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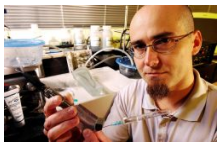

The Portable Vein Finder

Based on the Doppler effect

Bruises, burns, and other physical conditions often make it difficult for doctors or paramedics to locate veins and administer lifesaving drugs or solutions. In response, a team of Georgia Institute of Technology researchers is developing an inexpensive, handheld device that uses Doppler ultrasound technology to find veins quickly. "Depth and angle are the critical issues for vessel detection. Even if you locate a vein at the skin's surface, it's still easy to miss when you try to insert a needle into the tissue below," says project leader Michael Gray, a research engineer at the Electro-Optical (EOSL) Systems Laboratory within the Georgia Tech Research Institute (GTRI). The Doppler Effect is a phenomenon that occurs when electromagnetic and sound waves interact with a moving object, altering wavelengths and frequency. For example, a police radar gun sends microwave signals to a moving car, and when signals bounce back, the change in their frequency provides a measurement used to determine the vehicle's speed. Doppler ultrasound is similar, except that acoustical waves are transmitted. Compared to static skin and tissue, blood is a moving substance, so ultrasonic waves reflected from blood vessels have different characteristics than transmitted ones, providing critical 3-D information about a vein's location. Hospitals have sophisticated ultrasound systems to evaluate the heart, valves and vessels for general blood-flow studies. But this kind of equipment is impractical and too costly for field use. "Although the use of Doppler technology isn't new, the novel aspect of our vein finder is the system's design, which makes it both portable and economical," says Peter Rogers, a professor in Georgia Tech's School of Mechanical Engineering. The patent-pending vein finder is composed of two parts: A reusable unit houses the electronics and signal processing components, while a disposable coupler box holds a reflector and needle guide. The needle guide is positioned parallel to the sound beam being transmitted by a transducer in the device's reusable section. As medics move the device along a patient's arm or leg, the transducer emits a thin acoustical beam, about the size of pencil lead, into the reflector. Then the reflector directs the ultrasonic waves into the patient's skin at a slight angle. The device can determine the direction of blood flow to distinguish arteries (which carry blood away from the heart) from veins (which carry blood to the heart). Once the device detects a vein, an alarm is triggered, and medics insert the needle.*Image Credit: Georgia Institute of Technology*