Social Learning Strategies: Who you learn from affects how new behaviours are discovered

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Previous research has shown that with the use of social learning, individuals are able to discover more complex behaviours that are not accessible via incremental genetic evolution alone (Borg et al., 2011). In this work, and many other simulation models that explore social learning and culture, social learning itself is often limited. These limitations are often centred around who individuals learn from, or the social learning strategies employed. Here we report on new work which investigates a variety of teacher-learner social learning strategies (Jolley et al., 2016), inspired by the 'who' learning strategies discussed by Laland (2004). It is often the case that teachers in teacher-learner social learning models are restricted to one type of agent, be it a parent or some fit individual; here we broaden this exploration to include a variety of teachers to investigate whether these social learning strategies are also able to demonstrate access to, and maintenance of, behaviours inaccessible to incremental genetic evolution. In this work new agents learn from either a parent, the fittest individual, the oldest individual, a random individual or another young agent. Agents are tasked with solving an advanced river crossing task in which agents are expected to solve five increasingly difficult maps, with new agents learning from a teacher in mock evaluations. The behaviour necessary to successfully complete the most difficult version of the task (map 5) has been shown to be inaccessible to incremental genetic evolution alone, but achievable using a combination of social learning and noise in the Genotype-Phenotype map (Borg et al., 2011). Here we show that this result is robust in all of the teacher-learner social learning strategies explored here. Of particular interest is how these social learning strategies differ when discovering the behaviours available to them. We show here that despite all social learning strategies being able to discover the behaviours necessary to solve all maps, the details on how these new behaviours are discovered vary between social learning strategies. In Tab. 1 we can see that different strategies achieve simpler maps with differing probabilities; the suggestion here is that the behaviour required to solve earlier maps (maps 2-4) is imperfectly learnt to differing degrees by different strategies, with the more complex behaviour required to solve map 5 being discovered and maintained with differing probabilities by different learning strategies. Jolley et al. (2016) goes on to suggest that these effects, and differences in how quickly these behaviours are adopted by populations using different social learning strategies, are a result of the differing levels of conformity associated with each learning strategy, with more conformist strategies struggling to break away from potentially sub-optimal behaviours but providing advantages in the adoption of new behaviours when they are discovered.

Map	BP	Fittest	Oldest	Random	Youngest
None	1%	1%	1%	1%	1%
1	28%	31%	45%	25%	36%
2	24%	21%	17%	20%	16%
3	8%	1%	3%	5%	9%
4	31%	31%	29%	39%	31%
5	8%	15%	5%	10%	7%

Table 1: % of populations achieving each map as their maximum achievement for each social learning strategy. (BP = Best Parent)

References

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