Primate behavior explained by computer 'agents'

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The complex behaviour of primates can be understood using artificially-intelligent computer ‘agents’ that mimic their actions, shows new research published in a special edition of *Philosophical Transactions of the Royal Society B* and presented at the BA Festival of Science in York.

Scientists using agents programmed with simple instructions to work out why some primate groups are ‘despotic’ whilst others are ‘egalitarian’ - overturning previous theories developed by primatologists.

They have also found support for an existing theory of how dominant macaques make it to the safer positions at the middle of their troop without seeming to be pre-occupied with getting there.

Using agents programmed with two rules – stay in a group for safety and pester subordinates until they move away – scientists found that their more dominant agents would make their way to the centre of the group.

This desire to stay in a group and pick on subordinates could be an evolutionary mechanism that helps protect the more dominant and successful individuals in a group, they suggest.

“This kind of agent-based modelling is really a new way of doing science,” said Dr Joanna Bryson from the University of Bath who led the study and is one of the editors of the Philosophical Transactions special edition.

“Previously scientists have been limited to trying to understand animal behaviour by making observations and then developing theories that fit.

“Now we can test these theories using agents to give us a better understanding of complex behaviours.

“This work shows that agent models are an ordinary part of scientific theory building. We confirmed and extended previous work on spatial location of dominant animals, while showing where some theories got it wrong – in this case a theory put forward for why macaques form either despotic or egalitarian troops.”

Whilst there is no hierarchical structure in egalitarian groups there tends to be more fighting, although it is less violent, than in despotic groups.

Primatologists noticed that egalitarian groups tend to spend more time preening and hugging each other after fighting, leading them to speculate that the two different types of society evolved following the development of some groups’ ability to ‘reconcile’.

“Agent-based modelling techniques let us invent and remove behaviours to test the explanations of what we see in nature,” said Dr Bryson, from the University’s Department of Computer Science.

“Using modelling you can vary the external environmental factors to see if they have any effect on behaviour. You can do this for many generations in a few hours and see whether new behaviour is adaptive.”

More recent work by Dr Bryson and graduate student Hagen Lehmann has shown a new explanation for the theory they had previously overturned.

“By changing the amount of space between troop members, you can

create models of despotic and egalitarian groups of agents," said Dr Bryson.

"Then you can show that the despotic agents do better in the conditions we find despotic macaques in the wild. The same holds for egalitarian macaques

"The violence and lack of reconciliation in despotic groups comes down to the fact that they don't like living on top of each other.

"This creates more space for the troop so they can find more food.

"But by hugging and making up after fights, the egalitarians spend more time close to each other. This makes them safer in environments where there are predators.

"This is a simple explanation for what we see in the wild, and it explains why some groups have a different range of behaviours than another."

Source: University of Bath