

this is good. I like the social focus, and it seems like you have worked out a reasonable structure. I guess there are only two essays now? weird. we had personal statement (what you want to do) separate from personal history (what you have done). you might also want to introduce *why* you are working on this 3D printing project, since it is unrelated both to what you did before and what you want to do. :) nice job!

Title: Personal Statement

Author: Andrew Head

Paypal co-founder Peter Thiel describes that there are two types of ventures, those that build a technology from 0 to 1, and those that expand it from 1 to n [2]. *I want to do both.* After half a year developing personalized mobile advertising from 1 to n with a Silicon Valley startup, a visit to Berkeley's Institute of Design showed me a chance to to take 0 to 1, to pursue novel answers to socially significant questions with an open mind. Today, the work of my Berkeley peers places high value on impact and novelty, from discovering the principles of successful MOOC design to building rapid prototyping workflows that channels creativity of hobbyist makers. I strive to excel in this milieu, exploring gaps in socially-focused technology research and building a future to shepherd this work to widespread distribution.

Background. During my undergraduate study, the pleasure of creating digital projects attracted me to computer engineering. From designing pipelined CPUs to implementing mini-Java compilers, I found my coursework intrinsically engaging. My academic successes followed, with around thirty A-pluses in computer engineering and music and a GPA in the top two-percent of my class. With an NSF fellowship, I studied computer vision with Intel's lab in Beijing. Through an Arts & Sciences award, I pursued self-led education technology research. I co-taught Honors Physics review sessions for a former professor. And within music, I published creative research in the Forbes & Fifth undergraduate magazine and composed a work for full orchestra. Throughout my undergraduate degree, I found the technical skills I have learned to be both empowering and life-enriching.

Research Experience. Despite advances in rapid prototyping, building low fidelity control devices is a tedious and error-prone process, in part because it still requires the manual design and installation of custom electronics inside fabricated shells. To address these difficulties, I joined an on-going project with Valkyrie Savage and Björn Hartmann of the Berkeley Institute of Design (BiD) in August. We explore the design space of rapidly prototyped tangible input devices that generate control signals through audio signals detectable through simple commodity microphones, helping future designers to swiftly iterate on device prototypes and leading to higher-quality, faster designs at lower cost.

confusing wording

what is a faster design?

no - in 3D printed

There are several challenges to discovering design paradigms for 3D-printed devices that produce passive acoustic-sensable control signals. Printed materials produced by mid-range 3D printers like ABS produce resonant frequencies that are noisy and impure when compared to metals. And while resonant bodies of greatly varying size are a key to producing distinguishable control sounds, we are limited to produce printable structures that can eventually fit in a user's hand. Printed structures are brittle across at least one axis due to the layer-based construction method of modern additive manufacturing. Care has to be taken in print orientation to prevent fracture of noise-making structures on the first strike.

To address these challenges, I have worked in the last two months to prototype new devices with tine-based sound-generating structures. I have also refined code to extract and classify control events from real-time audio streams of stimulated printed devices. In a recent paper we submitted to an international conference, we detailed a tine detection method I implemented based checking FFT bin energies that correspond to particular tines against

"comb
tine-like"
might be
easier for
people to visualize

wording

thresholds, resulting in 80% classification accuracy on a subset of tones. My current efforts seek to discover more powerful features including harmonic frequencies. And in the coming months, I will produce more sophisticated 3D structures that produce multiple tones at once to support more granular position sensing with the same subset of tone lengths.

is it still
capitalized?

Meanwhile, I prepare for independent research I will start in the coming semester. The Web stores billions of documents, yet it is difficult for someone who intends to develop an understanding of a new subject to navigate the rich learning resources available online. My proposed upcoming research, detailed in my proposal, explores the challenges and solutions to developing search user interfaces for learners to determine the most helpful material to develop an understanding in a subject. I am eager to begin exploring in this direction.

Undergraduate Research. In the fall of 2012, I recognized that graduate study was a significant way in which I could continue my own academic growth and improve the impact of my technical ability. I sought out a research mentor who could help me to engage in research as a way to expand the impact of my computer science skill. In December 2012, I joined Professor Jingtao Wang of the Mobile Interfaces & Pedagogical Systems (MIPS) group. At the time, his research in educational technology and serious games matched my experience programming games and my interest in making socially impactful technical projects.

wording

A year after joining Dr. Wang, we submitted the *ToneWars* project I led for publication [1]. *ToneWars* investigated a multi-user interaction we believed was unexplored. This is the pairing of experts and students in a competitive educational experience. I built an application, *ToneWars*, to test the learning outcomes and user perceptions of this interaction. *ToneWars* teaches students, in this case second-language learners of Chinese, the Mandarin tones. Students compete against experts – native Chinese speakers. To implement *ToneWars* as a successful, scalable learning solution, we needed to address a major obstacle – students and experts had distinct goals. The former needed to learn a new skill, and the latter needed to have fun without external incentive.

this makes
me think
that it didn't
turn out to
be unexplored?

To develop *ToneWars* in a way that satisfied these two goals, I conducted research in multidisciplinary directions. By interviewing experienced Chinese instructors, I developed a game input mechanic that was based on established pedagogy. I programmed and tested the *ToneWars* application through several iterations to optimize challenge for both student and expert users, despite their unequal prerequisite skills. And to verify beneficial learning outcomes and expert engagement, I designed and conducted a 24-participant user study. Our study showed promise for language learning and expert motivation. Today, Dr. Wang is continuing this research by working to test the application on a larger scale at Pittsburgh area schools. so do *you* know the Mandarin tones now?

Outreach. Since early October, I have mentored a small group of students during sustainable energy lessons at a remedial-level Integrated Science course at Berkeley High School, with Students for Environmental Education Development (SEED). During our visits we lead lab activities to build simple solar and wind-harvesting circuits and emphasize the concepts of energy conversion and efficiency. Through this experience I recognize challenges to engaging students in remedial classrooms in approaching fast-paced scientific material. And it has become apparent that many high school students graduate without a knowledge of electric

generation that is key to understanding the benefits of renewable energy. But it is gratifying to see some students in my group hypothesize how the small DC motors we use in circuits relate to the three-rail local BART system. maybe say the three-rail local electric subway?

In my sophomore year, I served as a teaching assistant for Honors Physics. During review sessions, I strove to improve my mastery of the material and my ability to discover fundamental problems in students' misunderstandings. sophomore year of HS? college? outcomes of this?

In my past research, I collaborated with researchers with international backgrounds. In summer 2010, I traveled to Intel's Beijing Labs on an NSF International Research and Education in Engineering grant. For three months, I studied computer vision algorithms with my advisor, developing object recognition code for a proof of concept. Furthermore, my undergraduate research group was composed primarily of Chinese students and on a daily basis, I collaborated with these international researchers, often offering own communication insights when preparing English paper submissions. ?

Code I crafted at Quettra, Inc. was deployed on dozens of servers and filtered dozens of gigabytes a day from a large body of mobile devices. I developed the first iteration of the dynamically-configured server application monitoring system and sanity tests for our data collection servers. In my hobby time, I and collaborators from Carnegie Mellon developed a game, *King's Ascent*, and deployed it on major game portals. It received 70,000 hits, a spurt of player discussions and 4/5 stars on NewGrounds. I am eager to use the experience of designing and deploying applications for large audiences and server clusters to meaningfully distribute the results of my research through useful end-user applications in the future.

Future Goals. I gained an interest in human-computer interaction during undergraduate research in using pervasive technology to augment language learning and social sciences research. My continued interests in HCI and information retrieval manifest in my proposal to investigate how to improve the accessibility of helpful online educational resources for learners. The NSF Graduate Research Fellowship will allow me indepedence in pursuing these questions without reliance on my advisors for funding.

My next two years of research will begin to discover plausible ways to aid self-led learners to discover and reap the value of existing online learning resources. This is the first part of a larger set of questions that will last the length of my PhD study, if not longer, to identify challenges of accessing and productively using the vast amounts of learning material on the Web. Currently, I expect that my immediate post-doctoral plan will include applying these ideas in a commercial context to scale my findings to an audience that can benefit from them. Beyond this, I may find the most beneficial way to engage in this space either in academia or by working closely with a large-scale research organization.

References.

- [1] Andrew Head, Yi Xu, and Jingtao Wang. "ToneWars: Connecting Language Learners and Native Speakers through Collaborative Mobile Games". English. In: *Intelligent Tutoring Systems*. Ed. by Stefan Trausan-Matu et al. Vol. 8474. Lecture Notes in Computer Science. Springer International Publishing, 2014, pp. 368-377. ISBN: 978-3-319-07220-3. DOI: 10.1007/978-3-319-07221-0_46. URL: http://dx.doi.org/10.1007/978-3-319-07221-0_46.
- [2] P. Thiel. *Zero to One*. Random House Incorporated, 2014. ISBN: 9780553418286. URL: <http://books.google.com/books?id=BiC1ngEACAAJ>.

last sentence is quite vague.
even if you don't know the right
answer yet, you should show that
you have done some research/
thinking