On Quadratic Internal Model Principle in Mathematical Programming

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Abstract. We show that for continuous mathematical programming problems every optimization algorithm must encapsulate implicitly or explicitly a quadratic internal model of the problem to be solved which represents the essence of the problem from the view point of the algorithm. Optimization models are coming from the conservation laws. For systems which obey the principle of least action the Noether's theorem expresses the equivalence between the conservation laws and symmetries. But mathematically, symmetries are expressed by quadratic forms. Therefore, at the heart of every real optimization model is a quadratic form. The quadratic internal model principle says that this quadratic form modified in order to imbed the main ingredients of the optimization algorithm represents the quadratic internal model of the optimization algorithm.

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