Dynamic Graphs; Connectivity, Flows, and Coloring

The aim of the project is to study fundamental properties of networks evolving in time, called *dynamic graphs*. In many real life situations, nodes and links of a network appear and disappear in time. It is therefore important to have an effective way of controlling basic properties of such a dynamic network.

In the project we focus on dynamic variants of three basic graph theoretic concepts: *connectivity*, *flows*, and *colorings*. Our aim is to obtain a substantial progress in several key computational problems in this area. In particular, we wish to develop new, more efficient dynamic algorithms for higher order connectivity, and for the closely related problem of a flow. Furthermore, we introduce new model of dynamic graph coloring, called *regulated coloring*, which extends classical *on-line* coloring. A measure of solution quality depends here not only on the number of colors used, but also on the total number of single color changes made by an algorithm during execution. We expect interesting results, especially for those classes of graphs that are susceptible for on-line coloring.

Our motivation is basically purely cognitive, though we are also aware of potential applications. Indeed, dynamic graphs and dynamic algorithms constitute a relatively new and intensively developing direction of research inspired by needs appearing in real life applications. Problems presented in the project statement are located in the close neighborhood of the most important computational questions in this area. We expect therefore that our results will gain substantial resonance, contributing to its further development.