Rainbow Connection Number Two and Clique Number

Arnfried Kemnitz*, Philipp Krause, Techn. Univ. Braunschweig, Germany; Ingo Schiermeyer, Techn. Univ. Bergakademie Freiberg, Germany

An edge-colored connected graph $G$ is called rainbow connected if each two vertices are connected by a path whose edges have different colors. Note that the edge coloring need not be proper. If such a coloring uses $k$ colors then $G$ is called $k$-rainbow connected. The rainbow connection number of $G$, denoted by $rc(G)$, is the minimum $k$ such that $G$ is $k$-rainbow connected.

Some obvious properties of the rainbow connection number of connected graphs $G$ of order $n$ and diameter $diam(G)$ are
1. $1 \leq rc(G) \leq n - 1$,
2. $rc(G) \geq diam(G)$,
3. $rc(G) = 1$ if and only if $G$ is complete,
4. $rc(G) = n - 1$ if and only if $G$ is a tree.

In general, it is not an easy task to determine the rainbow connection number of a given graph. In fact, it is already NP-complete to decide whether $rc(G) = 2$.

In this talk we determine all graphs $G$ with rainbow connection number $rc(G) = 2$ and clique number $n - 4 \leq \omega(G) \leq n - 1$.

Keywords: edge coloring; rainbow connection; clique number