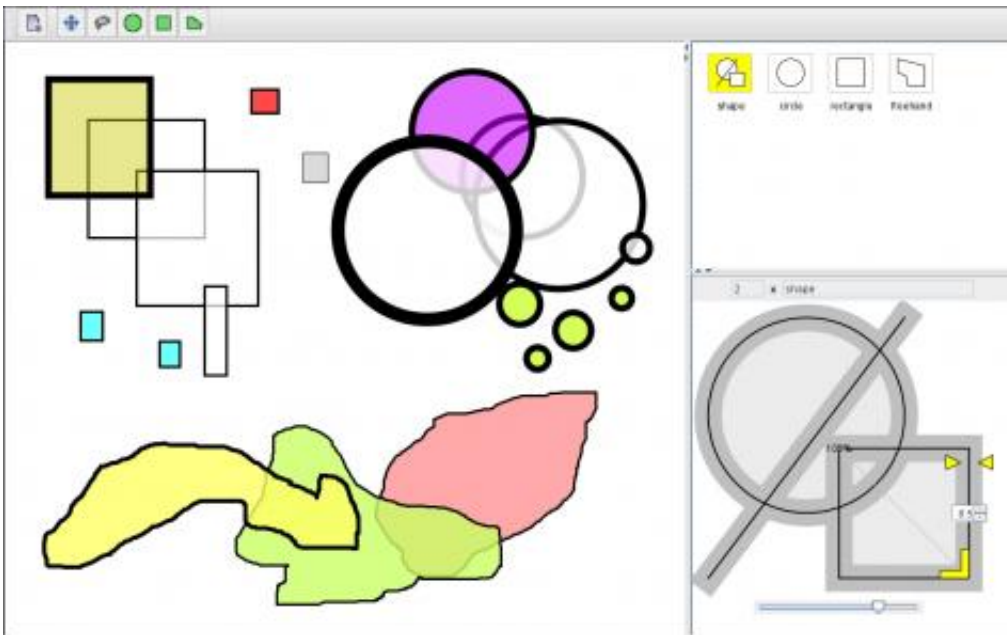# 'Surrogates' aid design of complex parts and controlling video games

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This graphic illustrates a drawing editor for a new class of software, named "surrogate interaction," a term coined by researchers at Purdue University. The approach enables designers and video gamers to more easily change features of complex objects like automotive drawings or animated characters in video games. Credit: Purdue University image/Niklas Elmqvist

Researchers have defined a new class of software, calling it "surrogate interaction," which enables designers and video gamers to more easily change features of complex objects like automotive drawings or animated characters.

The new interactive approach is being used commercially and in research but until now has not been formally defined, and doing so could boost its development and number of applications, said Ji Soo Yi, an assistant professor of [industrial engineering](#) at Purdue University.

Conventional computer-aided design programs often rely on the use of numerous menus containing hundreds of selection options. The surrogate interaction uses a drawing that resembles the real object to provide users a more intuitive interface than menus.

The Purdue researchers have investigated the characteristics of surrogate interaction, explored potential ways to use it in design applications, developed software to test those uses and suggested the future directions of the research.

[Surrogates](#) are interactive graphical representations of real objects, such as a car or a video game character, with icons on the side labeling specific parts of the figure, said Niklas Elmqvist, a Purdue assistant professor of electrical and computer engineering.

"If you click on one label, you change color, if you drag a border you change its width. Anything you do to the surrogate affects the actual objects you are working with," he said. "The way it is now, say I'm working on a car design and wanted to move the rear wheels slightly forward, or I want to change an object's color or thickness of specific parts. I can't make those changes to the drawing directly but have to search in menus and use arcane commands."

Several techniques have been developed over the years to address these issues.

"But they are all isolated and limited efforts with no coherent underlying principle," Elmqvist said. "We propose the notion of surrogate

interaction to unify other techniques that have been developed. We believe that formalizing this family of interaction techniques will provide an additional and powerful interface design alternative, as well as uncover opportunities for future research."

The approach also allows video gamers to change attributes of animated characters.

"For computer games, especially role playing games, you may have a warrior character that has lots of different armor and equipment," Elmqvist said. "Usually you can't interact with the character itself. If you want to put in a new cloak or a sword you have to use this complex system of menus."

Research findings are detailed in a paper presented during the Association for Computing Machinery's CHI Conference on Human Factors in Computing Systems through May 12 in Vancouver, British Columbia. The research paper was written by industrial engineering doctoral student Bum chul Kwon, electrical and [computer engineering](link) doctoral student Waqas Javed, Elmqvist and Yi.

Kwon and Yi helped theorize the idea of surrogate interaction with relation to previous models of interaction.

The method also makes it possible to manipulate more than one object simultaneously.

"In computer strategy games you might be moving an army or maybe five infantry soldiers, and you want to take a building," Elmqvist said. "Using our technique you would let a surrogate, one soldier, represent all of the soldiers. Any commands you issue for the surrogate applies to all five soldiers."

Current video game technology lacks an easy-to-use method to issue such simultaneous commands to all members of a group.

The method also could be used to make maps interactive.

"In maps, usually you have a legend that says this color means forest and this symbol means railroad tracks and so on," Elmqvist said. "You can see these symbols in the map, but you can't interact with them. In the new approach, you have a surrogate of the map, and in this surrogate you can interact with these legends. For example, you could search for interstate highways, bridges, public parks."

 More information: ABSTRACT

Direct Manipulation Through Surrogate Objects, by Bum chul Kwon, Waqas Javed, Niklas Elmqvist, and Ji Soo Yi, www.chi2011.org/

Direct manipulation has had major influence on interface design since it was proposed by Shneiderman in 1982. Although directness generally benefits users, direct manipulation also has weaknesses. In some cases, such as when a user needs to manipulate small, attribute-rich objects or multiple objects simultaneously, indirect manipulation may be more efficient at the cost of directness or intuitiveness of the interaction. Several techniques have been developed over the years to address these issues, but these are all isolated and limited efforts with no coherent underlying principle. We propose the notion of Surrogate Interaction that ties together a large subset of these techniques through the use of a surrogate object that allow users to interact with the surrogate instead of the domain object. We believe that formalizing this family of interaction techniques will provide an additional and powerful interface design alternative for interaction designers, as well as uncover opportunities for future research.