

This article deals with interesting interplay among apparently disconnected topics in mathematical physics under a common concept of integrability. To be more concrete, it deals with calculations of minimal surfaces in AdS_3 space that are circumvented by light-like segments. The recent study by the same authors shows that, by use of the gauge/gravity duality, these surfaces can be interpreted as gluon amplitudes in four-dimensional $\mathcal{N} = 4$ super Yang-Mills theory at strong coupling [1]. In this article under review, more mathematical aspects of the minimal surfaces are considered. Namely, it is shown that the calculation of the minimal surfaces in AdS_3 can be reduced to a generalized sinh-Gordon model and also to a problem of $SU(2)$ Hitchin equations. Particularly, using a known result on the Hitchin equations for supersymmetric gauge theories [2], the authors find an explicit form of the minimal surface for an octagonal polygon, which corresponds to the eight-gluon scattering amplitude at strong coupling. The materials covered in this article are both advanced and wide-ranged. For interested but busy readers, it is also recommended to refer to a short version of this article [3].

References

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- [3] L. F. Alday, J. Maldacena, [arXiv:0903.4707 [hep-th]].