Recurse

Andrew Poelstra

2010-03-27

The chicken-and-egg problem is a strange question for humans to try to comprehend. Even if one ignores the fact that both chickens and eggs predate people by a significant margin, and the fact that animals laid eggs long before chickens came to be — which is the answer, by the way, and really quite obvious — there is still the matter of comprehending the sheer magnitude of time inherent in the question.

Something that most everybody notices at some point or another is the phenomenon that the passage of time seems to compress as we move into the future. Yesterday and today are sharply defined and distinct from one another, and yet in a decade or two, it will in all likelihood be impossible to determine the exact year today's events occurred, let alone the day. And if we move further than a few decades — say, from the time when chickens and eggs were first invented – to today, the suggestion that one might have come first is absurd.

If it were possible to graph the passage of time, in numbers and dates, against our perception of the passage of time, it would probably look like a half circle. At the top, we sit, nearly horizontal, seeing time march along at pretty well the correct rate, and to either side, past or future, events start to slip and blur together. Things happen all at once or out of order, not at all or far away. And somehow, life goes on.

The track shifted and the train gave a small lurch, interrupting J's thoughts. His face is pressed on the window (yeech!) and he had apparently been asleep, or nearly so. Outside, he can see that his stop only a minute away. When he reaches to pick up his backpack, he has a sudden premonition: *The train is going to crash.* It's an insane thought and he knows it, but he knows just as surely that it's true.

He stands up quickly, rattled, and tries to move into the aisle to get off. Beside him is an old man, who was also asleep. The man wakes up when J brushes past him, and looks up into the boy's eyes. He smiles warmly, almost laughing. "It'll be fine," he says, as though reading the boy's thoughts. J just smiles back, and gets off the train.

Below that half-circle of time is probably another half-circle, J decides. Because for the most part, the universe likes symmetry. But he isn't sure what the implications of that are. Maybe at the end of time everything restarts. Or maybe it's not a circle, but a spiral, and time will just seem to restart, until one day it doesn't. And of course, that could mean that there was another one of him sitting there on the train — just above and below him, in a strange mathematical sort of way — on different parts of

the spiral.

J looks upward, as though he could see into that imaginary dimension, and of course he can't. Above him, there are a few small clouds floating in the sunset-red sky. A gust of wind blows by, harshly cold on his face, and he looks back down. It's getting late, and he needs to get home. Thought experiments are dangerous in the nighttime. Besides, he has homework to do.

As he does his homework, the hockey game sounds quietly through the radio. It isn't interrupted by any reports of train crashes — and J even makes a point of tuning into the news during the intermissions — so he lays those thoughts to rest. Probably just one of those feelings you get when tired and alone on public transit. His half-circles and time spirals, too, are undoubtedly just the whims of a tired mind.

But then, J thinks, circular time has a strange sense of mathematical beauty to it. Einstein had thought so too, actually, because if you try to graph a circle with a calculator, you use the function $y = \sqrt{1 - x^2}$. And if you replace x with your speed — as a percentage of the speed of light, naturally — you get a funny-looking number called a *Lorentz factor*. In Relativity 101, regular space and time coordinates (the ones with which cubes are cubes and time moves forward) are divided by Lorentz factors, and you end up with relativistic coordinates (with with neither of those things are true). Relativity 101 has a term for that act of division, too: a Lorentz transformation.

A *Lorentz transformation* is a big phrase that simply means that things that look like lines, are probably actually circles.

Now having spent three hours convincing himself that the earth is round, J decides that it's probably time to get some rest.

The next day the train crashes, of course. J is not on it, but it wouldn't have mattered if he was. Nobody was hurt, as it turns out. After the initial shock stories filtered through the media, the truth came out and turned out to be remarkably boring. The old man had had himself a heart attack, which prompted somebody to hit the emergency button just as they were leaving. The next train, though driving much too fast, was slow to get the message an didn't quite stop in time. So the trains bumped into each other and that was that.

After the paramedics confirmed that everyone was okay, save for a few bumps and scratches (and the old man, who was quite definitely dead), the trains resumed service and everything was normal again.

J reads about this on his laptop. The article doesn't have a very good picture, but J can see enough to tell that the heart-attack man was the same one that he had talked to yesterday. The one who had laughed and said everything would be okay. The one with those eyes that had seemed so strongly to be able to tell the future.

Something about this situation bothers him very deeply, but he can't put his finger on it. He wants to think it was merely a close call that left him rattled — after all, he had been on the train just an hour before the crash — but he knows that it's something else. Something about that old man and his knowing eyes had unsettled him even before he had died.

The next day J is on the train again. Well, it's not really the next day, J thinks. After all, the man is there, sitting right where he was yesterday, sound asleep. Of course, he died yesterday, so this must be a dream. Nonetheless, J sits down and closes his eyes. He has work to do for a programming class, and dream or not, he is going to get it done.

Lisp is a strange language. Nowadays most programming languages look pretty much the same: `LET A = B` and so on until the computer is doing what you want, or failing that, smashed into pieces and left on the floor. But Lisp is a sport. Everything is built out of parentheses and spaces, and there isn't really much to remember beyond that. The little things seem more difficult than they should be, but J likes it. The Big Things are easy.

Two weeks into the course J has figured out the basics. There are two kinds of procedures in Lisp; functions, which shuffle data around, and macros, which shuffle code around. And on a pretty fundamental level, they're actually the same thing. Because in Lisp, code and data are the same thing. That's a much stranger idea than it sounds at first, but that's okay. Once you understand it, everything makes sense. Or nothing does, depending how you look at it.

The old man wakes up and makes a small grunting noise. J turns to look at him, and raises his eyebrows expectantly. The old man smiles, and opens his mouth as if to speak. He takes a few seconds, but finally does. "You need to use recursion."

J looks to his notepad. The man is right. His equation solver is a mess of complexity trying to deal with entire equations, but it doesn't need to. It just needs to do the easy parts, then restart itself with what's left. Math equations are nice like that: if you keep doing the easy parts, eventually it's all just easy parts. Often programs restart themselves like that. It's usually simpler that way, in the end.

After scribbling a few things down, J turns back to the old man to thank him. His eyes are closed again, though. He's undoubtedly sleeping. Five seconds later, though, he starts to talk again without opening his eyes. "Life is a lot like Lisp, y'know," he starts, and J chuckles. If these are his dreams, he needs to get away from school for a while. "When you get right down do it, life is a just recursive function."

"Then what are dreams?" J asks, not expecting a sensible answer.

"Dreams are the macros."

The implications of that are probably staggering, but J isn't interested in philosophy right now. He just wants the damn program to work. And thanks to a tip from a dead man on a dream train — which now that he looks outside, has been going in circles the whole time — he might have it working today. If he remembers when it's time to wake up, that is.

Usually thoughts like that signal the end of a lucid dream, but not this time. The train and the man, the papers and code are still there in front of J, as real as they'll ever be. This makes him feel a little nervous, though he doesn't understand why. In all likelihood, he won't ever understand, either. But the time he's awake to consider it, the dream will be forgotten. *C'est la vie, je suppose.*

"Why did I die?" the old man asks.

"Because you were old." J replies absent-mindedly.

"Ah," the old man says, and nods as if to accept this answer. Then: "but she's not old, is she?"

J looks up. The man is looking pointedly at a young woman, probably around J's age. She has blonde hair and blue eyes, hidden behind her glasses. She's shorter than average, but certainly not old. J doesn't know what the old man is getting at. "No," he agrees, and turns back to his paper.

"She could have died when the train crashed."

"It wasn't a real crash," J answered. "The cars just bumped a little."

The old man ignored him. "If *my* age could cause *her* to die, that blows a hole in your little causality theory, doesn't it?"

J doesn't think so. What he says is, "life's a macro, isn't it?"

"No," the old man replies, annoyed. "Life is a function. *Dreams* are the macros. That's why I'm alive here, even though in real life we're past that part of the list. You're still not thinking in Lisp."

J is pretty damn sure he *is* thinking in Lisp. But it's hard to concentrate in this dream world. Colors and shapes are shifting strangely, and the clock on the train can't seem to count. He tells the man all these things, but he's

asleep again. A minute later he opens his eyes again, looking exasperated. "Follow me," he says impatiently, and goes back to sleep.

It takes a moment for J to decide what this means, then he follows suit. He closes his eyes and an instant later the two of them are together in a different dream. This one is simpler. The train is still there, humming along and shaking gently, but there is nobody there except J and the man. The man's seat is shaped bizarrely like a chicken. J's seat is an egg.

"Do you want to see a trick?" the man asks. He doesn't wait for an answer. "Turn your chair inside out."

Sure enough, the egg-shaped train seat turns out to have a zipper. J stands up and unzips it. Whatever was giving the chair structure is both there and not there at the same time: inverting it is easy to do, and yet it never loses its shape. Inside-out, the egg chair turns out to be the chicken chair. J sits down, half-expecting the old man to now be in the egg chair.

This is partially correct. Sure enough, the other chair is now an egg, but the man inside it is J. Looking down, J finds that he has become the old man. Maybe he always *was* the old man. Ideas like that only come in dreams, J thinks, and smiles. Smiling is harder than he expects, and he touches his mouth in surprise. His skin feels dry and heavy, and remembers how old he has become. The realization hits him like a ton of bricks and makes him feel dizzy. He closes his eyes to make the world stop spinning, then opens them again. Suddenly he feels fine.

He, or rather, the young version of himself in the chicken-shaped chair, turns to J. "Show me another trick," he asks. J has no clue what this means.

J wakes up, afraid. His face is pressed on the window (yeech!) and he had apparently been asleep, or nearly so. His stop is only five seconds away. He stands up in a panic and the old man beside him smiles. "It'll be okay, you know." J looks at him and smiles back.

J wakes up, afraid. His face is pressed on the window (yeech!) and he had apparently been asleep, or nearly so. His stop is only five seconds away. He stands up in a panic and the old man beside him smiles. "It'll be okay, you know." J looks at him and smiles back.

J wakes up, afraid. His face is pressed on the window (yeech!) and he had apparently been asleep, or nearly so. His stop is only five seconds away. He stands up in a panic and the old man beside him smiles. "It'll be okay, you know." J looks at him to smile back, but he is already asleep.