The role of compatibility in the diffusion of technologies through social networks

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Hari pointed out that it is important to be aware of the differences between different situations of diffusion on networks. For example, when comparing the spread of disease with the diffusion of technology in the paper of the day, it is important to note that the adoption model is different because in the case of disease, the nodes do not have any agency. On the other hand, the spread of rumor differs from the paper because people gain utility when they spread rumor but the cost of spreading rumor is typically low. Finally, looking at the model for the diffusion of technology in a chimpanzee social network the question was raised about if it was possible to invalidate links. That is, could a chimpanzee have learned to come up with the new sponge technology on their own instead of learning it from its neighbors?

An important point that came up when discussing the characterization of blocking structures is interpreting the meaning of the definition of blocking structures in the paper. For example, $qd_{SB}(v) > r\Delta$ means that the payoff of talking to B users ($qd_{SB}(v)$) is greater than the cost of bilingualism($r\Delta$). This also ties in with the idea from the Morris paper that tightly knit structures are barriers to diffusion in the case without bilingualism.

Professor started the discussion of bilingualism in the real world, narrowing from the bilingual behaviors to the specific discussion on languages. Professor asked why some people are willing to spend the additional cost on the ability to maintain more than one language? What is the cost r of being bilingual? And when people are willing to be bilingual?

I used some examples I saw to answer the question. Some kids whose parents are non-native English speakers are often bilingual. Their parents speak their native languages at home while kids speak English outside the home. But it’s not enough. These kids are prone to be proficient in English but not in their parents’ native languages. I know some of the parents paid some tutoring center after school to intensively teach their kids their native languages. The kids also have additional homework from language school in addition to their normal schoolwork. I think these costs are representations of r of being bilingual. For the question of when people are willing to be bilingual, let’s say communication e between two people (v, w). The payoff of communication is p or 1-p, and the cost per pair is r/(number of communication edges n language A or B). The gain of one communication edge is p-r/((number of communication edges n language A) or (1-p)-r/((number of communication edges n language B). It’s natural to see that people are willing to be bilingual because they have many friends speaking language A and many friends speaking B. It is rational to be bilingual to gain the max social payoff.

We also discussed the characterization of equilibrium properties of conta-gion games. First, the outcome of a game is unique and immune to the sequence of moves. In other words, since in this paper the adoption of technology only depends on the payoff of Technology A, B, and AB, the game finally must converge to a unique optimal result. Under this condition, some networks may have blocking structures that make the epidemic of Technology A impossible. Specifically, no nodes in the network where people use both Technology A and B will switch to only Technology A because the payoff of using single A is less than using both A and B for each node, and at the same time, no nodes in the network where people only use B will switch to only A or both A and B because the payoff of using only B is larger than the payoffs in other two situations. In this case, the diffusion of Technology A stops.