Proof! Just six degrees of separation between us

After checking 30 billion electronic messages, Microsoft researchers say the theory stands up

- David Smith, technology correspondent
- The Observer,
- Sunday August 3 2008

In a world of 6.6 billion people, it does seem hard to believe. The theory of six degrees of separation contends that, because we are all linked by chains of acquaintance, you are just six introductions away from any other person on the planet.

But yesterday researchers announced the theory was right - nearly. By studying billions of electronic messages, they worked out that any two strangers are, on average, distanced by precisely 6.6 degrees of separation. In other words, putting fractions to one side, you are linked by a string of seven or fewer acquaintances to Madonna, the Dalai Lama and the Queen. The news will come as no surprise to film buffs who for years have been playing the parlour game Six Degrees of Kevin Bacon, in which they link other actors to Bacon in six films or fewer.

Researchers at Microsoft studied records of 30 billion electronic conversations among 180 million people in various countries, according to the Washington Post. This was 'the first time a planetary-scale social network has been available,' they observed. The database covered all the Microsoft Messenger instant-messaging network in June 2006, equivalent to roughly half the world's instant-messaging traffic at that time.

Eric Horvitz and fellow researcher Jure Leskovec considered two people to be acquaintances if they had sent one another a message. They 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 hops, and that 78 per cent of the pairs could be connected in seven steps or fewer. But some were separated by as many as 29 steps.

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

Horvitz told the Post: 'To me, it was pretty shocking. What we're seeing suggests there may be a social connectivity constant for humanity. 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.'

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. The concept was popularised by John Guare's 1990 play, Six Degrees of Separation, which was turned into a film starring Will Smith, Stockard Channing, Donald Sutherland and Ian McKellen. One of the

characters says: 'I read somewhere that everybody on this planet is separated by only six other people. Six degrees of separation between us and everyone else on this planet. The President of the United States, a gondolier in Venice, just fill in the names. I find it extremely comforting that we're so close. I also find it like Chinese water torture, that we're so close because you have to find the right six people to make the right connection ... I am bound, you are bound, to everyone on this planet by a trail of six people.'

Then in 1994 students at Pennsylvania's Albright College invented the game Six Degrees of Kevin Bacon, in which the challenge was to connect every film actor to Bacon in six cast lists or fewer. Bacon thought the joke would die out, but when it didn't he launched a website, sixdegrees.org, bringing together people interested in helping good causes. He said: 'I thought it was definitely going to go the way of eight-track cassettes and pet rocks. But it's a concept that has sort of hung around in the zeitgeist.'

Attempts to prove the theory stretch back further and keep coming up with six or thereabouts. In a 1969 study, researchers Stanley Milgram and Jeffrey Travers asked 296 people in Nebraska and Boston to send a letter through acquaintances to a Boston stockbroker. Only 64 of the letters reached the stockbroker. Of those letter chains that were complete, the average number of degrees of separation was 6.2.

In 2003 researchers at Columbia University in New York experimented using the internet as the ultimate laboratory of the connected world. More than 24,000 volunteers tried to send an email via acquaintances to one of 18 target people in 13 countries, including a police officer in Australia, a vet in the Norwegian army and a professor at an Ivy League university in America. Only 384 of the chains were completed, using an average of four steps. But the researchers estimated the average length in all the chains was between five and seven steps. Facebook, the online social network, has a 'six degrees' application to test the theory through the connections of Facebook users. That may reduce a degree or two: Barack Obama already has well over a million Facebook friends.

http://www.guardian.co.uk/technology/2008/aug/03/internet.email

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Instant-Messagers Really Are About Six Degrees from Kevin Bacon

Big Microsoft Study Supports Small World Theory

By Peter Whoriskey
Washington Post Staff Writer
Saturday, August 2, 2008; A01

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."

http://www.washingtonpost.com/wp-dyn/content/article/2008/08/01/AR2008080103718_pf.html