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Mosquito detection and repellent system using acoustics signals for household use.

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There are over 130 mosquito species in Sri Lanka, and this abundance may be the reason for the spread of several critical diseases. Therefore, an effective mosquito repellent system, including a mosquito detection mechanism, is essential for daily life. Using acoustic signals is a harmless and cost-effective method for detecting and repelling pests compared to other visual or thermal processes. Therefore, this research investigates a novel approach for detecting mosquitoes and creating an effective mosquito-repellent mechanism based on acoustic signals. A system capable of distinguishing mosquitoes from other sound sources based on their unique wing flapping frequency was built and repelling them using specific ultrasonic frequencies was realized. The system consists of several components, including microphones, amplifiers, and filters, tested in both simulations and experiments. The methodology involved in determining the wing flapping frequency of mosquitoes by concentrating mosquitoes in a soundproof container, which was found to be within the 800-900 Hz range, with slight differences between male and female mosquitoes. Additionally, the effect of ultrasound in repelling mosquitoes was explored, discovering an effective frequency range of 42 kHz to 44 kHz. The system was subjected to numerous iterations and improvements to enhance mosquito detection sensitivity and the band of repellent frequencies. The final design includes an instrumentation amplifier for cancelling the noises and a second order Sallen-Key bandpass filter for filtering the flapping frequency of mosquitoes. However, due to the limitations of conventional condenser microphones, the discrepancy between simulations and physical implementations appeared. Further, the interference from surrounding noise caused some complications. Despite these obstacles, the results showed the system's potential in detecting and repelling mosquitoes. The system can be improved further by incorporating more sensitive microphones and filter circuits. By providing power with rechargeable batteries, it can be made portable. The flexibility and adaptability of the system design offer exciting possibilities for future enhancements and optimizations. In conclusion, this research advances the field of mosquito detection and repellence, providing new insights into the potential of acoustic signal processing in pest detection and control. Future improvements to the system could significantly contribute to mitigating the risks associated with mosquito-borne diseases.

Keywords: Acoustic filters, Mosquito detection, Mosquito repellent, Pest control technology, Signal processing