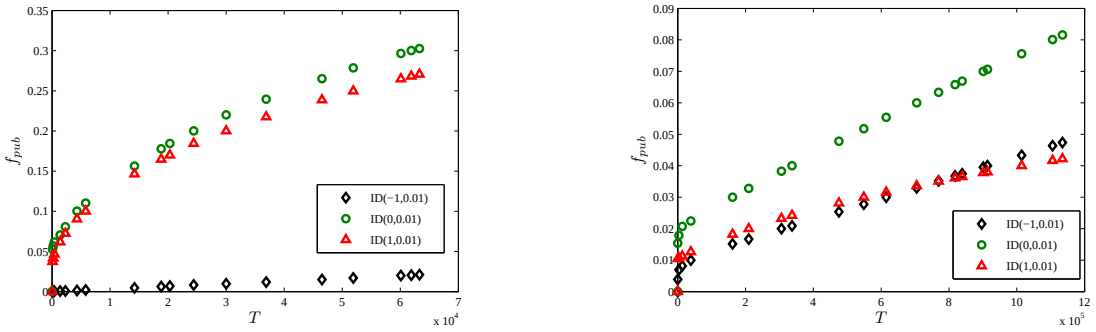
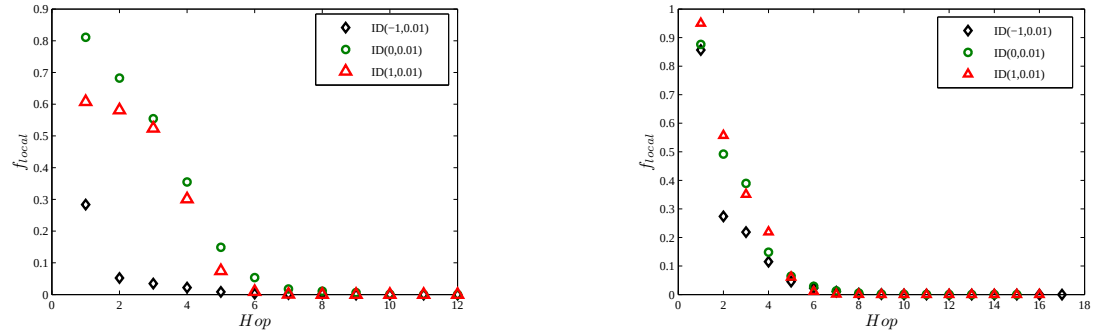


(a) `Facebook` (b) `YouTube`

FIG. 4: (Color online) The dynamics of f_{pub} during the process of the diffusion. We perform the experiments for each pair of α and β 20 times and return the mean value as the final result.



(a) `Facebook` (b) `YouTube`

FIG. 5: (Color online) The dynamics of f_{local} during the information propagation far away from the source. We perform each experiment 20 times and get the mean value as the final result.

in the network.

VI. SUMMARY

Online social sites have become one of the most popular Web 2.0 applications in the Internet. As a new social media, the core feature of online social networks is the information diffusion. We investigate the coupled dynamics of the structure and the information diffusion in the view of weak ties. Different from the recent work [25], we do not focus on the trace collection and analysis of the real data flowing in the network. Instead, inspired by [19], we propose a model for online social networks and take a closer look at the role of weak ties in the diffusion.

We find that the phase transition found in the mobile communication network exists pervasively in online social networks, which means that the weak ties play a special role in the network structure. Then we propose a new model $ID(\alpha, \beta)$, which associates the strength of ties with the diffusion, to simulate how the information spreads in online social networks. Contrary to our expectation, selecting weak ties preferentially to republish cannot facilitate the information diffusion in the network, while the random selection can. Through extra analysis and experiments, we find that when $\alpha = -1$, the nodes with lower degrees are preferentially selected for republishing, which will limit the scope of the distribution of republishing nodes in the following rounds. However, even for the random selection case, removal of the weak tie can make the coverage of the information decreases sharply, which is consistent with its special role in the structure.

So we conclude that weak ties play a subtle role in the information diffusion in online social networks. On one hand, they play a role of bridges, which connect isolated communities and break through the trapping of information in local areas. On the other hand, selecting weak ties preferentially to republish cannot make the information diffuse faster in the network. For potential applications, we think that the weak ties might be of use in the control of the virus spread and the private information diffusion.