K-087

Fundamentals of RFID and its Application Analysis in Smoky Area

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Abstract

Recent technological development on RFID has made rapid growth of its application. Currently location sensing is being done using various technologies. But location sensing in a smoky area is difficult. The fire caught place has poor visibility which would normally hamper rapid identification. As RFID is susceptible to hazardous environment and has non-line of sight feature, it could be used as a navigator in a fire caught place. In association with this Milliwave radar, Gyroscope and 3D stereo camera can be used for the prior measurement and spatial visualization. The RFID tags could be placed in predetermined locations and a reader will gather information from it through wireless communication. This retrieved information would assist the fire extinguisher inside a smoky area.

Keywords: RFID, Position detection, Extinguisher.

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1. Introduction

The abbreviation RFID stands for **R**adio **F**requency **ID**entification. RFID is an IC chip base for radio frequency transmission and is also called radio frequency identification tag. Having being standardized by the international organization, it is generally called RFID. It is not a new technology. Actually this technology was invented in the late 1930's for IFF (Identify Friend and Foe) aircraft Identification and has been extensively used since World War II [1].

In the area of Fire Extinguisher, advanced assistant methods are expected to appear as a result of the recent advancement of IT. It is necessary to provide enough information about internal structure of the fire caught place and position of the wounded people and damaged assets to the Fire Extinguisher team for prompt and accurate operation. Hence our goal is to provide such information to the fire extinguisher who would rescue the wounded people using FRID, Stereo camera, Milliwave radar and Gyroscope sensor data.

2. Fundamentals of RFID System

Due to the enormous advantages of RFID systems such as operability in relatively harsh environment, non-contact and non-line-of sight features, RFID systems are now beginning to conquer new mass market [2]. There are four fundamental components of a RFID system- Transponder, Antenna, Reader and Encoder. The transponder, referred to as RFID tag (Fig.1), stores data and contains the identification code which is placed by an encoder. It is located on the object to be identified. The tag has an antenna to send and receive data to and from the reader system. The reader system interprets and decodes the radio signals and performs other system functions [3].

Fig.1: RFID tag

3. Proposed Approach

To prevent the damages of assets, it is necessary to extinguish the fire as quickly as possible when a building, house or company caught fire severely. At the same time, the accuracy to detect the position of injured and assets are important factor.

Currently the position sensing is done using various technologies. But a fire caught place become smoky enough. Therefore, position sensing in a smoky area is not same as position sensing in a normal place. When a place is caught fire, its surroundings become invisible with smoke.

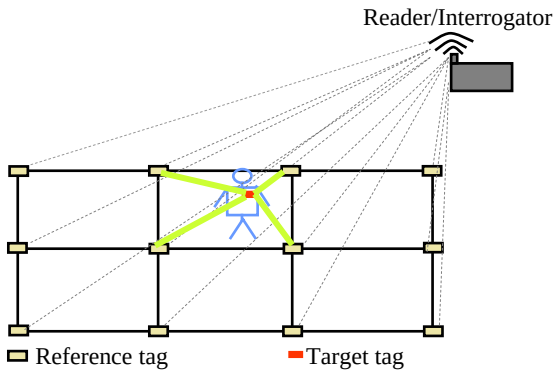

Fig.2: Proposed RFID Grid System.

For this purpose we propose a Fire Extinguisher System using RFID in association with FM-CW radar, Gyroscope sensor and Stereo camera. RFIDs would be placed at each predetermined spot such as on the ground as grid array (fig.2), which are called here as a reference tag. Again tags are attached with the people entered inside the study area which is referred as target tags. In our system, the information about the internal structure of building, interior decoration style and furniture placements could be distributed to the site by placing many reference RFID tags in the site. The target tags can be used to provide the information about the people and their position. The RFID reader system, carried by fire extinguisher, will obtain information from the target RFID tags with the help of reference RFID tags using radio frequency linking. In wireless communication area its use is a rising issue as it can survive where automatic hands-free operation over relatively long distance is required [4].

Fig. 3: Improvement of Spatial perception ability using Milliwave radar data, Stereo camera data and Gyroscope sensor data.

Again Millimeter wave radar data, Gyroscope sensor data and Stereo camera data are used (Fig.3) for visualization of 3D study space and improvement of spatial perception ability. As Stereo camera does not work in smoky area, it is used only for prior measurement. From these observation Milliwave 3-D map item of information which it constructed being easy to understand as shown in fig. 4. By the stereo camera the measurement (Digiclops) is formed from 3 CCD cameras [5]. FM-CW 76GHz band radar is used as it can inspect the target even under the foul weather of the rainy fog snow. The distribution of reflected strength of the radar signal for the object is observed. The distance information obtained from the ultra high frequency radar and the direction information of the gyroscope sensor are integrated; the system for spatial visualization is achieved.

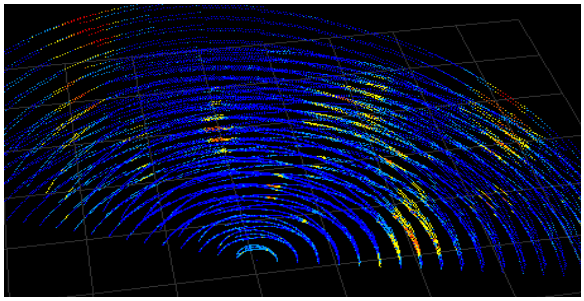

Fig.4: Milliwave 3-D map of the observed area.

4. Conclusion

The implementation of advanced Fire Extinguisher System using RFID grid system and spatial visualization system (which consists of Milliwave radar data, Stereo camera data and Gyroscope data), will play an important role in human disaster control. Now a day, people are getting used to have various kinds of home security systems. This approach would enhance the demand of indoor life security (outdoor as well) and would open a new path for rescue process of fire extinguisher.

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