

# Properties of marked graph diagrams for knotted surfaces in the four space

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Surfaces that are smoothly embedded in the four-dimensional euclidean space can be depicted in several ways. We will describe the technique of investigation by examining critical points produced by mapping of a given embedding into a lower codimensional ambient space. Our description will be by a marked vertex diagram obtained from the hyperbolic splitting of the embedding.

We describe a method for generating minimal hard prime surface-link diagrams. Along the way we extend the known examples of minimal hard prime classical unknot and unlink diagrams up to three components and show figures of all minimal hard prime surface-unknot and surface-unlink diagrams with prime base surface components up to ten crossings.

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