# Documentation

## ChainLinkSource

### Applying forces for Pulling In and Pushing Out the Chain

The pushOutForce should be applied in the forward direction of the source as the winch that is in theory pushing out the chain would push it in the forward direction.

There has to be differentiated between pushing the chain out and pulling the chain in. In reality, when the chain is pulled in, the

### Aligning a ChainLink with the Source

In theory, the first ChainLink should always pass through the source because that is the source of the chain.

### Determining if the Source is Behind or in Front of a ChainLink

The source lies behind the chainLink if the source lies on the negative side of a plane defined by the normal vector positionToLinkChainLinkTo -> positionToLinkToHook and the plane point positionToLinkChainLinkTo. Otherwise, the source lies in front of the chainLink.

### Determining if the Chain should be Lengthened or Shortened

The chain should be lengthened if one of the following holds:

* There is no previouslySpawnedChainLink AND the hookToConnectChainLinkTo has some distance to the source AND the maximumPushOutSpeed is greater than 0.
* There is a previouslySpawnedChainLink AND the source lies behind it AND the maximumPushOutSpeed is greater than 0.

The chain should be shortened if one of the following holds:

* There is a previouslySpawnedChainLink AND the source lies in front of it AND the maximumPullInSpeed is greater than 0.

### Lengthening the Chain

When the chain should be lengthened, it should be lengthened as much as possible under the following requirements:

* The chain is not lengthened more than would be possible with the current maximumPushOutSpeed and the time that passed.
* If there is a previouslySpawnedChainLink then the chain is not lengthened more than is needed to connect the positionToLinkToHook with the source in a straight line.
* If there is no previouslySpawnedChainLink then the chain is not lengthened more than the distance to the hookToConnectChainLinkTo.

If lengthening the previouslySpawnedChainLink is not enough to lengthen the rope to the necessary amount, then a new ChainLink is spawned.

### Shortening the Chain

When the chain is shortened, it should be shortened as much as possible under the following requirements:

* The chain is not shortened more than would be possible with the current maximumPullInSpeed and the time that passed.
* The chain is not shortened more than is needed

If the