

Echolocation by the blind – influence of signal type and directionality of the sound source on acoustic localization of obstacles

Not everyone knows that humans are capable of limited echolocation by subconsciously processing changes in perceived sounds. Echolocation is used by many blind persons to localize obstacles or perceive layouts of their surroundings using reflected sounds, such as mouth-clicks or special mechanical clickers. Recent research has demonstrated that some sounds may be better at producing useful echoes, e.g. the mouth-clicks produced by echolocation experts differ significantly from those made by the average blind person.

The proposed project will focus on synthesizing other sounds which are intrinsically better for perception of reflected echoes. We hypothesize that various untested natural or artificial sounds exist that can be equally or potentially more useful for echolocation in comparison to traditional mouth clicks. Psychoacoustic and acoustic analysis as well as signal processing algorithms can be used to design such sound sources.

The designed sounds will be tested in various echolocation trials in which we will measure their influence on the correctness of localizing obstacles and walls. Additionally, the study will test a novel approach with a highly directional parametric speaker used as a sound source, theoretically creating an “echo-flashlight” that can project sounds onto specific obstacles.