Coulomb model for friction

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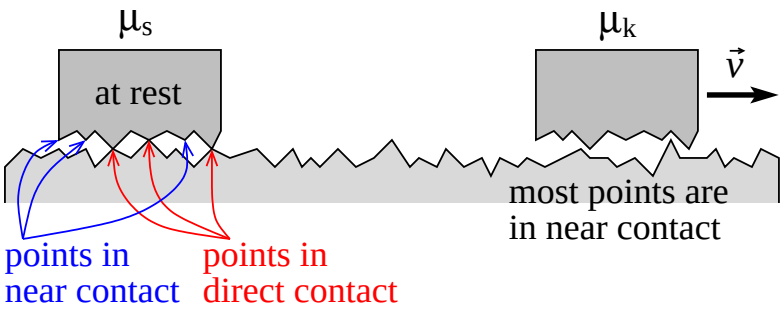
Even "smooth" surfaces are "rough" on the atomic scale.

Points where surfaces make *direct contact*, "residual Coulomb forces" (attraction between + and − points of atoms/molecules) make weak bonds.

Points where surfaces make *near contact*, residual Coulomb forces are weaker.



For surfaces at rest, there are points in both "direct" and "near" contact.

For surfaces in motion, most points are in "near" contact; atoms/molecules don't have time to set up "direct" contact bonds.

Thus, maximum *static friction* ($f_{\mathrm{s,\,max}} = \mu_{\mathrm{s}} N$) is a stronger force than *kinetic friction* ($f_{\mathrm{k}} = \mu_{\mathrm{k}} N$). That is, $\mu_{\mathrm{s}} > \mu_{\mathrm{k}}$.

Model useful for many surfaces (*e.g.*, smooth table top) but not all (*e.g.*, sticky side of tape).