Full Abstract & Bio

"Developing Realistic, Non-Destructive Alternatives for Quality Assurance and Counterfeit Detection Testing of Microelectronic Components"

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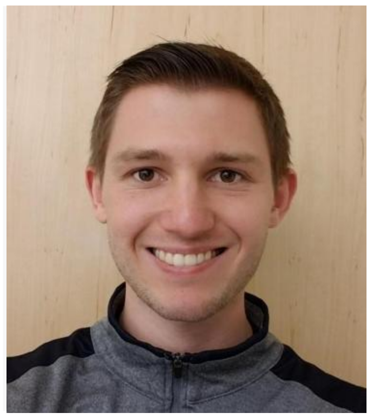

Abstract: **Existing measures to assure the quality and authenticity of microelectronic hardware components are predominately destructive in nature. In the case of packaged microelectronics, bulk package removal followed by invasive and sensitive mechanical testing is executed regularly by both manufacturers and consumers prior to integration and/or after failure. Such an approach raises concerns if we consider first that the tested circuit cannot be both assured and integrated because the process of examination renders it useless. In addition, these destructive physical tests are expensive to conduct. They require specialized, precise testing apparatus with trained users and a lot of time, especially for long-term testing (i.e. fatigue, creep, vibratory, and other lifetime predictions). Beyond that, the need for a subject matter expert to interpret results in relation to any acceptance criteria leaves test results open to interpretation and far removed from the possibility of automated decision-making.**

As a potential solution, a non-destructive alternative that involves accurate data acquisition by 3-D X-ray tomography, file size reduction and conversion to a CAD-editable geometry through reverse engineering, and finite element analysis is under development. To summarize, by attaining realistic, 3-D geometry non-destructively, we can assume that features that would impact the performance of the system or indicate tampering are included in proceeding analyses. Knowing that the proposed methodology would need to remain manageable in expense, conservative reverse engineering would make data handling much easier for modest workstations and quicken the time spent during finite element analysis. With the conversion to a CAD-editable format, relationships between test results and variable geometric models can be established, so design studies are also possible. Finite element analysis will also benefit from the conversion because importation and simulation errors that require repair can be addressed in a geometric modeling software instead of a finite element testing package. At this point, little alteration will be needed to create countless testing environments for the microelectronic components in finite element testing. Conceivably, long scale tests would be possible in much less time and unique test environments that would be inordinately expensive to recreate can be generated.

Bio: **Joe Favata is a Ph.D. Candidate in the REFINE Lab at the University of Connecticut where he conducts research and handles lab management duties. His research pertains to multi-modality, cross-correlative microscopy and finite element modeling. He works to effectively capture, visualize, and understand phenomena existing on the micro- and nano-scales to solve pervasive industrial issues. He routinely conducts experimental work with 3-D X-ray tomography, focused ion beam, focused electron beam, analytical optical, and ultra-short pulsed laser systems, partnering with industrial and academic collaborators from across the northeast. His experience with commercial image processing, reverse engineering, and finite element analysis software are also important to his research. He studied Mechanical Engineering and Physics at Manhattan College, where he earned a B.S. in 2016 and earned an M.S. in Mechanical Engineering from UConn in 2017.**

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