

Invariants

Eric Blair

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This is about two technological revolutions that didn't happen, and aren't going to happen any time soon.

To some extent, this is also about a recent revolution in economics, where the study of how people interact has shown that there ain't nearly as much variation as we'd thought before: what we thought was wide variety is actually just a combination of invariants. More generally, it's a result of computational progress that has allowed us to pay more attention to distributions that are not in the Gaussian family (binomial, Normal, t, F, chi-squared) like the exponential, poisson, Zipf, &c.

The problem is that we humans have limits, and they have not in any way changed thanks to technology. The key limits are time and memory.

Who here bought R.E.M.'s Out of Time on vinyl or cassette?

The first result of these limits is the size of our comprehensible network. That is, how many people do I know well enough that I could hold a friendly conversation with them?

We can connect faster via cellular telephones, email, ntalk, or whatever point-and-talk technology has emerged since I wrote this, and so the time spent connecting is shorter, and we can cheaply connect to more distant people. But once the connection is made, we still have to resort to just talking or writing as before. This takes time, and the new toys don't speed this up at all.

Sure, you've got Friendster (or whatever the cool kids are using these days) allowing you to browse through photos of your pals, but back in the day, you had a paper address book, with scraps of everything hanging out of it, that let you do the same thing.

de Sola Pool and Kochen [1978/79] made various attempts at estimating the number of acquaintances that a person has, and found that folks generally have about 1,500 immediate acquaintances whom they will see over the next two months once or twice and say hi to, and then about 4,500 less direct acquaintances, like the people from college whom they'll only see every few years. Perhaps our online networks have sort of blurred the lines on the close-by acquaintances and distant acquaintances, but how many hundreds of your high school pals have emailed you lately?

But that's all scale: what about structure? Are our social hierarchies flatter and more egalitarian now that we've got the Net? Again, no. We still see the same sort of pattern we saw in last episode: a few people who are very

well connected and a lot of people who are minimally connected. The debate (about which I am no authority) is whether this is because some people have a higher capacity to maintain pals, due to more time dedicated to it or an innate name-and-face memory; or because of a rich-get-richer story that people find new pals via their old pals, so those who are well-networked will only wind up better-networked in the future. The true story is no doubt a bit of both.

Costly maintenance of links and costly search for new links have not changed for us humans. Generally, if you've got both of those characteristics, you're going to have a network that looks like standard social networks, and if those limits are set by the human brain and our 24 hour day, then the scale of those networks is set.

Content

Moving on from social networks, the second limit is in what we can produce. If you spent every minute of the next year typing away at your keyboard, your computer's hard drive would barely notice it all. [1 word= about 6 bytes. Given 60 words per minute times 1440 minutes per day = 518,400 bytes/day; in a year that's 180MB.] For most of us, everything we ever wrote would easily fit onto a single CD. That is, the technology of text processing has blown past the human ability to produce text.

For music and still pictures, we're in about the same place. The roadblock is not in storage and transmission, but in the process of finding artistic inspiration and the time and skill needed to execute it. Moving pictures are not far behind, and twenty years from now, downloading a movie won't take a moment's thought by anybody. Nobody will worry about the price of film stock, but the process of writing and producing a movie will still be a massive effort.

On the consumption side, it still takes 70 minutes to listen to Beethoven's Ninth, though you no longer have to get up and flip the disc in the middle. It still takes 90 minutes to watch a ninety-minute movie. The articles that I have on my hard drive in the 'read any day now' pile has certainly grown, but the 'articles I've read' pile grows at the slow, steady pace it always has, and the 'articles I remember reading' pile continues to wither.

So scale is again set. As for structure, we find that there is again the same power-law type distribution in consumption. If we plot sales and Amazon sales rank on a log-log scale, we find that it's linear. In other words, the top ten best-selling books sell ten times as much as the bottom of the top 100, and those sell ten times as many as the bottom of the top 1,000, and so on down into the millions. [Below the top sellers, by the way, the ranking is basically the order of last sale, by the way.] That is, content is another power law, and that structure doesn't change with onlineness: before millions of blogs only read by three people, there were 'zines only read by three people, and before that, letters.

So the distribution of book popularity happens to match the distribution of people popularity, which is no surprise, because the same two problems—costly search and costly linking/consumption—are an issue in both cases.

Policy implications

We are all more-or-less as networked as we're going to be by maybe age sixteen [socially; sexual networks follow different patterns from social networks, and tend to take more of a rich-get-richer form.[Lijeros et al., 2001]]. When you meet somebody new, they're crowding out somebody else, as time spent cultivating your new pal is not time spent cultivating the old. The same works for entire networks: just as advertisers must compete for your few dollars, networks must compete for your limited networking resources. Similarly, having a wealth of new content available just means that we have a wealth of things that we'll never read because they're crowded out by the other things we're reading.

I don't mean to say that the Web as a whole is a stagnant waste or that our information processing abilities are irrelevant. But with regards to certain basic human desires, we arrived about fifteen years ago when everybody got a PC, and everything since then has just been adding more features, giving you one more place where you can start a blog and one more list of contacts to keep synced.

References

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- Fredrik Lijeros, Christofer R Edling, Lus A Nunes Amaral, H Eugene Stanley, and Yvonne Åberg. The web of human sexual contacts. *Nature*, 411, 2001.