UWB WITH AGV FOR LOCALIZATION SYSTEM

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Abstract

Automated guided vehicle (AGV) has great significance in material flow and distribution of goods with high precision and efficiency. Besides, Ultra-wideband (UWB) is a technology used to transmit wireless signal in nanosecond. In this paper, localization system using AGV via UWB is designed. Furthermore, the experiment of localization with AGV is introduced and the result is discussed. In addition, control system for AGV is developed by using kinematic control system via Labview.

Keywords – UWB Technology; Localization; AGV; Kinematic Control.

Research Highlights

AGV has played an important role to improve the efficiency of the enterprise especially in transportation. It takes the task from starting node to a destination node in the given storage environment(1). In term of localization, LPS has several technologies to get position such as Wi-Fi, Bluetooth, RFID, IR, Ultrasonic and Ultra-wideband (UWB). UWB is a wireless technology used ultra –short pulse based on radio signals. It has many features and has been implemented in many LPS application(2). The aims of this paper are to discuss localization system using UWB technology as well as the experiment of localization with AGV.

UWB technology :

The UWB signal is a short-rang radio type device that uses ultra-short pulse and this reaches within nanosecond to calculate a position. UWB has many features in term of transmission and it has high data rate with low power transmission. At the same time, it has large bandwidth with low power consumption, high multipath immunity (3) and high resolution. All these features led UWB to become an important technology in various applications in LPS such as position tracking. For positioning system, GPS has been widely used since 1995, where 24 satellites were used to obtain full functional GPS. However, GPS has some constraints in specific area where it is unable to transmit GPS signal inside the building due to insufficient amount of line of sight (LoS). Those constraints causes to signal to be blocked thus multipath signals will be produced which lead to the change of signal direction and finally affect the accuracy of GPS data (4)(5). Therefore, UWB is selected to be implemented in this paper due to its abilities to overcome those constraints in localization system.

Table 1. UWB Features

Size	Dimension :29mm x 52.7mm
Power Consumption	Universal PCB, can be flashed to operate as an anchor or as a tag.

DWM1000 Transceiver	UWB Decawave Localization Transceiver (DWM1000)
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Results

Figure 1 shows the kinematic control for AGV motion where the target point (x_d, y_d) is selected as (2,2). The kinematic parameters that used is k_y , l_y , l_x , k_x which selected = 1 and the real motion for AGV shows, it can reach point (2, 1.99).

Figure 1. Kinematic Control for Point (2, 2)

In Figure 2, the AGV motion is started from point (0.48, 0.33). The AGV moved smoothly till it reached to the desired position at node (3, 2.5) that is selected inside the front panel. The real position that AGV reached is (3.05, 2.51) for (x, y) position. The error in x - axis is 0.05 m and in y - axis is 0.01 m. At the same time, the AGV motion in real time is very near to the required destination shown in Figure 2.

Figure 2. Robot Motion (3, 2.5)

Conclusion

In this paper, the experiment of AGV localization system is discussed. In addition, the results for AGV motion are also discussed. Furthermore, the experiment results has shown that the AGV is able to navigate smoothly to reach the target location.

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