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Another look at Small Worlds: one node set – two link structures

The Hungarian writer Frigyes Karinthy proposed already in 1929 the idea that any two persons on the planet can be connected through a chain of at most five intermediaries (Karinthy, 1929; Braun, 2004). This idea, known as the Small World phenomenon, has been taken up independently by Milgram (1967) who performed his famous letters experiment from Wichita, Kansas to Cambridge, Massachusetts. Technical details of his experiments are provided in (Travers & Milgram, 1969). More recently Duncan Watts and Steven Strogatz (1998) contributed to the popularisation of the term, sparking a broad interest among many scientists from various fields. Closer to the field of informetrics the contributions of Ithiel de Sola Pool and Manfred Kochen should be mentioned (de Sola Pool & Kochen, 1978; Kochen, 1989).

I would like to make the following observation. It was considered a 'surprise' that two persons, living very far away from each other could be joined by a short chain of acquaintances. I think some kind of mix-up has occurred leading to the so-called surprise. In a 'neighbour' network persons who live a long distance from each other need a lot of links before they are joined by a shortest path. However, an 'acquaintance' network is a different network, so it seems to me that the experiment took place in the acquaintance network and the surprise in the neighbour network. This mix-up occurred probably for the simple reason that most neighbours are also acquaintances.

As a mathematician this observation would lead me to the study of graphs (networks) with the same node sets but with different link sets. Has anyone studied Small Worlds in this framework? Or has anyone studied such graphs, and if so, have the results been applied to Small Worlds?

Possible applications in the field of webometrics are paramount (Björneborn, 2004).

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