Direct manipulation & virtual environments
Schneiderman & Plaissant
chapter 6

Core properties of ***direct-manipulation interfaces*** is a feeling of empowerment, strong conceptual model, enthusiasm, confidence. It is enabled by ***rapid, reversible and iterative actions***. Games, word processors, all the alternatives to typed commands. (p. 214)

The ***principle of virtuality*** (Tel Nelson): A representation of reality that can be manipulated. Also, ***principle of transparency***: Apply intelligence without thinking about the tool itself. (p. 231) Similar to Norman's gulfs of execution/evaluation. Psychology of learning suggests that correct representations are crucial in solving problems and learning.

There are various problems with direct-manipulation: Disabilities, form factors, meaning of visual representation, acquisition time to move hand to mouse. (p. 223)

Piaget's developmental psychology suggests that at the age of 11 children begin to use symbolic understanding, and since direct-manipulation interfaces avoid that, it may be easier to use for both children and adults. (p. 235-236)

The visual capacities of computers may attract a different population than the original hackers.

Programming is a powerful capacity and technology is not only about doing tasks but also about automating tasks. Many technologies involve programming languages, fx Excel. ***Direct-manipulation programming*** should thus be considered. (p. 238)

Teleoperation is remote control (p. 247), and can be used for many times of jobs, to make them safer and cheaper. Designers must think about slower response times when designing feedback.

Virtual/augmented reality (p. 249) **Augmented reality** (p. 253)