"Satellite Image and Signal Processing with Cuis"

For the last 2 years, at Satellogic we needed to experiment with several Image and Signal Processing tasks. We needed to model and simulate the non-ideal behavior of image sensors and optical systems, including motion blur. We needed to process raw images, and experiment with deblur, coded exposure, automatic registration, resampling and HDR. Additionally we needed to do image compression, transmission over an unreliable low bitrate link, and decoding. Besides all these, we wanted to experiment with our own decoder for radio signals (SDR). For some of these tasks we used state of the art methods, and for others we had to develop new ones. Cuis Smalltalk proved to be an agile and flexible environment for these tasks, enabling both quick experiments and their growth into useful frameworks and applications.

26-Nov-2008 - Thoughts frome the time Squeak was stuck, and Cuis and Pharo were born

Let me tell you about the about how Cuis got started.

Squeak Central, the dream team led by Alan Kay and Dan Ingalls was formed to create Squeak. A few years later they went on to new adventures, and left Squeak in the hands of its community. It was almost too much. Nobody dared to change anything but small details. People though that the best they could do, the only thing they could do, was to be guardians of this heritage.

The Squeak community behaved like Europe in the Dark Ages. The Ancient Greek had been the highest point of the occidental civilization, and were considered the only authority and the source of all knowledge. Studying meant studying the classics, not looking at the world. Saying they were wrong about anything was unthinkable.

Things have changed a bit in the following years, but not a lot. The evolution of Squeak is still strongly limited because of keeping compatibility with ancient code.

I will now read to you some thoughts I wrote in 2008.

Stuck in the Dark Ages

We still venerate the Ancient Greeks. Essentially, because we could not yet attain such a clear vision of the world as they had. We are still prisoners of our own ignorance and the superstitions emanated from it.

Our challenge is to build Renaissance and Enlightenment. To lose fear. By means of study and work, to recover the classic knowledge, to put it in proper perspective, understanding the limitations of its time.

This also includes discarding things, such as antique religious and mythologic beliefs, knowledge we can replace with something better, and a folklore that is no longer ours. Not completely forgetting about them, but giving them their proper historic value. The theory of the four elements is not part of modern Chemistry. We need to free ourselves from this burden to be able to keep walking.

Unfortunately, path to modernity might require hyper specialization. An ever growing number of specialists that know about ever decreasing domains. And an army of historians, sociologists and epistemologists, not to understand the system, but just to understand the huge and heterogeneous society that is developing it.

Maybe the solution is (at least at the system kernel), not to try to go much beyond Renaissance, where dedicated and talented people tried to practice all the arts and sciences at once. This is not a new idea, it is Dan Ingalls' "Personal Mastery" principle, from "Design Patterns Behind Smalltalk". The Smalltalk kernel should be simple and small enough to fall within the reach of a single person.

So, where do we want to go with Cuis? Which is the logical evolution of Smalltalk-80 and Squeak?

Let me tell you about the origin of Smalltalk, and of the idea of Personal Computing:

The Dynabook ideal, imagined by Alan Kay in the late 60's and early 70's.

The Dynabook: A new kind of instrument, whose music is ideas

A computer can fruitfully process any kind of existing media. Computers are used by painters, musician, film makers, photographs, writers, etc, and they help them work more comfortably and be more productive.

The first person who realized this was Alan Kay, when he envisioned the Dynabook in the late 60's and early 70's. He also realized that this new media that encompasses all the previous ones, is also a meta media. This means that it allows us to define the behavior of the objects that the it can process, and it also means that it makes the creation of new kinds of media possible. And all this should be within the reach of anybody: There should not be a need for specialists to create the applications to make all this happen, although the system should be powerful enough to be useful to professional programmers too.

Building a Dynabook, or at least a first prototype of it, was the main objective of Alan's Learning Research Group at Xerox. Smalltalk-72 was the first experiment in building the software part of the Dynabook. It was also the last one, because it was the only one to be used for people who were not programmers (primary school students).

They found two kinds of problems: The system was hard to use for the kids, and it was also too limited for professionals. The following system, Smalltal-76, and all the later ones, were each time better for programmers, were never used by non-programmers. Instead, they were used to build environments that were friendlier but more limited, like Playground, Etoys and Scratch. These systems do not offer the whole power of Smalltalk. Building a real Dynabook became a dream for the future.

A Dynabook for programmers

I think that we programmers are a privileged kind. This is because the Dynabook does exist for us. Smalltalk-80 and its offspring are real Dynabooks, if the user is a Smalltalk programmer.

Smalltalk eases the activities we expect a Dynabook to be used for: It allows the design, simulation, experimentation and documentation of active knowledge.

The Cuis project explores the possibilities and reality of Smalltalk as a programmer's Dynabook: An universal processor of ideas and knowledge, that lets the user run any system of ideas and artistic expression he might want.

We want to keep walking the path Dan Ingalls showed us. The possibility of having a real Dynabook is too good not to follow it.

This is the main objective of Cuis, and the guide to many design decisions.

Cuis also wants to be a Dynabook for other people, not just me. So:

- Multiple platforms. Platform agnostic.
- Open source. MIT license.
- Free of patent issues. See www.defensivepublications.org
- Encourage and support a community of users and contributors

Please read

"Design principles behind Smalltalk"

Cuis @ Satellogic

At Satellogic my duties are:

- Explore problem spaces.
- Learn. Experiment. Implement to document what was learnt.
- Solve problems, answer questions.
- Develop frameworks and applications.

What could be better than a Dynabook for all this?

Cuis is the Dynabook I use. Now I'll tell you about some of the things I have done there.

Taking images of Earth from space

Low orbit: 400 km to 650 km Apparent ground speed about 7km/second

Motion blur!

(For the second part of my talk, I didn't use any slides)