



# Developing a Realistic Interface for Simulating a Kit of Objects

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## The Project

Conventional (WIMP) interfaces have many shortcomings when applied to drawing programs in the context of geometry instruction. Among them are: High complexity, implying waste of time to learn the interface instead of the target contents; availability of shortcuts to solve problems that ought to be constructed geometrically by the student and none resemblance to real drawing instruments. Aiming to mitigate those problems, this project presents a new educational geometry drawing software called *RISKD* (*Realistic Interface for Simulating a Kit of Objects*). Following the direct manipulation, concrete, real world metaphor style, the *RISKD* interface features four drawing tools (triangle set, compass, pencil/eraser), which behave almost like their real counterparts. Due to its characteristics, the *RISKD* is intended to be very intuitive, not requiring any operating instructions and being capable of implementing all compass-and-ruler geometric constructions, while training the apprentice in the correct ways of using real drawing instruments.

## The New Interface

To fulfill the needs stated before, a direct manipulation, concrete, real world metaphor interface was proposed as an alternative GUI to an educational geometry drawing software. This interface has no menus or buttons. It resembles a paper sheet over a drawing table and features only four drawing instruments: a triangle set (45-90° and 30-60-90° degrees), a compass and a pencil with eraser. The figures 1, 2, 3 and 4 illustrate some of its characteristics.

## Local Tools

The proposed interface incorporates the "local tools" concept (Bederson et al., 1996): unlike tool palettes, where there can be only one tool active at a time, local tools can be picked up, used and put down anywhere in the work surface, retaining their attributes (pencil color, compass radius, etc.). Bederson et al. (1996) found out that this interaction style is easily learned with minimal instruction, even by very young children.

## Composite Tools

In addition, the "composite tool" concept (Daughtry; Amant, 2003) also can be identified in the proposed interface by the manner the drawing instruments interact with each other to increase their usefulness.

## Direct Manipulation

Direct Manipulation Interfaces have three defining principles (Schneiderman, 1997), which most GUIs implement:

- Continuous representation of the objects and actions of interest;
- Physical actions or presses of labeled buttons instead of complex syntax;
- Rapid incremental reversible operations whose effect on the object of interest is immediately visible.

## Real-World Metaphors

Metaphors are associations between the user's world and concepts of the computer universe. They are extensively used in modern interfaces due to their intuitiveness (e.g. Windows and Macintosh's folders, files and trash can, representing office objects).

## Conclusion

The software *RISKD* and its new interface were presented. It is based on powerful interface-related concepts like direct manipulation, concrete metaphors, real-world metaphors, local tools and composite tools.

The *RISKD*'s main goals are:

- to be immediately understandable, even for first time and occasional users, requiring no instructions at all;
- to allow all possible compass-and-ruler constructions to be executed without offering the powerful commands usually available in drawing software;
- to train apprentices in the use of drawing instruments in spite of using a virtual environment;

This software is intended to support teaching of face-to-face Geometry classes as well as distance learning courses.

## References

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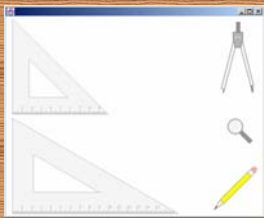


Figure 1 - The start window

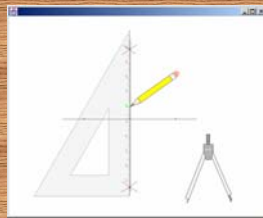


Figure 2 - Performing one construction

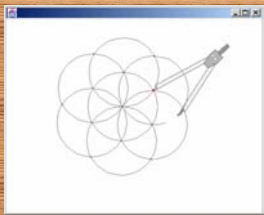


Figure 3 - Using the compass



Figure 4 - Triangles' interaction

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