Developing a New, Lightweight, Hands-Free Personal Safety System for Female Runners

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Eighty-four percent of female runners experience harassment. This ranges from catcalling to stalking. Female runners are also at risk for being sexually assaulted, attacked, or murdered. While personal protective equipment is available for runners, these can be burdensome or difficult to access quickly. This project developed a new device to provide female runners with security while overcoming the challenges and limitations of existing devices by being hands-free, lightweight, and fully functional without a phone or additional device. A speaker, 9V battery, Arduino Nano microcontroller, and a Panasonic Grid-EYE Infrared Array Sensor were mounted on a perf board using wires, hot glue, and soldering. A holding case was designed and 3D-printed, with a spring clamp to make the device wearable. The Grid-EYE Sensor enabled the device to successfully sense people up to 5.36 meters away over about a 77-degree angle between 0 and 26 degrees Celsius. The speaker played three different tones, depending on the distance of the other human, with a long-lasting tone signaling another person less than one meter away. The device could also be used as an alarm. This lightweight (125-gram) device offers a hands-free solution for personal protection. In fact, the device may be useful for more than just runners, for example by sensing when another person is socially distanced or by warning people of bikers or runners passing on a trail, to improve personal safety in multiple scenarios.

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