Universal features of dynamic small-world networks
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dynamic small-world contact network, an individual has fixed short range links within
its local neighborhood and time-varying stochastic long range links outside of that
neighborhood. The probability of a long range link occurring (p, in analogy with
the standard small-world rewiring parameter) is a measure of the mobility of the
population. In this study we investigate the epidemic to non-epidemic phase tran-
sition that occurs in a susceptible-infected-recovered (SIR) disease spreading model
located on this type of dynamic network. We first derive the finite-valued critical
mobility $p_c$ and find excellent agreement with numerical simulations. Close to $p_c$
the outbreak size scales as $(p-p_c)\beta$ since it is a continuous transition; we find that
$\beta$ is near 2, but varies as a function of the infectivity and recovery rates. At the
critical point our study shows that the distribution of outbreak sizes scales as $\sim N^{-\alpha}$
with $\alpha = 1.5\pm0.03$. We compare these critical exponents to those found in
related small-world and dynamic small-world networks and comment on potential
universality.

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Date submitted: 12 Nov 2010