

Mechanical Engineering Master's Defense

Tolerance Maps For Patterns Of Profiles

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abstract

This thesis contains the applications of the ASU mathematical model (Tolerance Maps, T-Maps) to the construction of T-Maps for patterns of line profiles. Previously, Tolerance Maps were developed for patterns of features such as holes, pins, slots and tabs to control their position. The T-Maps that are developed in this thesis are fully compatible with the ASME Y14.5 Standard. A pattern of square profiles, both linear and 2D, is used throughout this thesis to illustrate the idea of constructing the T-Maps for line profiles. The Standard defines two ways of tolerancing a pattern of profiles – Composite Tolerancing and Multiple Single Segment Tolerancing. Further, in the composite tolerancing scheme, there are two different ways to control the entire pattern – repeating a single datum or two datums in the secondary datum reference frame. T-Maps are constructed for all the different specifications. The Standard also describes a way to control the coplanarity of discontinuous surfaces using a profile tolerance and T-Maps have been developed.

Since verification of manufactured parts relative to the tolerance specifications is crucial, a least squares fit approach, which was developed earlier for line profiles, has been extended to patterns of line profiles. For a pattern, two tolerances are specified, and the manufactured profile needs to lie within the tolerance zones established by both of these tolerances. An i-Map representation of the manufactured variation, located within the T-Map is also presented in this thesis.



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