HealthDrone: An Autonomous, Offline Medical UAV For Advanced Biometric Collection and Analysis Using Deep Learning

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A guaranteed and comprehensive response to medical needs is a key deterministic factor of patient outcome. The current COVID-19 pandemic has exacerbated this need due to the number of people without access to healthcare. The existing pandemic healthcare methods, such as videoconferences, have been limited by their lack of coverage, lack of access to specialized medical equipment, and lack of available physicians. To this end, I propose to you HealthDrone, an autonomous medical drone providing remote, offline diagnosis of biometric data. The basic features include tests for visual acuity, hearing accuracy, and mental state. The advanced features consist of three deep-learning assisted examinations, including heart arrhythmia detection, lung respiratory audio analysis and dermatological lesion examination. This is implemented with a flight and medical system. The flight system consists of a flight computer interfacing with a power distribution board, motors, telemetry radio, and GPS- allowing for fully autonomous flight. The medical system consists of a Raspberry Pi processor interfacing with a TkinterGUI-built touchscreen and text-to-speech-enabled speaker as well as a variety of onboard biometric sensors, including an onboard digital stethoscope, camera, and an ECG sensor. Once collected, data is sent to their respective deep neural networks, trained on Google servers and installed on the Raspberry Pi, for autonomous diagnosis. The result is an auto-generated and color-coded patient report that is able to be shared with the physician. HealthDrone can be deployed in a variety of medical environments, allowing for more accessible and comprehensive patient care, all while decreasing costs and time.

Awards Won:
International Council on Systems Engineering - INCOSE: Third Award of $200
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Regeneron ISEF Category