TelKart and QnA: An Open Teaching System for Computer Science

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ABSTRACT

This session talks about an initiative at Carnegie Mellon University to build an online open source teaching tool and complementary interactive video recording and production hardware. Our system consists of a hardware system (TelKart) to record videos, slides, and/or whiteboard, as well as a software system called QnA to create and present lecture notes and assessments through a web interface. The resulting videos, instructions, and assessments can act as part of a course or a stand-alone instructional piece.

The software part (QnA) was implemented using open source software, and we used a user-centered approach to building the system, seeking active feedback from instructors. The QnA system is deployed in Carnegie Mellon’s campuses in Pittsburgh and Silicon Valley and is in closed beta to students in the Pittsburgh area.

We hope to use this session to talk about our insights deploying the system to computer science courses, including challenges faced in a university setting and future work. We also hope to seek feedback towards making our software system open and employing OER principles in synergy with the university guidelines. Finally, we hope to showcase and seek feedback about our lightweight hardware solution.

HARDWARE

The hardware part (TelKart) records interactive videos, either live streaming or recorded course content. We developed a custom hardware solution through iterative prototyping and refinement. The hardware is deployed at Carnegie Mellon’s Pittsburgh campus. One part of our future work consists of prototyping and evaluating a more lightweight hardware solution.

SOFTWARE

The software system (QnA) is used to distribute content and conduct assessment for a course module or an independent instructional piece. QnA is a web interface that allows instructors to embed course content; it has basic content management features like version control, LaTeX for equations or tables, rich text editing, and embedded media.

DISCUSSION & FUTURE WORK

We have a prototype of a new low-cost version of the system based on a laptop and a tablet. The system uses open source software like ORBS studio and QuickTime player to create or stream videos. We plan to conduct a formal evaluation of the prototype and submit a publication in the next few months. We hope to open source the setup and publicly setup Do-It-Yourself (DIY) instructions on the web to help instructors create content from their offices.

We used structured interviews as well as targeted scenario-based feature design to deploy new features to the software. A typical deployment of a feature would first be done by seeking feedback from the alpha testing faculty giving us the first level feedback. The next iteration would be done by a beta test from a Teaching Assistant, providing the second level of feedback. Finally, we would deploy the system in production, watch user behavior and telemetry data, and work on the final iteration of the feature release.

CONCLUSION

This session presents an innovative system to record videos and deploy them through an online system. The goal of the project is to simulate the physical teaching experience in a classroom through an online environment and distribute content through the web interface. We have used rapid prototyping and user-centered design to improve the system through iterative improvement in a university setting. We seek help from instructors and teaching assistants to get involved in building the software and this helped us ground our ideas and seek internal and external validity before deploying a new feature. Inspired by our hardware setup called TelKart, we hope to deploy a low-cost hardware version of the prototype that can be beneficial to instructors interested in distributing content. The software system called QnA is deployed in campuses of Pittsburgh and Silicon Valley. We hope to open source the software for the benefit of educators. Finally, we hope to seek feedback on our system towards making our beneficial towards open education.

REFERENCES

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QnA system has gotten positive feedback from instructors and teaching assistants and is rapidly gaining users in the Machine Learning Department. The system is being improved through user-centered design and we hope to make the software open source so instructors can benefit from our effort. The software is in pipeline to become a independent Docker script to make it easy to be deployed once the software is open source. We hope to use this session to seek feedback on making our hardware and software system open and effective towards open education.