WEARABLE BIOMEDICAL INSTRUMENT FOR ARTIFICIAL ORGAN IMPLANTATION AND MONITORING USING ANTENNA-BASED PHANTOM MODELS

This research focuses on developing a wearable biomedical device for monitoring artificial organ implants using an antenna-integrated system and AI-driven data processing. The goal is to create a non-invasive solution that enables real-time monitoring of artificial organs post-implantation, enhancing patient care and early detection of complications.

The project introduces a novel approach by incorporating antenna-based phantom models, which mimic the electromagnetic properties of human tissues and artificial organs. These models allow for safe, controlled testing of the wearable device, ensuring accuracy and reliability before clinical application. The wearable system will use AI algorithms to analyze physiological data in real time, detecting anomalies and predicting potential organ malfunctions.

The device will consist of biocompatible sensors and a flexible, low-profile antenna designed to wirelessly transmit data to an external processing unit. AI models, including deep learning techniques such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs), will be used to process the data, extract key features, and predict possible health risks. The use of advanced software tools like ANSYS HFSS for antenna design and TensorFlow for AI algorithm development will facilitate the system's design and testing.

Applications of this wearable system include continuous monitoring of artificial organs like hearts and kidneys, providing real-time alerts for early detection of complications, and enabling remote patient care via telemedicine. The non-invasive nature of the system, coupled with its AI-based monitoring, will significantly improve patient outcomes by offering a more precise, reliable, and personalized healthcare solution.

The proposed research offers several advantages, such as reducing invasive monitoring techniques, enhancing early detection of organ malfunctions, and improving the overall success rate of artificial organ implants. Future work will focus on integrating the device with telemedicine platforms and conducting clinical trials to validate the system in real-world settings.