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Instant-Messengers Really Are About Six Degrees from Kevin Bacon; Big Microsoft Study Supports Small World Theory

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Author: Peter Whoriskey - Washington Post Staff Writer

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Turns out, it is a small world.

The "small world theory," embodied in the old saw that there are just "six degrees of separation" between any two strangers on Earth, has been largely corroborated by a massive study of electronic communication.

With records of 30 billion electronic conversations among 180 million people from around the world, researchers have concluded that any two people on average are distanced by just 6.6 degrees of separation, meaning that they could be linked by a string of seven or fewer acquaintances.

The database covered all of the Microsoft Messenger instant-messaging network in June 2006, or roughly half the world's instant-messaging traffic at that time, researchers said.

"To me, it was pretty shocking. What we're seeing suggests there may be a social connectivity constant for humanity," said Eric Horvitz, a Microsoft researcher who conducted the study with colleague Jure Leskovec. "People have had this suspicion that we are really close. But we are showing on a very large scale that this idea goes beyond folklore."

In recent years, the massive databases yielded by cell phone records have been exploited by researchers to better understand human movements and social networks. Stripped of text messages and personally identifiable information, the records indicate users' location and patterns of contact.

The Microsoft research focused on the popular concept that has inspired games such as Six Degrees of Kevin Bacon and a well-known play by John Guare. A "degree of separation" is a measure of social distance between people. You are one degree away from everyone you know, two degrees away from everyone they know, and so on.

But proof of the theory has been thin.

Its origins lie in the work done in the '60s by Stanley Milgram and Jeffrey Travers. In an oft-cited 1969 work, they put the figure at 6.2, though they never referred to it as "degrees of separation."

Their finding was based on asking 296 people in Nebraska and Boston to send a letter through acquaintances to a Boston stockbroker.

The subjects were told to send the letter to an acquaintance who could best advance the letter to the target, but most failed: Only 64 of the original 296 letters reached the stockbroker. Of those letter chains that were complete, the average number of degrees of separation was 6.2. The high failure rate, and the possibility that the incomplete chains reflected much more distant relationships, led some to question the results. Also, all of the subjects were in the United States. What would happen if the test was expanded to the planet?

The idea was taken up again, this time on a global scale, by Columbia University researchers in a 2003 report of an e-mail experiment. More than 24,163 volunteers agreed to try to send an e-mail through acquaintances to one of 18 target persons in 13 countries. Only 384 of those 24,163 letter chains were completed. Of those completed chains, the average number of steps was 4, and using statistical techniques, the researchers estimated that the average length in all of the chains was between five and seven steps. Still, it was an estimate.

The Microsoft Messenger project, which was presented at a technical conference in Beijing in April, went further.

"To our knowledge, this is the first time a planetary-scale social network has been available to validate the well-known '6 degrees of separation' finding by Travers and Milgram," the researchers said.

For the purposes of their experiment, two people were considered to be acquaintances if they had sent one another a text message. The researchers looked at the minimum chain lengths it would take to connect 180 billion different pairs of users in the database. They found that the average length was 6.6 steps and that 78 percent of the pairs could be connected in seven hops or less.

Some pairs, however, were separated by as many as 29 hops.

"Via the lens provided on the world by Messenger, we find that there are about '7 degrees of separation' among people," they wrote.

Microsoft Messenger use is most intense in North America, Europe and Japan, and in the coastal regions of the rest of the world. While the study sample is huge, there is little way of knowing whether Microsoft Messenger users are as socially connected as the rest of humanity.

Why does it matter that people from around the world are closely tied together? Researchers said that the knowledge might have applications for political organizations, charity efforts, natural disaster relief and missing-person searches.

"They could create large meshes of people who could be mobilized with the touch of a return key," Horvitz said.

It also means that, strictly speaking, six degrees of separation might be just a bit off. It's closer to seven, at least in their study.

"For a piece of folklore, it wasn't bad," said Duncan J. Watts, one of the Columbia researchers, now at Yahoo Research. "It was off only in its detail."