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An evolutionary approach to epidemics

September 9 2014

An evolutionary analysis of public health data during a major disease outbreak, such as bird flu, *E. coli* contamination of food or the current Ebola outbreak could help the emergency services plan their response and contain the disease more effectively. Details are reported in the *International Journal of Innovative Computing and Applications*.

Dehai Liu of the Dongbei University of Finance and Economics, in Dalian, Liaoning, China, and colleagues have used evolutionary game theory to examine the data associated with a major public health event - the emergence of a new pandemic virus. The team explains that the characteristics of disease outbreaks in the modern world have shifted since the advent of high-speed air travel. Moreover, increased population density and changes in economics have meant that the progress of an epidemic will not necessarily follow the course nor move at the speed of historical "plagues" even up to the global influenza outbreaks of the twentieth century.

Evolutionary game theory is a mathematical tool that allows researchers to simulate various scenarios and predict outcomes. It essentially applies Darwinian selection to the contests, strategies, and analytics that various "actors" in the scenario might be involved. The Chinese team has now applied this approach to understanding the spread of disease and demonstrated that there are four main outcomes one might see with a pandemic in today's world all affected by the government response to the outbreak, the provision of healthcare, the isolation of patients and availability of treatments of the given disease.

Their approach tested on actual data from the 2009 outbreak of influenza A (H1N1) accords with a scenario involving active prevention and control, which led to limited casualties of the epidemic. The ongoing analysis of data associated with the current outbreak of Ebola might be exploited to ensure quarantine and control measures are put in place effectively to prevent widespread deaths from this lethal disease and likewise with future emergent pathogens.

More information: Liu, D., Chen, J., Chai, R. and Wang, W. (2014) 'Evolutionary analysis of important public health event-based multi-agent simulation model', *Int. J. Innovative Computing and Applications*, Vol. 6, No. 1, pp.33