Optimal design of a railway bypass at Parga, north-west of Spain

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The railway line in the northwest of Spain was put into service at the end of the nineteenth century. It runs through multiple small towns and villages, which generates a high accident risk due to the existence of many level crossings with roads and secondary path. To alleviate this problem, inherited from the historical construction development of the railway, in recent years the Administrator of Railway Infrastructures in Spain (ADIF) is performing numerous actions. Usually, these actions consist of fencing the railway track area and removing level crossings, which are replaced by bridges or underpasses allowing the passage of vehicles and pedestrians. These actions may negatively affect some important aspects of the town (economical, environmental, social, etc.), and sometimes they are rejected by both neighbors and local institutions. This is the case of Parga, a village in the northwest of Spain, where the neighbors have established the #parganonsedivide association, to disagree with the project presented by ADIF and to require a railway bypass bordering the urban area. In this work, at the proposal of the aforementioned association, the feasibility of such bypass is studied. In order to do it, the problem of designing a bypass fulfilling with technical standards and being optimal from an economical point of view, is formulated and studied in the framework of non-linear and non-convex constrained optimization. As result of this work, a railway bypass at Parga is obtained. It satisfies all technical standards, is acceptable from an economical point of view, and verifies all requirements made by #parganonsedivide, promoter association of this Project.

Keywords: railway bypass; optimal design; non-convex optimization; differentiable optimization

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