PROJECT HANDOVER IN UNDERGRADUATE PROJECTS – EFFICIENT HANDOVER FOR INCREASED LEARNING OPPORTUNITIES

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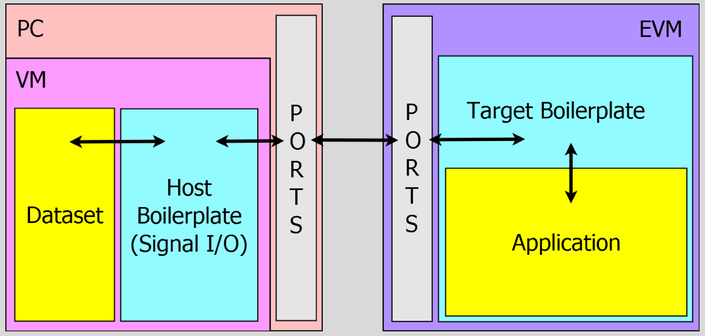
1. Abstract

In this paper, we describe a method we have employed at the University of Bristol to improve the undergraduate project experience. We describe the methodology we employ, which consists of a pre-built environment, close supervision by a researcher, and compiled reference material. We then compare the methodology with its absence using the frequency of undergraduates publishing as our metric. We observe a noticeable increase in the number of undergraduate publications under the new methodology, as well as a number of unexpected benefits for the students.

2. Boilerplate and Material

- Students provided with boilerplate code that allowed them to get data in and out of the system with ease.
- Boilerplate made use of a virtual machine to allow the host software to be moved between different computers.
- Students could then write their applications almost immediately, as opposed to a long set-up process.
- Boilerplate made generic so that it can be used for multiple purposes.
- Provided multiple example applications so that students could understand how to use boilerplate code
- Provided reference books [1] to help students understand the architecture and for looking up the solution to problems.

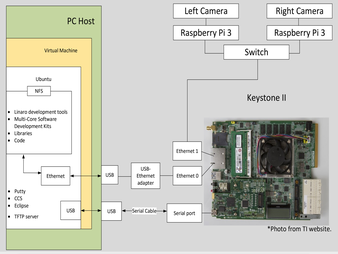


3. Assistance

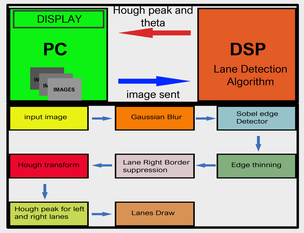
- Undergraduate students working alongside researchers.
- Researchers have experience in the area and disseminate knowledge to undergraduates.
- Researchers provide the link between subsequent years.
- Researcher can suggest areas that are lacking in research (due to in-depth literature review) and hence easy to publish in.
- Researchers benefit from the experience of explaining ideas (presentation and communication skills).
- Knowledge gained by undergraduate student is fed back to researcher.
- Researcher can test ideas with the support of the undergraduate students.
- Researcher co-publishes with undergraduate student.

4. Examples

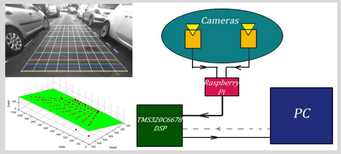
- **Han Cui**
  - Development of real-time stereovision on DSPs for automotive applications.
  - Hardware set-up and boilerplate provided.
  - Was able to start immediately with algorithm optimisation.
  - Published a paper [2] and accepted to Cambridge for a masters degree.



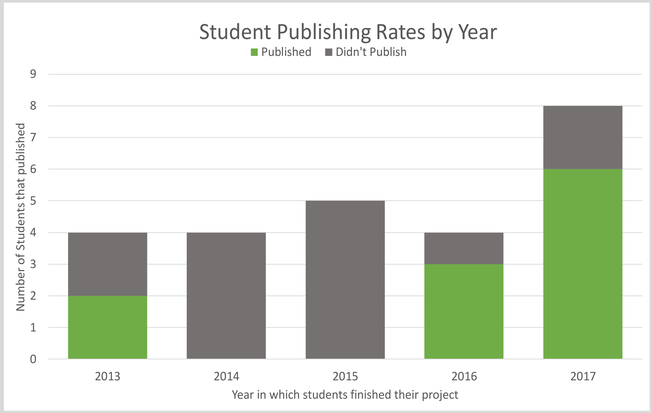
- **Victor Prokhorov**
  - Development of a faster-than-real-time lane detection algorithm.
  - Given a multitude of example applications, pre-built environment and tools.
  - Arrived at the point of working communication in weeks when it originally took months.
  - Published a paper [3] and accepted to Cambridge for a PhD.



- **Aliaksei Mikailiuk**
  - Development of a real-time surface fitting algorithm for pothole detection.
  - Example applications and hardware provided.
  - Published a paper [4] and accepted to Cambridge for a PhD with a grant.



5. Results



- For the three years before the change we had publishing rates of 50%, 0% and 0%.
- For the two years after the change we had publishing rates of 75%. Since publishing our paper, another student's work was accepted for publication.
- Results are promising but have not yet withstood the test of time: can this be maintained across multiple researchers? Can this withstand multiple generations of technology?
- Results shown for embedded programming and video signal processing, need to investigate how this approach can be generalised across multiple disciplines.

6. Conclusion

- We saw vast improvements in our chosen metric (student publishing rates) after implementing this new methodology. This implies a significant improvement in student achievement and satisfaction.
- Our new methodology allows students to deal with real-time signal processing tasks on embedded hardware without spending excessive amounts of time learning the platform. They can learn only what is needed to accomplish their goal.
- We aim to continue utilising this methodology and determine its long-term viability to alleviate the issues of the increasing rate of new technology releases.

[1] Naim Dahnoun, Multicore DSP: From Algorithms to Real-time Implementation on the TMS320C66x SoC, John Wiley & Sons, Inc., 2018

[2] H. Cui and N. Dahnoun, "Real-time stereo vision implementation on the texas instruments keystone ii soc," in 2016 IEEE International Conference on Imaging Systems and Techniques (IST), Oct 2016, pp. 195–200.

[3] R. Fan, V. Prokhorov, and N. Dahnoun, "Faster-than-real-time linear lane detection implementation using soc dsp tms320c6678," in 2016 IEEE International Conference on Imaging Systems and Techniques (IST), Oct 2016, pp. 306–311

[4] A. Mikhailiuk and N. Dahnoun, "Real-time pothole detection on tms320c6678 dsp," in 2016 IEEE International Conference on Imaging Systems and Techniques (IST), Oct 2016, pp. 123–128