

MATHEMATICAL MODELLING FOR AN OPTIMAL MONITORING DESIGN IN QUALITY CONTROL OF TRAFFIC

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Abstract: Monitoring consists of carrying out surveillance on and/or recording any variable under study. It is not only a very useful technique in medicine (observation of a disease or any medical parameters over time), but also in computing, social sciences, environment, industry, etc. Particularly, it is an essential tool in the Quality Control (QC) of any process. For example, pollution monitoring in a river can be very useful to locate any illegal discharge. In a similar way, traffic flow monitoring can help to detect accidents or cars failed on the road. The design of a monitoring system is a very important task in the QC process. In many cases, reliable estimations of the variables under study can be obtained by using mathematical modelling (numerical simulation). If estimations are available, a monitoring strategy giving representative measurement of these variables can be obtained by solving a multi-objective optimization problem. The usefulness of this procedure can be shown, for example, by designing a river quality monitoring system, using a 1D hyperbolic-parabolic system for the numerical simulation. Another useful application of previous procedure consists of designing a road monitoring strategy. In this case, the mathematical model is the 1D Lighthill-Whitham-Richards (LWR) model, which can be combined with a 2D pollution model if air quality is also being monitored.

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