Attitude Determination of Passively Magnetically Stabilized Nano Satellites
by
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This research enables attitude determination to be performed on passively magnetically stabilized nano satellites using only a measurement of the solar vector. Existing state of the art methods can achieve an accuracy of one degree using a full attitude sensor suite. The methods presented in this thesis achieve an accuracy of five degrees at a reduced mass and power cost, opening up new mission opportunities for nano satellites and providing a backup capability for existing designs.

Two approaches to attitude determination were taken. First, a batch algorithm was developed that simultaneously estimates both satellite attitude and unknown parameters in the satellite's attitude dynamics model. Second, an online attitude determination capability was created by extending the commonly employed MEKF for situations where no gyros are present.

Both approaches were applied to actual flight data from the University of Michigan's RAX-1 nano satellites and the results were verified against independent data.