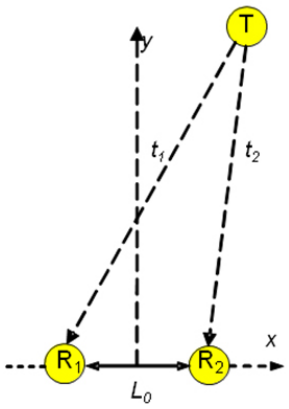
Ultrasonic coordinate meter

A co-operative project between HAAG Elektronische Messgeräte GmbH and Ultrasound Institute

The objective of the project

To develop ultrasonic system for measurement of the position coordinates of the moving object.

Ultrasound Institute



Developed system consists of the small size transmitter of ultrasonic waves, fixed to the moving object, two receiving channels, separated by a specified distance 1m and the software for calculation and presentation of the 2 coordinates on PC screen. The transmitter is triggered wirelessly by infrared (IR) transmitter and is radiating 40kHz frequency ultrasonic pulses. These pulses are received by 2 receiving channels and processed by an embedded digital signal processor (DSP). In order to increase a noise robustness and accuracy of system, the transmitter radiates coded sequences, which are processed by the DSP.

Position of the ultrasonic source is determined by the binaural method.

- Ultrasound propagation times t_1 and t_2 from the transmitter T to two receivers (R_1 and R_2) placed at some distance L_0 from each other are measured;
- The coordinates of the transmitter x_t, y_t can be calculated according:

$$x_t = \frac{c^2}{2L_0} \cdot \left(t_1^2 - t_2^2\right)$$

$$y_t = \sqrt{c^2 t_1^2 - \left(x_t + \frac{L_0}{2}\right)^2}$$

Technical parameters

- Maximal distance 20m;
- Expected uncertainty of measurement of the *x* and *y* coordinates ±7cm;
- Measurement duration (20m):
  - single measurement mode 5s;
  - averaging mode (10 measurements) 10s;
- Frequency of ultrasonic waves 40 kHz.

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RELATED INFORMATION

1. **R.Kažys, L.Mažeika, O.Tumšys.** The experimental investigation of spatial resolution of ultrasonic coordinate meter. Ultragarsas. 2002. Vol. 42. No. 1. P. 29-31. /**pdf**/
2. **R. Kažys, L. Mažeika, O.Tumšys.** Ultrasonic method for measurement of mobile object coordinates. Ultragarsas. 2008. Vol. 63. No. 4. P. 20-24. /**pdf**/