Paper ID: 30573
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SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Mobile Satellite Communications and Navigation Technology (1)

Author: Dr. Jan Walter Schroeder
Sensovo, Germany

Mr. Manuel Martin-Salvador
United Kingdom
Mr. Rashid Bakirov
Azerbaijan
Mr. Ulrich Straus
Sensovo, Germany

TACTILE SATELLITE NAVIGATION SYSTEM: USING HAPTIC TECHNOLOGY TO ENHANCE THE SENSE OF ORIENTATION AND DIRECTION

Abstract

The majority of commercially available navigations systems use visual or acoustic instructions to indicate the path from a chosen starting point to a pre-defined destination. Alternatively, several haptic devices and concepts which enhance the sense of orientation and direction have been proposed. A haptic device uses mechanical vibration to stimulate the touch receptors in the skin. It can give navigation information by activating tactile actuators (e.g. vibration motors) indicating the direction of the destination. The direct input from such a device allows a faster response time than watching and interpreting a screen or listening to the information. By not distracting other senses, this approach helps the user to focus on other simultaneous tasks which require senses like vision and hearing. Hence individuals with impaired vision or hearing can benefit from this approach. Another application of the haptic device is the usage as an additional help for orientation that is indicating cardinal direction or the direction to a specified location, like someone's home. New environments to the wearer can be explored more intuitively by using this extra sense of orientation. The system can be integrated in wearable electronics e.g. a waist belt. In this work a prototype of a tactile satellite navigation system was developed. The system consist of a Galileo-compatible Global Navigation Satellite System (GNSS) receiver and an array of several tactile actuators for the transmission of haptic information. Preliminary test results with the system are discussed. Further possible applications to explore the potential of such systems are evaluated, reaching from implementations for private as well as professional use. The usage for individuals with impaired vision or hearing is promising as the haptic device becomes like a "6th sense" allowing the individual to compensate for sensory impairments.