ACS 2024 Surgeons and Engineers: A Dialogue on Surgical Simulation Meeting

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Promoting Technology and Collaboration

Digital Stethoscopes for Live Broadcast in Educational Environments

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Background: Digital stethoscopes enhance the diagnostic power of auscultation through noise cancellation and telehealth potential. Broadcasting auscultation sounds to colleagues maxes at a few streams without increased computing costs or degraded sound quality. As a result, current devices lack cost-effective, synchronized listening modes for large care teams in both clinical and educational settings. We introduce a WebRTC and P2P (Peer-to-Peer) powered digital stethoscope as a cost-effective broadcast tool.

Technology Overview: The hardware consists of a 3D printed housing that attaches to any commercially available stethoscope. A bluetooth module transmits auscultation to a user's mobile device for broadcasting. The software uses WebRTC, real-time communication protocol to initiate the connection between users. The sound is transmitted directly through a P2P scheme. Depending on network conditions, the system supports up to 50 simultaneous users. The application is hosted at https://stethotech.com/.

Potential Application in Surgical Simulation and Education: Our results show that auscultatory findings can be transmitted for simultaneous listening using a P2P scheme. This technology has multiple applications in simulated teaching environments as well as actual patient care. A perfect example is with medical students, who would benefit from hearing heart sounds in real-time with their professors. Professors could more easily communicate their findings and assess student understanding. This technology could also be useful for administering student skills exams, where proctors could ensure students use proper stethoscope technique and placement.

Potential Opportunities to Collaborate: Preliminary results show promise in improving care by allowing fifty members of a team to listen simultaneously without compromising sound quality or latency. Future steps include real-time encounter testing, addition of the app to the Apple App store, and integration of auscultatory findings to an EMR system. We also would like to collaborate with an audio professional to improve the acoustics and digital audio processing of our device.