Portable MRI scanner: Magnet designs, gradient coils, and open-source resources

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Magnetic resonance imaging (MRI) is an important imaging modality for diagnostic and therapeutic purposes. It offers the best soft tissue contrast without ionizing radiation. However, due to the high cost and/or immobility, it is only available in the radiology department in a hospital and to less than 30% of the world population. A conventional MRI cannot be taken to a patient. Portable MRI is compact with light weight and a small footprint, and is low cost. Its compactness makes MRI available to the bedside of a patient, and to the sites, e.g., in an ambulance and a medical tent for disaster rescues. The low cost makes MRI more available to the under-developed counties and regions.

With the advancements of 3D printing technology and when personal computers become more affordable and powerful for signal acquisition and image processing, building one MRI scanner in the lab or by oneself as a hobby becomes possible. The talk will provide a detailed introduction on the design and building of permanent magnet array and gradient coils for portable MRI scanners, and the open-source resources.