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Abstract Quantifier elimination for real variables constitutes an interesting computational tool with efficient implementations in some popular computer algebra systems and many applications in several disciplines. On the other hand, many practical problems concern situations under uncertainty, where uncertainty intervals and, more generally, reliability regions of uncertain quantities have to be computed. Here the interest is in the popular Ben-Haim's IGDT (info-gap or information-gap decision theory) for problems under severe uncertainty based on info-gap models, where quantifier elimination already proved to constitute a possible tool for the computation of the related reliability regions and robustness functions. Here Ben-Haim's IGDT is considered again, but now in a modified form, where more than one horizon of uncertainty is present (here two, three or four). More explicitly, here each uncertain quantity is assumed to have its own horizon of uncertainty contrary to the usual case in the IGDT, where only one horizon of uncertainty is present in the related infogap model. Six applications are presented showing the usefulness of the present computational approach. These applications (mainly based on fractional-error info-gap models) concern (i) a linear system, (ii) a sum, (iii) the area of a rectangle, (iv) the volume of a rectangular cuboid, (v) the buckling load of a fixed-free column and (vi) the von Mises yield criterion in two-dimensional elasticity. Beyond the uncertain quantities (here two, three or four) one, two or three parameters may also be present and appear in the derived QFFs (quantifier-free formulae). Of course, it is noted that quantifier elimination generally has a doubly-exponential computational complexity and this restricts its applicability to problems with a small total number of variables (quantified and free).

Keywords Severe uncertainty, Info-gap, Information-gap, IGDT, Decision theory, Modified info-gap model, Non-probabilistic methods, Robust reliability, Reliability region, Robustness, Sum, Rectangle, Area, Rectangular cuboid, Volume, Column, Buckling load, von Mises yield criterion, Quantifier elimination, Quantifier-free formulae, Computer algebra, *Mathematica*