# The Connect-The-Dots Family of Puzzles: The Video

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*Connect-The-Dots* puzzles are popular puzzles for children, where a labeled set of points is given and the goal is to connect points with consecutive numbers. The resulting polygonal line typically forms a recognizable picture. In this video, we present three new variants of Connect-The-Dots.

## Full Version

This abstract accompanies a video at the Multimedia Track of the Symposium on Computational Geometry. For more details, please refer to the full paper, to appear at the 41st International Conference on Computer Graphics and Interactive Techniques (SIGGRAPH 2014).

## Classic Connect-The-Dots
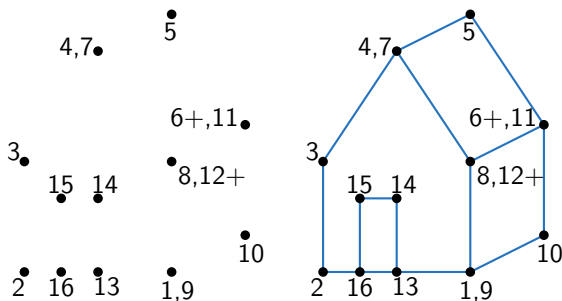


To alleviate the problem that only a single polygonal line can be drawn to solve the puzzle, we allow interruptions by using two point symbols instead of just one. If the label of a dot is a normal number, then the edge to the next higher-numbered point should be drawn, but if the label has a "+" appended to it, then the next edge should not be drawn. In this way the puzzler draws several polygonal lines. By giving a point more than one label, junctions can be made as well.
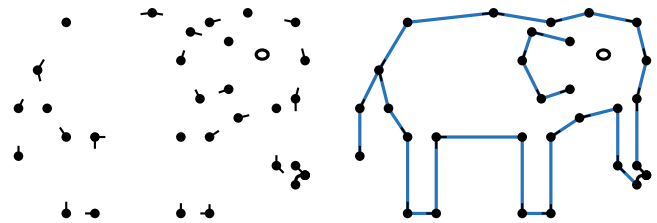
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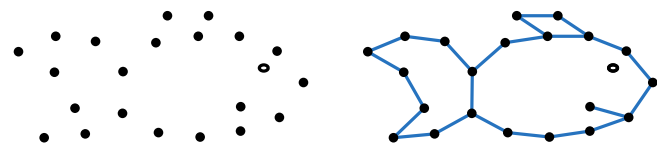
## Connect-That-Dot



Instead of labeling each point, we can extend the point symbols with a small link that shows the direction in which an edge should be drawn. The puzzler extends this link until another point is reached. Points can have more than one link attached, and then we draw more edges from the point. The puzzle type can be such that each edge to be drawn has links at both endpoints, or there is a link at exactly one of the endpoints. We call these types *two-sided* and *one-sided*.

## Connect-The-Closest-Dot
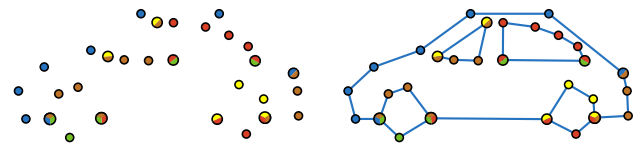


We can require every point to be connected to its nearest neighbor. So, for any edge to be drawn by a puzzler, at least one of its endpoints must have the other endpoint as a closest point. We will require that each point has a unique nearest neighbor. Since the nearest-neighbor graph of $n$ points has $n-1$ or fewer edges, only very simple drawings are possible. To allow for more complex ones, we assign each point a color. The nearest-neighbor rule is now applied only for points of the same color.

## Connect-The-Unit-Dots



Finally, we can connect two points if and only if they lie at a unit distance. The exact value of the unit is not important because a point set that is good as a puzzle for one distance can be scaled to make it good for another distance. From the puzzler's perspective, it may make sense to choose the distance equal to the diameter of a small coin, so that the coin can be slid over the points to decide which ones should be connected.