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SIMULATION-BASED DENTAL TRAINING SYSTEM  
ABSTRACT

This Phase I SBIR proposal will yield a prototype of a fully synthetic simulation-based training system to teach proper assessment, diagnosis and treatment of incipient lesions and true dental caries. IDEA International, Inc., in conjunction with the Harvard Dental School and others with experience in the simulation and virtual environment business, will create a simulator in Phase I, showing that a fully implemented dental simulator with clinical value can be successfully completed in Phase II.

Learning to diagnose incipient versus true dental caries and making medical versus surgical treatment decisions is a difficult task which at present is primarily taught with patient volunteers. Simulators teach pilots to control synthetically generated aircraft through combining sight, feel and cognition; the same can be done for dental training. The proposed simulator is based on voxel representations of the teeth for both tool interaction and visualization. The system uses a haptics interface, allowing the students to feel what they are doing. The synthesis of seeing and feeling combined with instruction is an area that can be enhanced through simulation-based training. They see their actions as they would in the clinic by looking into a thin stereo display placed between their eyes and hands giving them the proper parallax of their hands and eye gaze interacting with the mouth. The system will allow easy expansion of its training curricula. This approach is technically more complex, and more effective than the approaches tried in previous attempts at implementing computer technology within the dental curriculum.

By following the approach of using a fully synthetic simulation-based training system with validated caries curricula, students will be more confident and capable in their initiation to the clinic, enhancing the cost and time effectiveness of the time spent there. This same approach will allow expansion into continuing education and provide a broad platform for the transference of future dental expertise.