Advanced communication device for interventional MR communication and talking

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Introduction: Magnetic resonance imaging (MRI) is an excellent platform for interventional radiology due to its non-ionizing radiation and excellent soft tissue contrast. Interventional procedures rely heavily on comprehensible communication between radiologists and MRI technologists. Commonly used interventional communication systems are technologically advanced, and tend to be expensive and often burdensome with all of their fancy knobs and dials. In this work, we present an innovative communication system for MRI interventional systems that is cost-effective, low-power, MRI-compatible, noise-free, and probably idiot-proof.

Methods: A bidirectional communication system (fig. 1) was constructed using MR-compatible vocal transceivers with the audio transmitted (literally) on a fiber optic cable. The transceivers are optimized for reception in the audio band, with a size chosen for ease of use and comfort. While the transceivers are capable of full-duplex communication, we chose to separate functionality into clearly defined transmit and receive modules to eliminate an possible confusion. To demonstrate effectiveness, the communication system was utilized in a sample (N=1) of typical MRI interventional procedures. Attending radiologists were asked to evaluate the performance of the system, specifically with the percentage of successfully understood words, using the technique known as “shouting very loud” as a baseline.

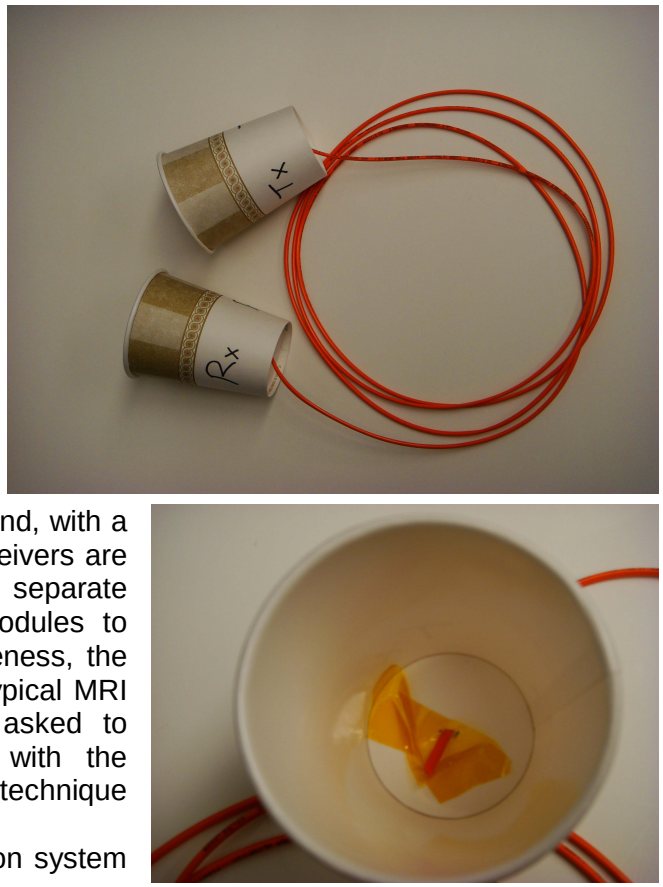

Figure 1: Depicting communication device construction, including audio transceivers and fiber optic transmission line, which is terminated at high performance polyimide tape bond.

Results: Figure 2 demonstrates operation of communication system during a typical interventional procedure. Significant noise was observed in the presence of gradient activity. Due to the absence of statistical power for this study, no statistically significant conclusions could be drawn for the system’s operation. Therefore, the authors assume that communication will succeed 99% of the time.

Conclusions: In this work, we present a novel communication system for interventional MRI procedures. Absence of electrically conductive material, the presented system is completely MRI compatible, and can be assembled at a minimum cost. The system is also not cumbersome unless the users require the use of their hands. Though only a single communication channel is presented, this technology is easily scalable when additional persons are present. Future work will investigate the use of arrays of this technology for needless complication and to distance it from any possible clinical relevance.

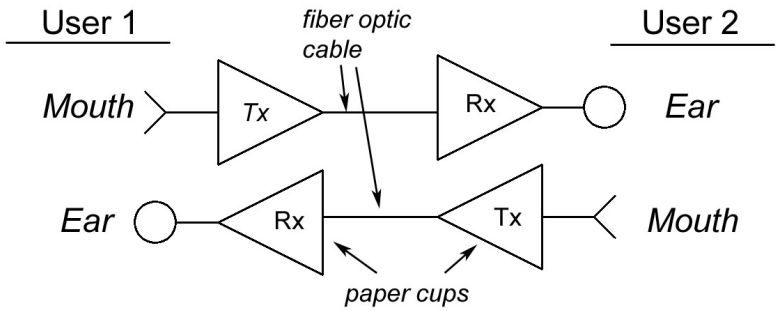

Figure 2: Overview of communication system concept, in which transceivers are held to mouth and ear via hands.