A STUDY TO DETERMINE THE USEFULNESS OF INTERVAL ANALYSIS IN SOLVING PROBLEMS IN CELESTIAL MECHANICS

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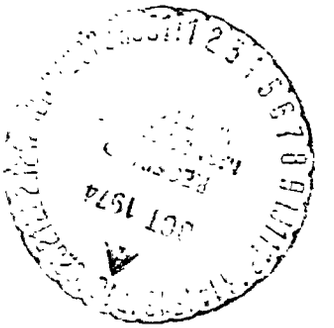
TEXAS TECH UNIVERSITY
DEPARTMENT OF MATHEMATICS

DERALD WALLING
ASSOCIATE PROFESSOR



A STUDY TO DETERMINE THE USEFULNESS OF INTERVAL ANALYSIS IN SOLVING PROBLEMS IN CELESTIAL MECHANICS

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The purpose of this study was to determine the usefulness of interval analysis to numerical integration and matrix inversion techniques and to combine the above results to determine the value of interval analysis in bounding computational errors in the two-body problem.

The word useful is used in the sense that the analysis is completely automatic and the results are easily interpreted and have practical meaning.

We made every effort to try to make use of interval analysis as applied to matrix inversion. We were not able to find any real value of using interval analysis. Faddeev [4] sets forth formulas for the number of computational steps for various inversion techniques. These clearly set forth the large number of steps needed for inversion of high order matrices. In every case, we found that our error bounds were so wide spread as to be completely meaningless. In fact, if doubt occurred concerning whether a matrix was ill-conditioned, we gained more by following the techniques set forth in Faddeev [4], then by using interval analysis.

A seminar was offered and approximately ten graduate students took part. We looked at various problems. The result of the discussion was that interval analysis was an interesting approach but we question its use for large scale problems.

Interval analysis may be worthwhile in certain small scale isolated problems but we doubt its usefulness in any large scale problem.

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