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Team Assignment #2

Prefix has a multitude of applications in parallel programming. Two examples are solving the line-of-sight problem and radix sort [1].

Line-of-sight is the problem when you have two positions on a euclidian plane and you want to determine which points along the path are within "line-of-sight." A prefix algorithm can be used to test for line-of-sight, and if blocked, it can tell us at what step the sight was blocked.

We can break the distance between the two positions into n steps. First, get the angle from the low position to the high position. For each step, calculate the angle of that sub-problem. We want to precompute and store the previous maximum angle along the way, so we use prefix to pass the maximum previous angle to each point. From that, we check if this point's angle is lower than that of it's previous max angle.

Radix sort for integers can be performed by Prefix, by using the binary bits. Given a vector of integers, we perform this operation as many times as there are bits in their numeric representation (padding any number with zeroes in the front to give them all the same magnitude). Starting with the least significant bit, if the position is a 0, move it to the front of the vector (in order). Repeat this operation and at the end, we have a sorted vector of integers. In terms of prefix, the determining of the indices of each value is performed by two prefix algorithms, one going each direction.

[1] Blellock, G.E, "Prefix sums and their applications", Carnegie Mellon University School of Computer Sciences, 1990.