

## Gesture-Based Software Development with Undergraduate Teams

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### ABSTRACT

Undergraduate professors in computing often find it difficult to bring 'real world' projects to their students. Many undergraduates aim to work in industry and value hands-on development of software and the challenges it brings. As faculty, we search for opportunities to work with industry partners who have a plausible idea, but lack either the software expertise or resources to complete development. Faculty also struggle with bringing successful business models into the classroom that help students understand their role as emerging professionals, but which also meet the needs of an academic experience. In pursuit of these experiences we have found applied research grants to be excellent opportunities to bring industry and the classroom together. Further, to meet the rigorous schedule that projects like these often require, we have also found it useful to draw from business models found in digital agencies. Digital agencies are work environments involving teams of developers and designers who coordinate wide skill sets in the creation of complex projects. The implications of this experience for other computing faculty are that the creation of a talented team of seniors can be used to simulate a real world work environment while performing work of use to industry partners.

**Keywords** *STEM, Conference Proceedings, Higher Education, Educational Quality*

### INTRODUCTION

Higher education is under increasing pressure to prepare its students for today's workplace. Many students attend college with the hope of obtaining well-paying jobs upon graduation. Industry employers increasingly expect graduates of university computing programs to be ready to work with little, if any, training (Gorka, Miller, and Howe 2007). One way to do this is with hands-on, real-world projects. However, undergraduate professors in computing often find it difficult to bring real-world projects to their students (Murray, 2011; Reinicke and Janicki, 2011). When used as part of regular coursework, real-world projects add substantial upfront work on the part of faculty (Sabin 2008) and leave less opportunity for student experimentation and failure.

Jones-Boast and Flint (2009) describe the different stakeholder outcomes that coursework based projects face: academics need to be able to assess student learning with confidence, students want to learn as well as achieve satisfactory grades, and external clients want a robust, finished product. Balancing these three is very tricky, especially when accommodating differing student skill levels, schedules, and learning styles. Reinicke and Janicki (2011) outline the types of pitfalls that can occur, including technological, team

dynamics-related, and logistical. Taking on real-world projects as extracurricular, grant-funded projects can align the goals of all three participants. By removing the extra overhead of grading for faculty and being graded for students, focus is put on developing a quality technology product and on providing students with real-world development experience within the university.

## **METHODOLOGY**

We have found many industry partners who have a plausible idea, but lack either the software expertise or resources to complete design and development of their idea. Our project brought together an industry partner, faculty, and senior computing students. We were given a short timeframe in which to create a gesture-based system that would record and display hand position as a user performed single-handed tasks.

Prior projects developing augmented reality tools, information systems, and mobile applications allowed the faculty involved to assign students to teams based on their prior coursework and internship experiences. We created three teams, each with four students: a 3D modeling/user interface team, a camera interaction team, and a data storage and reporting team. Through the creation of these three domain-specific teams, with one professor overseeing the team s/he had more expertise in, we were able to leverage specific knowledge and skill sets alongside interested students while creating a robust prototype that would not have been possible alone. After initial investigations with various camera hardware and available APIs, a camera model and finger-detection API were chosen.

For two weeks during a university break, we used a “digital agency” approach. To elaborate further on the definition of “digital agencies”, teams of developers and designers are assigned parts of projects and have to coordinate closely with each other in tight sprints using Agile methodologies. Students worked on campus and were visited by professors daily to provide updates and receive clarification. Through establishing daily milestones and benchmarks, students rose to the challenge, and in many cases exceeded, the faculty's requests. It prompted students to ask questions and clarifications immediately, since progress was expected on a daily basis.

## **CONCLUSIONS AND FUTURE WORK**

The final result was a functioning prototype, presented to the industry partner to be used for pursuing future grants and/or venture capital. The implications of this experience for other computing faculty are that the creation of a talented team of seniors can be used to simulate a real world work environment while performing work useful to industry partners. Larger projects and teams afford the students the opportunity to subspecialize and pursue much deeper learning in an area they are interested in. Students were able to focus in depth on one area rather than having to do a cursory job of juggling all aspects of the project. By having teams of four, we also built in some redundancy in case of student absence. We were able to provide our undergraduates with well-paying employment, offer service to our academic partners, and facilitate a learning experience that is close to real-world development.

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**Amod Damle** received a Ph.D. in cognitive engineering from The Ohio State University. His areas of research include human-computer interaction, design thinking, prototyping, social innovation, and conflict resolution. He has taught several university level courses on a wide range of topics pertaining to design. Currently he works as an independent design consultant.