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Ultrasonic Tag Recognition

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Abstract. The tagging of objects or people with devices containing some form of unique ID that can be read remotely is a valuable technique for wearable computing applications. Many technologies have been adopted to support this functionality ranging from RFID tags to printed QR codes. In this demo we present an ultrasonic tag design with a range of over 8 metres which can be implemented using low power microcontrollers for both the tag and the receiver. In addition by using multiple devices we are able to achieve position estimation with an accuracy of better than 10cm.

1 Background

The featured ultrasonic tag consists of a microcontroller producing regular packets each containing a coded sequence of 10 cycle pulses at 40kHz. The packets are fed through a resonant circuit to a low cost ultrasonic transducer. The tag receiver decodes the ID of the tag by measuring the intervals between the pulses in the sequence. This design was first used with a single board computer for an auto-calibrated tracking system. The tags were placed on everyday objects and a variety of algorithms were used to determine the 3D position of the tags [1]. A subsequent design was used to track visitors wearing the tags in a medieval church [2]. The tags proved useful for these large installations and a subsequent design implemented a receiver based on a single microcontroller which could be housed in a wearable badge-like device.

2 Demonstration

For this demonstration we are using a minimal infrastructure of tags placed in the environment. These tags are recognised by the badge device worn by the demonstrator. The tags are powered by a button cell with a life of many months. The badge is powered by the RS232 port of a PDA which also receives and displays the ID of tags within range. The components are shown below in Fig. 1.

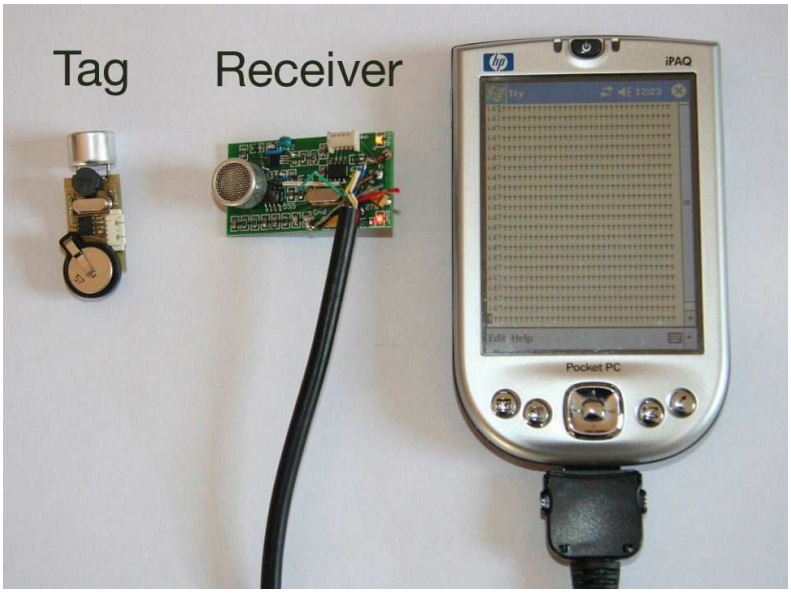

Fig. 1. Tag, Receiver and PDA.

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