currently organized into two sub-teams. The first sub-team focuses on the frontend design and user experience, and the other focuses on the backend development. Students are welcome to work with either sub-team, and can switch between them if they desire. The students meet with their sub-team each week to discuss progress and assign new work. There is also an active Slack channel used by the team throughout the week. Students give a presentation in week 5 of the semester outlining their goals for the semester, and in the final weeks of the semester they give a second presentation to demonstrate their progress and start planning for the next semester. In addition to the weekly sub-team meetings, leaders from each group also meet regularly with the team advisor to discuss any issues that come up. There is no formal lecture component for the course and there are no quizzes or exams. The students are encouraged to pursue their ideas and not shy away from failure, but instead to document what they learn in their notebooks.

Current Work

During the 2020-2021 academic year the team has been pursuing a number of different projects. The frontend team has been investigating tools for conducting meaningful user testing. Originally, they were exploring a number of software options, but with the increased use of Zoom, they realized that most of the functionality they needed was already available to them and they would not need to license a separate technology. With this user testing the frontend type is hoping to expand on work done in previous semesters to understand the wants of the potential user population, and to begin examining user response and interaction with current design prototypes. All of this is meant to inform the app design. Additionally, the frontend team has begun developing screen tests for a mobile app, and an augmented reality-based tour of the library. Figure 1 shows some of the screen tests developed. Other projects the frontend team is working on are the integration of the libraries room reservation and chat services, a hub for library

announcements, as well as partnering with the backend team to help with design concepts.

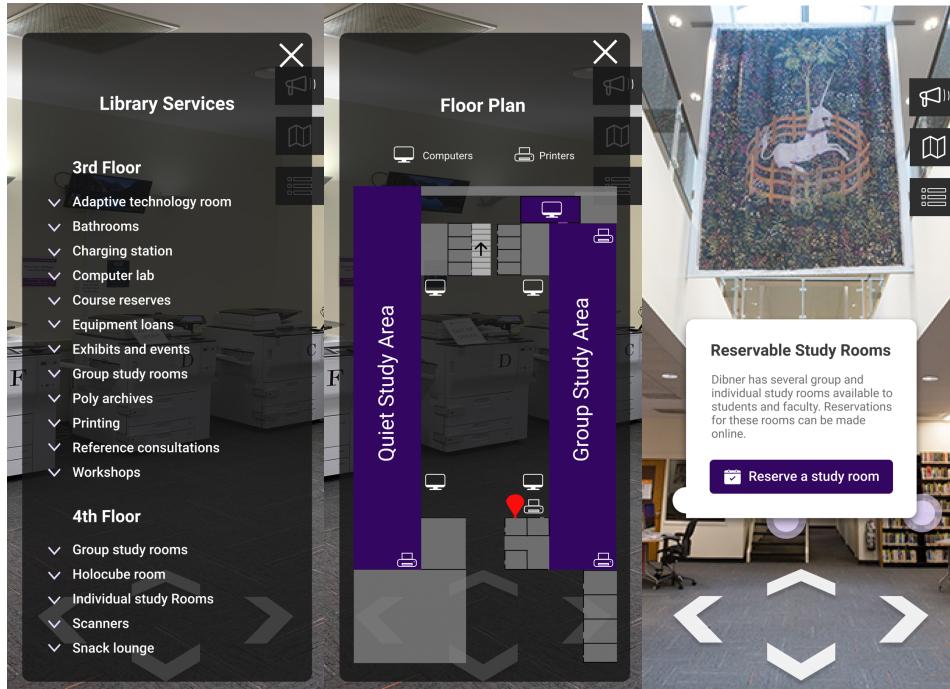


Figure 1: Screen Tests of library floor plans, features, and tour.

The backend team is currently engaged with 4 different projects: interactive flyers, path finding, database design, and AR Vision. The use of interactive flyers is intended to increase engagement and reduce the printing burden on the library. The idea being to create simple printed flyers that could be posted throughout the library to cover various topics (library hours, workshops, printings, etc.). Students working in the library would be able to enhance these flyers using augmented reality on their phones. As a result, the library would be able to easily update information such as upcoming workshop offerings, or spring break hours of operations without having to print new posters. The frontend team is exploring the impact this might have on accessibility in the library. It is also hoped that the element of augmented reality would increase student engagement. Figure 2 shows an example of a proof of concept of a virtual flyer.



Figure 2: Trigger image tracked by camera and surrounded by augmented reality blocks

Path finding questions are commonplace for a library reference desk. The backend team hopes to develop functionality within a library app that enables students to be directed to various locations in the library such as stacks or study rooms. Figure 3 shows a mockup up what that could look like from the user perspective. In order to utilize both the interactive flyers and path finding the team is working to build a database to store the information that will be used by the app. When this database is up and running it will become possible to train library staff to access it and update it. As a result, the library staff will be able to make changes anytime information displayed by the app needs to be made current. As an example, this could be related to a change in library hours, a new database or technology the library wants to advertise, or any other information the library is excited to highlight such as an upcoming event. Lastly, the backend team has begun to investigate how to integrate computer vision into any application that is built. At the current moment the system often works off QR codes or preset trigger images. A more robust computer vision system could increase the path finding accuracy of the app, as well as open new functionalities of the app for resource discovery.

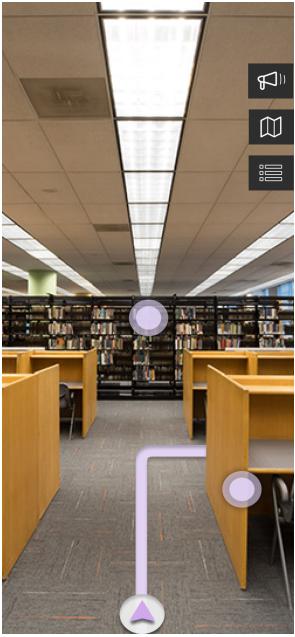


Figure 3: Design of way finding screen.

Conclusions and Future Discussions

Partnership between the library and university's VIP program has resulted in opportunities for students to gain meaningful experience, course credit, and feel that they are giving back to the library. Students are able to fill out a course evaluation at the end of each semester, though the small number of students participating has limited our access to these reports due to university policies. On the other hand, the retention of students for multiple semesters on our team is taken as a good sign that students are gaining meaningful experience through this class. Though the size of the team has increased over the past few semesters, we have found that keeping the team at approximately 12 students creates a manageable environment, while providing students with enough teammates to work with on any challenging problems they encounter. As the project continues to move forward the library hopes to see the students dive into new areas of research such as the completion of an augmented reality library tour, path finding beyond the library building, and electronic resource discovery through augmented reality. The VIP program does not require an end date for projects, and ours is one with enough on-going work to continue to run for many years, as long as there is student interest. Instead of setting hard deadlines for developments, our team sets semester to semester goals, encouraging students to try for exciting ideas without worrying that missing a deadline will result in a course failure. We hope that we will be able to continue this project into the future, increasing the functionality of the app and potentially expanding beyond our library. The students are currently building much of the backend architecture using GitHub which we hope, when it is ready, will enable us to share this work with other libraries interested in bringing augmented reality into their space. We are also aware that other schools may not currently have VIP programs, but we do believe that a lot of this work could translate to interesting partnerships with other courses such as senior design or freshman introductory engineering courses.

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